

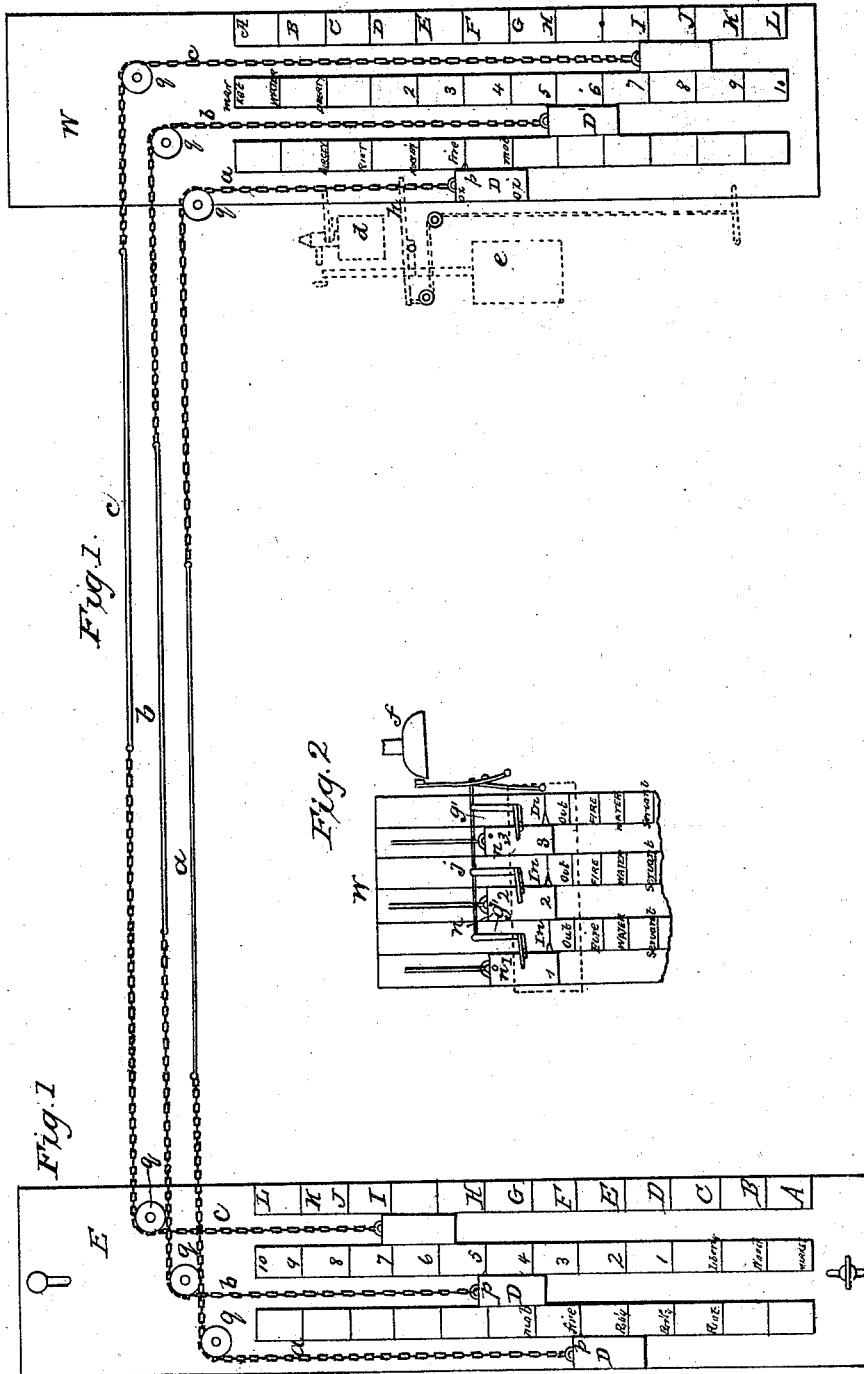
S. FREW.

2 Sheets—Sheet 1.

Telegraph.

No. 2,701.

Patented July 2, 1842.

