Oct. 23, 1928. 1,688,935

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APPARATUS FOR TESTING THE APTITUDE OF KEYBOARD OPERATORS

Filed Sept. 27, 1926 4 Sheets-Sheet 1

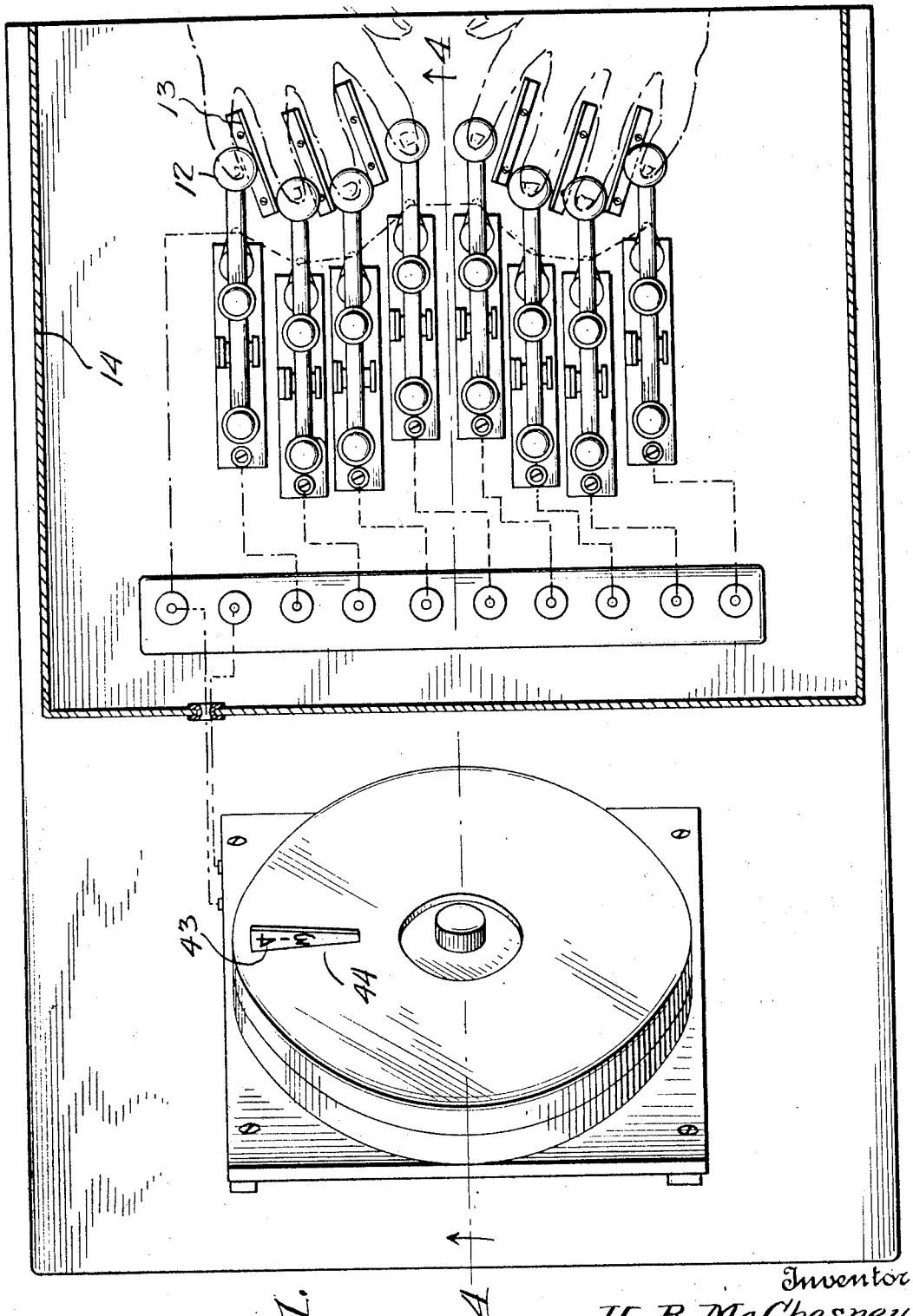


Fig. 1.