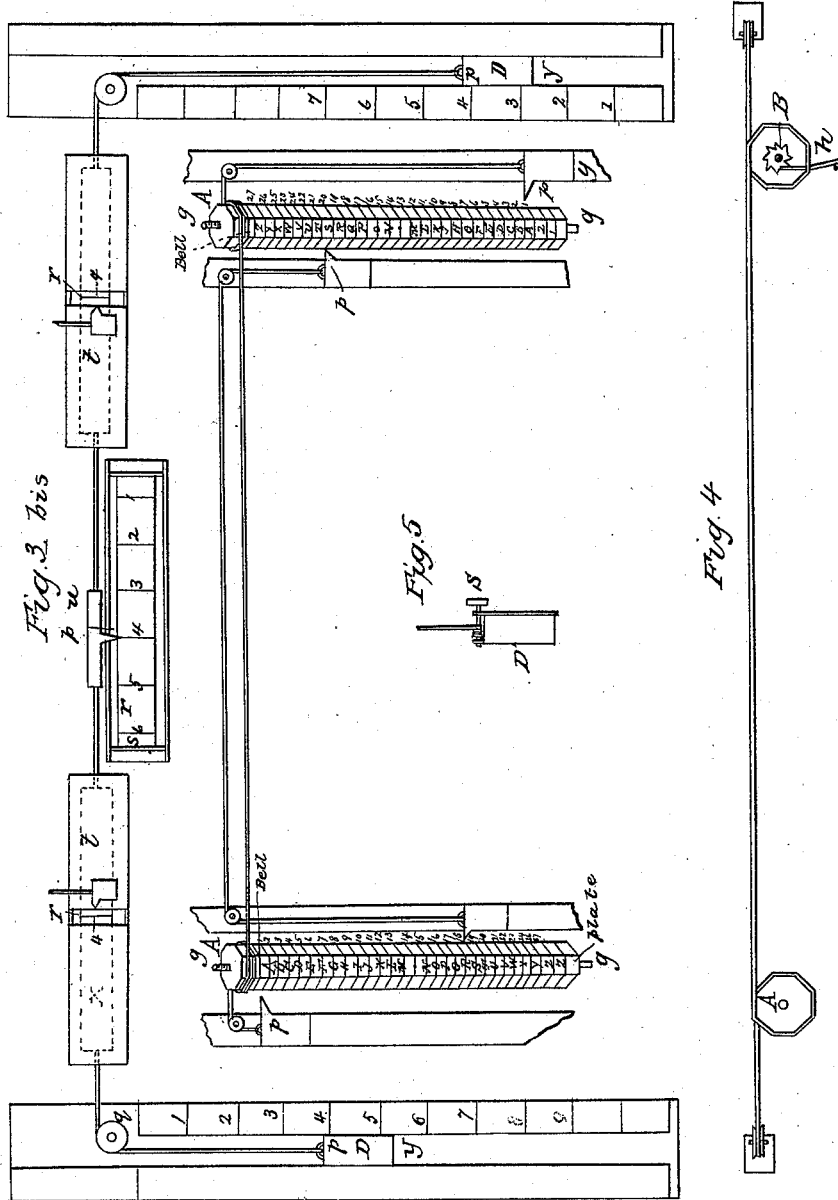


Telegraph.

2 Sheets—Sheet 2.

No. 2,701.

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# UNITED STATES PATENT OFFICE.

SAMUEL FREW, OF ELIZABETH, PENNSYLVANIA.

## IMPROVEMENT IN TELEGRAPHY.

Specification forming part of Letters Patent No. 2,701, dated July 2, 1842.

*To all whom it may concern:*

Be it known that I, SAMUEL FREW, of the borough of Elizabeth, in the county of Allegheny and State of Pennsylvania, have invented a new System of Telegraphic Correspondence; and I do hereby declare that the following is a full and exact description.

The nature of my invention consists in a movable wire (or other agent) in a state of tension, so as to be equivalent to a continuous rod without elasticity extending from one place to another, by the moving of which wire a given space at one extremity a movement over an equal space is produced at the other, and by the use of dials and indices at the extremities the simultaneous movement of these indices are made to coincide in their notations by pointing to the same word, letter, figure, sign, or emblem in both places at the same moment.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation.

For long distances it will be necessary to protect the wire, and in doing so by the same means it becomes easy to give to it what support is required at intermediate points. I will describe its construction combined with the protection of a pipe in which it is made to pass under ground from one place of correspondence to another.

For convenience of expression, let E and W, Figure 1, in the accompanying drawings denominate, respectively, two telegraphic offices, E being at the eastern and W at the western terminus of a line of communication. A pipe of lead or other material is laid under ground as nearly as practicable, in a straight line from one to the other. In this pipe, box, or whatever covering may be used while in course of being embedded by sections, pulleys or rollers are placed. These support the wire and diminish its friction. If an angle occurs in the course of the wire, a pulley with a square groove is there placed, and a piece of chain is inserted, the length of which should be a little more than the intended sweep, in order that the tie of the chain and wire may not be drawn in either direction upon the pulley. This use of the chain and pulley is made in all cases of angles, whether occasioned by an undulation of the surface of the ground or by lateral deviation. In

case of angles by undulations the chain passes under the pulley in ascending, and over it in descending. At the end the line is brought up by again recurring to the use of the chain and pulley. A pulley is fixed in a frame-work hereinafter described, and this is firmly secured upon the wall of the office. The chain passes over the pulley and descends by a weight, which is here attached to it, into a channel in the frame-work, in which the weight is arranged to rise and fall. This weight is adapted in quantity to the length of the line and must be sufficient to keep the wire tense. Where this rule of proportion does not make it too ponderous it is raised and drawn down by the hand, where otherwise mechanical power is used to effect the required movements.

Remarking that all other details of structure and operation are the same as are minutely described in the subsequent specifications, I here detail further only such different essential modifications as arise in an extended line. It is to be understood that the machinery, fixtures, weight, &c., are the same at both ends, and that the weights are exactly equal. Consequently the rising of the one causes the other to descend at the same moment, and on releasing the operation of the motive power their equipoise causes them to remain till again moved in the position where left by its withdrawal. In the case in view the structure of the dial is different from that herein described as pertaining to a limited establishment, and is therefore here described in particulars. This dial consists of an octagon body A A, Fig. 4, whose several faces are each broad enough to contain a list of words, figures, or letters. Each list of words is adapted by powers of combination to form expressions relating to a particular subject. Thus one face contains words of commerce. Another relating to stocks has a list of the several prominent stocks, with the words "Par," "Under par," "Premium." These several faces are designated, respectively, by the numbers from 1 to 8. Below (or above, as the case may be) the range of the text words and numeral characters on each face is the word "plate," to which the pointer is moved when a change of dial is required, and thence to the numeral character 1, 2, or 3, or whichever is the indicative number of the required plate. The party

thus directing a change of dial makes the same change himself. This is conveniently done. The dial A is constructed to turn upon a gudgeon *g g* at each end, and is so incased as to present but one face at a time. Its regular presentation is governed by a rag-wheel B, Fig. 4<sup>bis</sup>, on the end of the lower or upper gudgeon, whose indentations are equal to the number of faces on the dial. Against this a spring *h'* is made to press, presenting thereto a surface with corresponding cavities. One face of the dial, it should be stated, contains the letters of the alphabet, to which resort is had to give unusual words not found on the other dials. It also has the zero-point, which serves to divide words.

Each frame-work E and W, Figs. 1 or 4, has attached to it a bell, such as represented at *f*, Fig. 2; which is placed in such a position as to be sprung by the weight when let down to the bottom of the channel. Now suppose a telegraphic agent at E, Fig. 1, to send a message to one at W. He raises his weight D to the top of the channel, which brings the pointer to the word "Bell," which is on the upper line. In consequence of this movement the weight D at W sinks to the bell-trigger and rings it. This party may return a signal of readiness in the same manner. The agent at E then indicates the dial to be used, and then moves his weight successively (or rather the pointer which is attached thereto) to the several words, letters, or figures composing the message, pausing with the pointer at each just long enough to be understood. In this form of use the words on the dial at W are placed in the inverse order of the arrangement at E, this being necessary to produce the coincidence of rotation. By using the wire in a horizontal line in the offices the dial is also placed in a horizontal position, in which case the same order of words is observed on both; but while in view of the perpendicular dial I will illustrate the rapidity with which a message may be sent by repetition over a long line composed of numerous sections. Suppose A, B, C, and D to signify four telegraphic offices one mile distant from each other. The agent at A raises his weight and rings the bell of B, who has a dial for the second section on the same wall and immediately beside the one on which he reads and immediately copies the action of A and warns C. C immediately does the same with D. In the meantime A has commenced his message to B, who in his turn copies or repeats each word as it is marked. C sends the words as they appear without waiting for more than one at a time. Thus it is practicable to send a message of ten words over a distance of one hundred miles in about four minutes.