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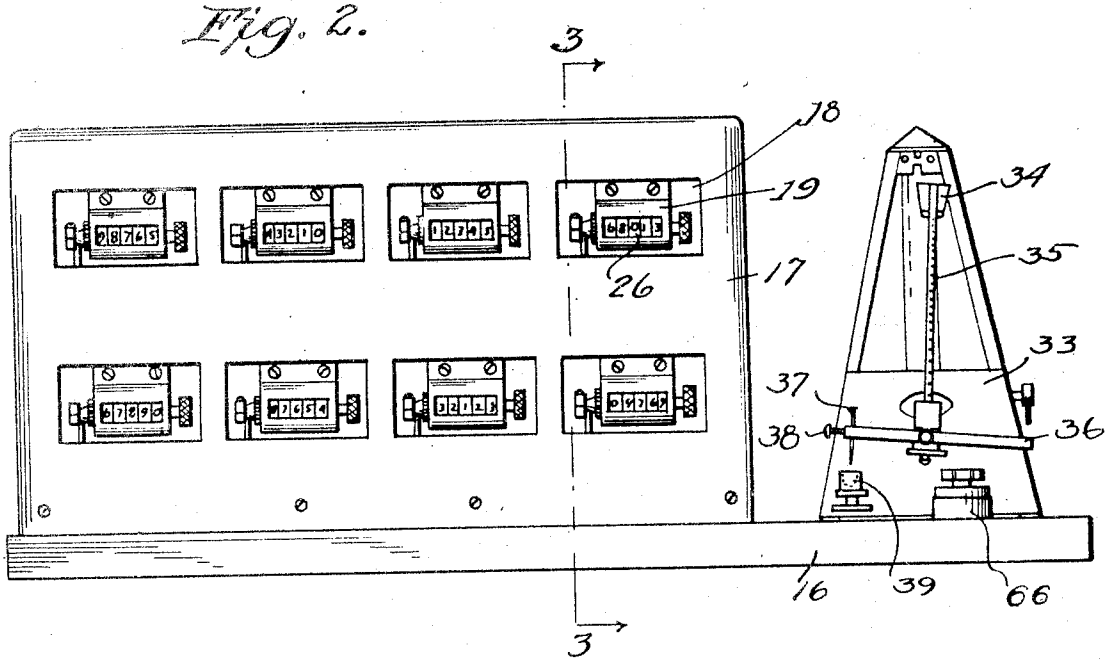
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Fig. 2.