It may be proper to remark here that the objection at first apparent to the employment of numerous repeating offices is less forcible when duly considered. The agent at each office may earn his wages at any mechanical employment which is noiseless and not such

as to call for his leaving the house. The nature of public intelligence, too, is commonly such as to make its general dissemination desirable; but the system is at the same time capable of transmitting a private message known only to the correspondents. This may be done by a concerted transposition of the alphabet, the address to be indicated by number.

The extent of wire capable of being used in one section can only be determined by experiment, and from what has been said above as to sections of one mile it must not be supposed that this is the presumed limit of its practical operation.

As a substitute for the revolving dial, a movable plate may be used with columns of words or sentences, which by the alphabetical method of division could be readily distinguished, all words or sentences beginning with A to be placed in the column A and in the order of sequence observed in dictionaries. This form of dial is required when by the use of two wires the operator at one place in the absence of his correspondent chooses to direct his attention to a special order. The sliding plates being visible only for the width of one column at a time and being so fixed originally as to present the same column at both ends, the wire from one to the other being tense, it follows that a change of presentation in one produces a corresponding change of the other. This done, the requisite column being presented, the other wire, with its fixtures and machinery, serves the purpose of pointing to the particular word or sentence. This form of the invention would be useful in houses of several stories from one floor to another, or for a conversations telegraph from one house to another, or in a military establishment of any sort, or from a dwelling-house to a mill, or store-house, or mechanical or manufacturing shop. As a convenient arrangement, the weights, which give tension to the wire that connects with the movable plates X, are placed in grooves *y* and work therein the same as the others. They are provided also with pointers *p*, and a dial to each with the letters of the alphabet thereon. These serve as guides in moving the plates *e.g.* When first adjusted, the column marked 4 is presented through the aperture in the screen on the horizontal dial. The pointer belonging to the vertical column ought to stand at 4 on its dial. By drawing it down to 6 the plate X in the horizontal column, moving the same distance, though in a different direction, presents the column 6 also. Where it should be desirable to have the columns wider than the spaces on the dial, double pulleys can be used, whose relative sizes may be rated to any proportion desired to be established in this respect.

For some purposes it may be advantageous to communicate from one to several other places the same thing. This is done by branch wires of smaller size connecting with

the main stem as near as possible to the point of distribution. The weights attached to these branch wires are small in proportion to the number of branches, and in the aggregate should be just equal to the weight at the end of the main wire. From a court-house to a block of law-offices the progress of the court with a trial-list might be kept always apparent in each office by the attention of one person at the court-house.

So multifarious are the uses, or rather the situations of usefulness, to which this invention is applicable that it would be equally tedious and unnecessary to go into a lengthened enumeration of them all. It being sufficient for the purpose of this specification to elucidate the principles of the invention and its mode of operation, I shall here only enumerate the more prominent and leading objects to which it may be applied, and close with a minute description of its modification in some one of the more confined forms. Of its uses: first, the transmission of intelligence of a commercial, warlike, political, legislative, or miscellaneous character from one place to another; second, the transmission of notices of any occurrence from one part of a town or city to another, as in cases of fire or police operations; third, the communication of orders in a military garrison from one department to another, or from one part of a naval vessel to another—the same on board a merchantman or other vessel; fourth, the object of exhibiting in the cabin of a steamboat or other vessel making periodical voyages between the same points the stage of her progress at all times, this being done by a wire running from the pilot-house to the stern, passing through such apartments as in which the information is wanted; a dial in each apartment running horizontally, on which are written the names of intermediate ports and other objects, the pilot having a dial to correspond, moves on approaching each place to the name of the place, this movement ringing a bell and drawing attention; fifth, between public offices, between which calls often occur for the transportation of books and papers—as from a judicial hall to a clerk's or prothonotary's or register's office, or from the apartment of the head of one bureau to that of another in any branch of the executive department of a civil government. Again, of construction and operation.

For the purposes of a police and fire telegraph in cities several wires *a b c*, Fig. 1, may be run in the same pipe under the sidewalk and used thus: One wire *a*, with its weight *D* and other fixtures, to have words of occurrence—as “Fire,” “Riot,” &c.—on the dial; another *b* with a dial containing the names of the streets another *c* with a dial containing words denoting the particular square in conformity with a map for police and fire purposes, the squares being designated by letter or number.

By the same movement of the wire as in in-

dicating an occurrence, a light may be raised in the office to which the indication is given by using a small gas-box *d*, Fig. 3, the same which is in common use in the form of a contrivance for igniting hydrogen gas by contact with a platina sponge, and also a reservoir of carbureted hydrogen *e*, supplied from gas-works. These are provided with triggers *h*, which open the valves. These triggers are commanded by pins *i i* on the weight *D*. The pins and triggers are adjusted so that the valve of the hydrogen gas is opened a moment sooner than the other, so that ignition is effected, when the carbureted hydrogen being thrown into contact is lighted, and continues to burn till extinguished by another movement of the weight acting upon a trigger which closes the valve. The trigger of the hydrogen-gas box or reservoir reacts by the force of a spring, as in the usual form, when the cog has passed so far as to loose its hold upon it. These triggers are provided with joints in the same form and have the same action as those herein described as commanding the bell in a hotel arrangement. The trigger which commands the emission of the carbureted-hydrogen gas has, however, no reaction by spring.

By means of the contrivance here described any number of lamps, by means of a wire extending along the whole line, may be simultaneously ignited and extinguished.

When a line of wire is placed in the open air—as in crossing over a street and thus exposed to great changes of temperature—two wires are used. One serves to preserve the regularity of the other. The dial at one end of the line is suspended to the end of the one, while the other operates as in any other form. The frame-work of the dial should be equal to the weight employed. Both wires, being exposed to the same influences, will contract and expand alike. Here it would be better to have the weight at the end where the movable dial is a pound or two heavier than that at the opposite end, so that in case of expansion the weight at the heavier end will descend as the dial does.

For the purpose of giving support to the wire in the open air in crossing streets or streams, a line of wire is firmly stretched from one side to the other, with rings upon it through which on the under side the moving wire is made to pass.

For purposes of conversation at short distances, the revolving dials *A A*, Fig. 4, are used with a double wire. One wire passing from dial to dial causes by its movement a coincident presentation of the corresponding faces, while the other serves to note particular words. Of the several faces of this dial one should have words or figures of time, number, quantity, and measure; another the letters of the alphabet; another a miscellaneous selection of names of persons and words of ordinary inquiry, with the responsive words “Yes” and “No” at the top or bottom. The

other faces may contain words relating to particular subjects, or may be filled up, as the taste or circumstances of the possessor may dictate.

First among the limited or local uses to which the invention is applicable may be placed the communication of orders from one part of the same house to another, as in a private mansion or a hotel. In the latter its exemplification as between the room of a boarder and the bar will exhibit this arrangement. A copper wire, say of No. 17, extends from the room to the bar, making the same angles and pursuing the same course as if intended for the ringing of a bell. At the angles instead of quadrants or swivels, as used in the connection of bell-wire, a pulley is placed, like *g g*, Fig. 1, and a piece of chain is inserted and is so adjusted as not to pass entirely by any movement admissible by the arrangements at the extremities of the wire. One end of this line of wire and chain is made to come down parallel with the wall of the room to a place convenient for the operator. To this is attached a weight sufficient, when counterpoised by another of equal quantity and gravity at the bar, to give perfect tension to the wire. These weights (see 1 2 3, Fig. 2,) are in size and gravity proportionate to the weight of line, and may generally be found sufficient at five pounds. About six inches long, two inches wide, and one and one-quarter inch thick is a convenient size; but where economy of space is an object the width should be reduced. The material in view of this calculation is lead. A cheaper article equally good is cast-iron. On a frame-work consisting of a thin board four inches wide and three feet long, are fastened two strips of the same length and about an inch wide, so as to form an interspace of two inches from end to end. In this the weight is placed. The depth of the rabbet thus formed is gaged to suit the thickness of the weight, allowing the index or pointer, which is fastened on the face of the weight to project to one side a little and move over the frame without rubbing. On one of the sides of this frame-work is placed a paper or other dial, which is divided from top to bottom into equal spaces, each defined by a visible rule-line. It is now to be understood that at the other end of the wire—viz., on the wall of the bar-room—is a similar frame-work and set of fixtures corresponding exactly with the first, so far as yet described. By means of a handle, which is placed on the face and near the middle of the weight, it is made to rise or sink in the channel in which it plays, with a slight degree of force, while it remains stationary wherever set, in consequence of the equilibrium.