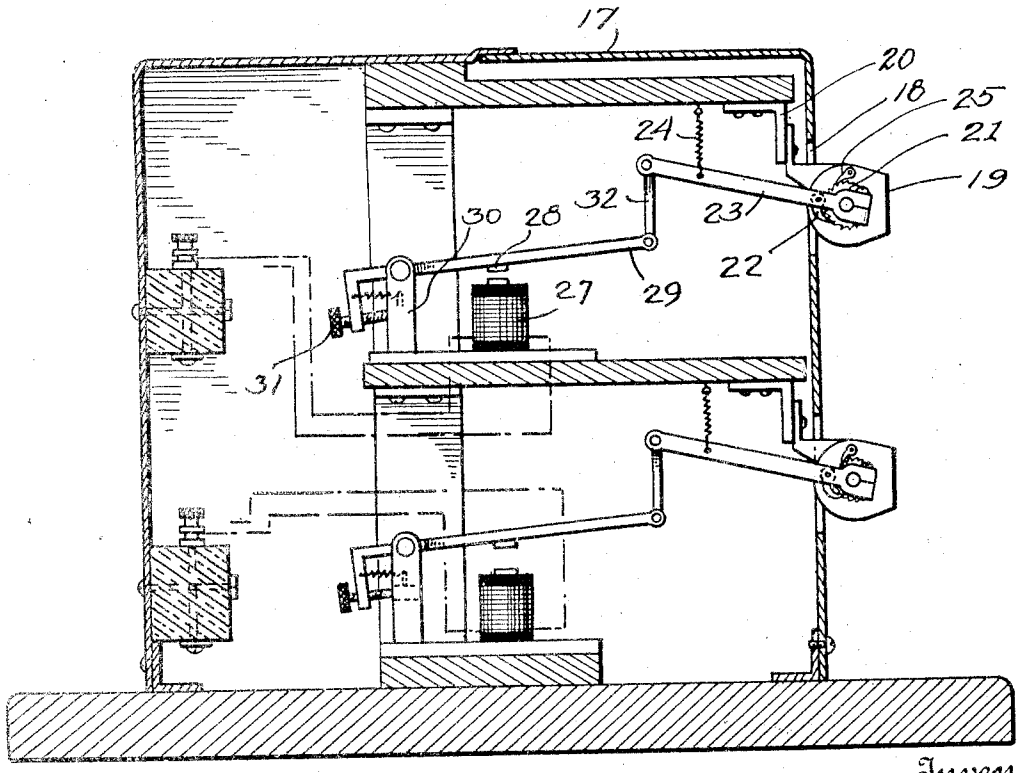


Fig. 3.

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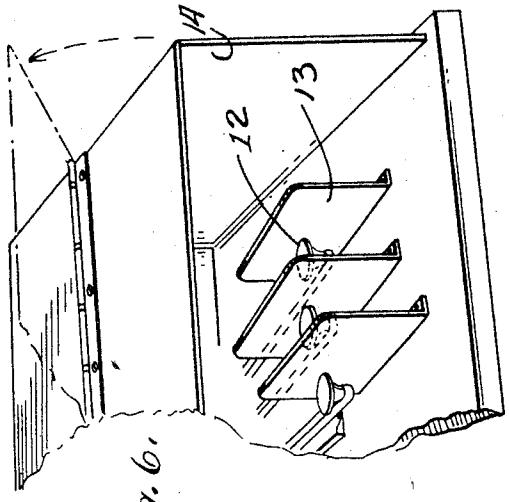


Fig. 6.

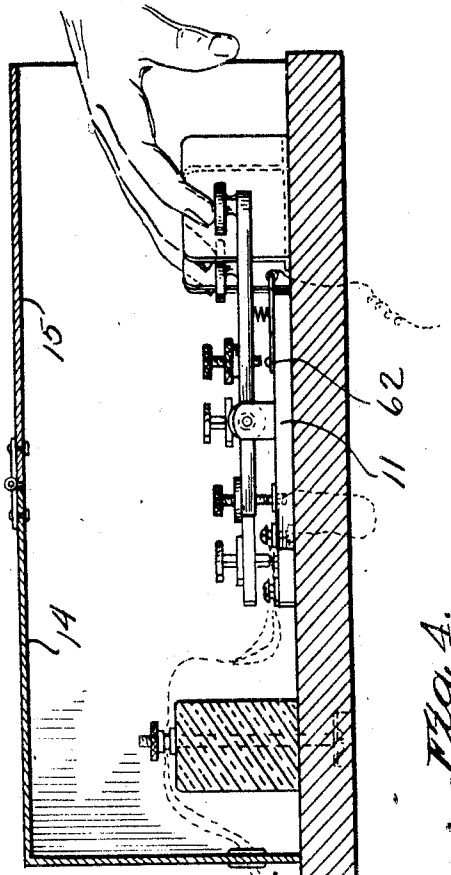


Fig. 4.