In adjusting the length of the wire the weight should be held with the pointer on the lower line of the dial at one end, on the upper line at the other. A list of words likely to denote the wants of a traveler or boarder are written on these plates or dials. The one

must be in the inverse order to the other, thus "Water" being written on the top line of the plate in the room must be on the foot line of the plate at the bar. The weight or dial is marked at the bar end with the number of the room to which it pertains. So the occupant of the room—say No. 1—raises his weight so as to bring the pointer to "Water," and in consequence of this movement the weight in the bar-room sinks its pointer to the same word, thus indicating the article wanted, and the place where, by a single movement. In this as in all the other modifications of this invention a zero-point, which is simply the period used in punctuation, is used for the purpose of regulation. In the form herein described it is placed on the same line with the word "In." The weight and frame-work at the bar are so adjusted that when the pointer rises to this zero-point, the weight stops against the top of the frame-work, so that if any elongation or contraction of the line takes place it is corrected at the other end either by moving the dial so as to bring the zero-point to the end of the pointer or by turning a screw in the weight, like that of a stringed instrument, to lengthen or shorten the line.

The words "In" and "Out" to denote the presence or absence of the occupant of the rooms are thus placed: "In" on the top line of the dial at the bar, "Out" on the next line below. Where a number of telegraphic dials are placed on the same wall or in the same room, a single bell is made to strike alike for all of them. The weights in this case are made to conform to one straight line at zero. A thin board or other material (shown in dotted lines in Fig. 2) equal in width to the length of the weight is placed over them, so as to conceal them from the eye at the word "Out." Any weight being set to "In" will be displayed above this screen, so that its presence there denotes that the occupant is in—when invisible, that he is out. A removal to any word denoting a want displays the weight below the screen. The numbers of the several rooms are placed over their respective weights, to serve the purpose of distinguishing when the weights are behind the screen. Each weight is provided with a pin *n n n* at the top, which as the weight ascends catches a trigger *g' g'*, which commands a wire *j* attached to a bell and causes it to ring by drawing and suddenly remitting it. The trigger is constructed with a joint at its angle, so that in the return of the weight to zero it lifts out of the way of the cog and drops back into the proper position to act again. The wire which commands the bell-hammer is stretched in a straight line over the dials. Each weight has its trigger, and that trigger fastened to the wire. The bell being at one end of this wire, the other is fastened to a spring upon the wall at the other, which keeps the wire tense. This arrangement enables the bar-keeper at all times to know if a call be neglected. When the servant takes the article called for to the

room, he pushes the weight there to the bottom of the rabbet, which restores the one at the bar to the position for "In." A small bell giving the tone of D in concert-pitch is loud enough for the largest house. The stroke of the bell gives notice that a call is made, and the display of the weight below the screen attracts the eye and shows from which room it is by the number. The bell-trigger is so located as not to draw the wire till the pointer has passed the word "Out," so that for a movement from "In" to "Out," and vice versa, no notice is given, because not necessary. A smaller sized wire than No. 17 will be found more convenient when chain of proportionate size can be had. Weight enough to spring the bell must be preserved in any reduction of size.