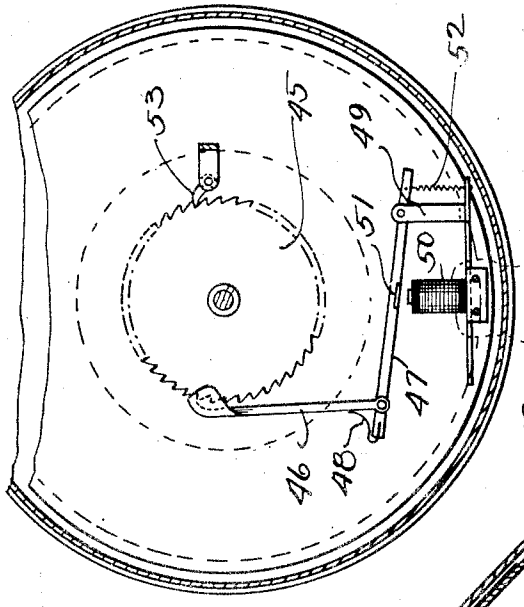
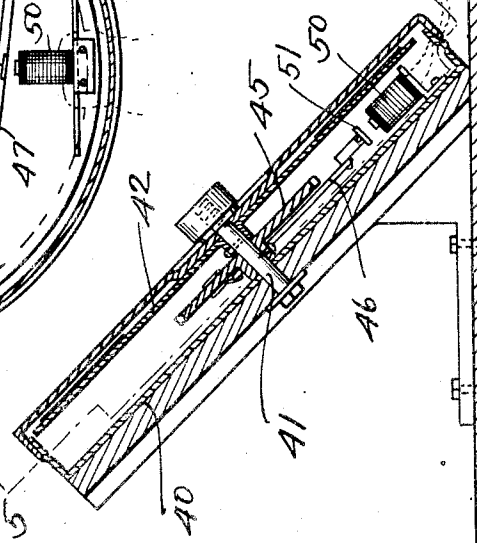


Fig. 5.



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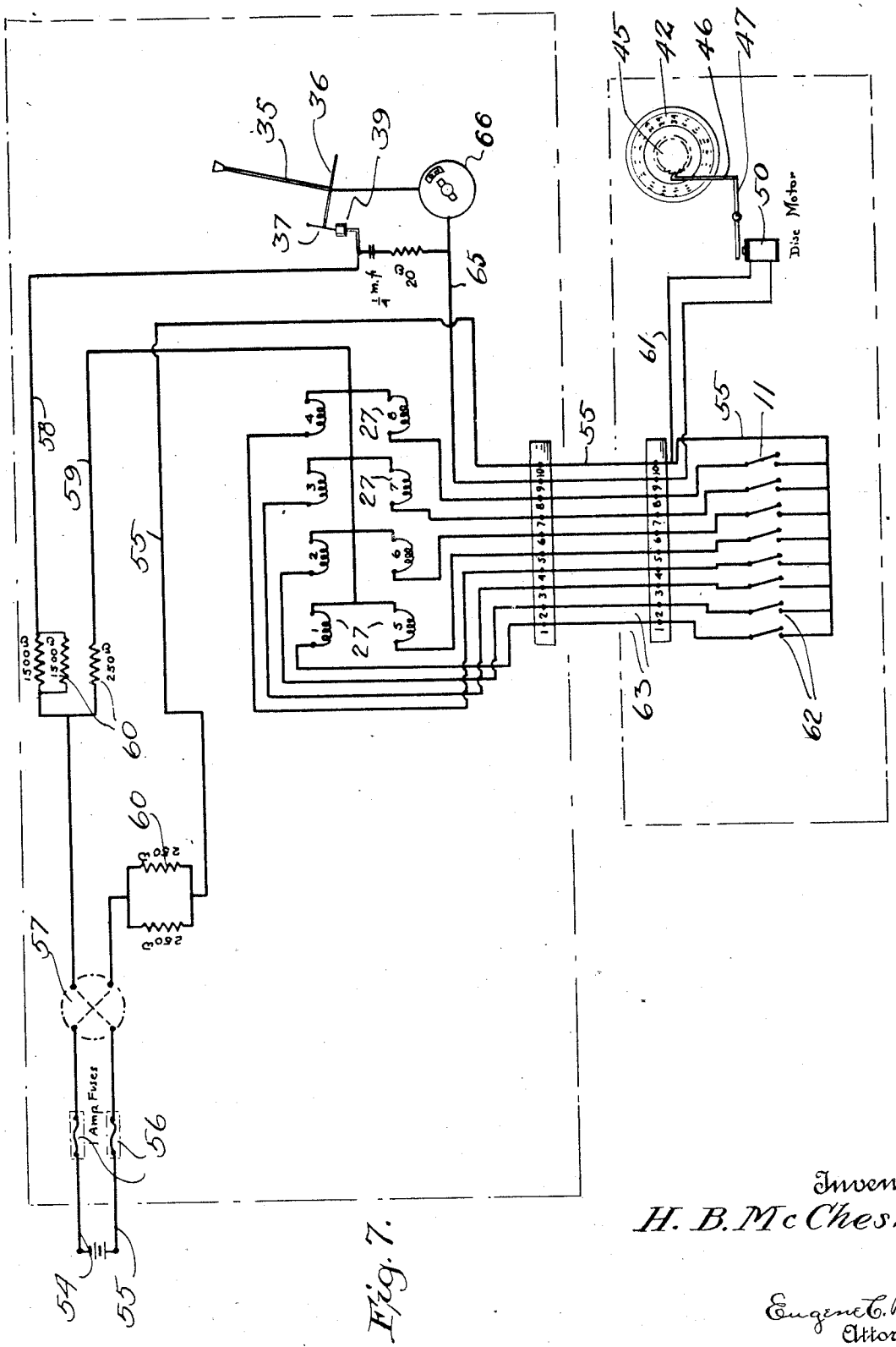