*General explanation.*—The pointer *p* is simply a piece of sheet-brass or other metal fastened across the face of the weight *d* and projecting on the side next the dial half an inch, the end being filed to a point. It may be cast with the weight and filed into shape. The chain for long distances and very exact operations should be the same in structure as the internal chain of a watch. The bell-chain used by bell-hangers is of a quality suitable for this use. The pulleys *q* should have a square groove adapted to this form of chain. The common round-link wire chain with the round grooved pulleys serves very well for ordinary purposes. For elegant work, where the pulley is exposed to view, as in a parlor, the mainspring of a watch, which moves with great ease and without noise, is preferable to the chain. An order may be given without the notice of any one present. The dial for hotel purposes may be a thick paper covered, after being imprinted, with a coat of varnish and put onto the wood with glue or paste.

The zero-point serves to correct any contraction or elongation of the wire. Thus the operator at one end of an extended line immediately after moving so as to strike the bell of his correspondent sets his pointer at zero. The latter, if he finds any variation, slides his dial so as to bring his zero under the pointer. Having done this, he moves his weight either up or down and returns his pointer to zero, which proves his accuracy to the other and gives notice that he is ready. In the alphabetical dial it is used to divide words, the reader pronouncing at this notation. Two successive notations indicate a conclusion of the communication made. The sliding dials *r*, as represented in Fig. 3<sup>bis</sup>, consist of a thin board or piece of sheet-iron, the edges confined in a rabbet above and below. The screen *t* is a material of the same sort, and is of the same size, except in length, which is double that of the dial. The aperture *r* is a mortise cut from the upper to the lower edge, or nearly, of *t*. Through this mortise or aperture the several columns of words, figures, or letters appear in alphabet-

ical or other succession as they are moved back and forward in a horizontal direction. The sliding horizontal dials, moved by a catch on the wire, is of the same material and structure, excepting as to the words or letters inscribed upon it, which are in the horizontal order, and in this form no screen is used in front. In the wire line, immediately in front of the sliding dial here referred to, a piece of sheet-copper *u* or other thin substance should be inserted and the pointer *p* attached to this. The openings in the rings being accommodated to the width of this, which should be about an inch, preserve the pointer in a parallel position to the dial.

In situations of great exposure to alternating temperatures rods or filaments of wood may be substituted for the wires.

In the double, triple, or any greater number of wires in which the sliding plate with columns of words is used the variation of the wire which moves the plates is corrected to the zero-point on the alphabetical dial, in which case the alteration is made by a screw in the top of the weight *D'*, Fig. 5. This may be secured by the common rag-wheel and dog.

Where horizontal dials are placed along a line, as shown at *s*, Fig. 3<sup>bis</sup>, catches may be fixed upon the wire and the dial be made in the sliding form, so that by placing a ruling-point at each end the action of the wire itself, moved at the end of the line where the permanent dial is, with two corresponding zero-points, will regulate the dial without the assistance of any person. In the same manner the dial at one terminus of any line may be regulated from the other without concerted action of persons. Thus, place two ruling-points upon the vertical dial, one an inch above the other an inch below the column of words. The frame-work being constructed to stop the weight with the pointer at these ruling-points admits of vibration from point to point, and no more. The wire at the other end passing through rings attached to a sliding horizontal dial, with catches on the inside of the rings admitting of the same vibration, draws the dial by means of the catch to its proper relative position.

What I claim as my invention, and desire to secure by Letters Patent, is—

1. The use of a wire or other movable medium extended from one place to another, together with movable dials or other alternative contrivances, hereinbefore described or alluded to, by which corresponding notations are made at the same time on the dials at the termini of the line by means of words, figures, letters, signs, or emblems written thereon at equal spaces, so that the moving of the wire or other medium an allotted space is made to produce accurate, intelligible, and coincident indications at the extremities, comprising under this principle the different modifications set forth in this specification by which

combined movements of two or more media are made to result in definite indications of fact, locality, or idea.

2. As original with the several systems detailed in this specification by which the eye and ear both are notified of a call or other movement, the system herein set forth by which one bell is made to serve for a number of rooms in a hotel or other establishment.

3. The system herein set forth by which light is produced and extinguished at any given point by the movement of a wire or other medium.

SAML. FREW.

Witnesses:

E. DOWSING, Jr.,  
CLEMT. T. COOTE.