Fig. 7.

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UNITED STATES PATENT OFFICE.

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APPARATUS FOR TESTING THE APTITUDE OF KEYBOARD OPERATORS.

Application filed September 27, 1926. Serial No. 137,993.

This invention relates to an apparatus for testing aptitude for keyboard operation.

In the transmission of telegraphic messages by the so-called automatic transmitter, it is necessary to prepare; for the present type of transmitting instrument, a code strip or ribbon which consists generally of a paper ribbon having, for each letter or character transmitted, a series of holes punched therein, the arrangement of which differs distinctively for the respective characters. This ribbon is prepared on a punching machine having a keyboard substantially like that of a typewriter, machines of this type being well known as used in perforating the type of telegraph transmitters. After the ribbon has been prepared it is sent through the transmitter and, in accordance with the punched code characters, letters are transmitted to the receiving machine. It is, in practice, impossible to correct the characters punched in the ribbon, and if the operator makes an error in striking the keys of the keyboard that error will be transmitted unless the entire message is discarded. Consequently, the service requires a highly experienced operator who has been specially trained for this work, since an operator making errors will cause erroneous messages to be transmitted, and this frequently results in damage to the receiver, for which the company handling such messages is, in some instances, held financially liable.

Under these conditions it is necessary to select competent keyboard operators and then to train them in the handling of the particular ribbon preparing machine. This special training is usually done at the expense of the company about to employ such operators, and experience has shown that even under the most careful selection of operators believed to be competent on the keyboard, the training will develop that such operators are deficient in one or more particulars which cause them to constantly make a definite type of error. It is to be understood that speed being an essential, the touch system of keyboard operation is used. Some operators may have a weakness or deficient nerve coordination in one or more fingers or in one hand, and this has heretofore only developed in the course of the special training given such operators. It has been found that previous to the invention of this device about one-half of those operators given the special training were found, upon examination, to be useless for service as operators on the special machine. Naturally, much unnecessary expense has been thereby entailed. The present invention contemplates the provision of a special testing instrument whereby those operators having marked defects in the coordination of sight, brain and nerves, and muscles will be readily detected by examination prior to training so that only those operators showing aptitude for receiving the training and profiting thereby need be given such training. Thus the apparatus herein set forth, which is preferably termed a "digitometer" is designed for the purpose of ascertaining the potential ability of applicants for employment in operating a keyboard similar to that of a typewriter, used as part of the transmitting apparatus in automatic printing telegraphy. At the same time, this device will also have its application in testing potential ability in ordinary typewriting. Furthermore, the apparatus is, truly speaking, a psychological device.

In the drawings accompanying this specification the same reference characters will be used throughout the several views, and:

Figure 1 is a plan view of the keyboard and symbol displaying device, the casing of the keyboard being shown in section.

Figure 2 is a front elevation of the counter case and metronome used herewith.

Figure 3 is an enlarged detailed section on line 3—3 of Figure 2.

Figure 4 is a section on the line 4—4 of Figure 1.

Figure 5 is a detailed section on the line 5—5 of Figure 4.

Figure 6 is a detailed perspective view from the front showing a portion of the keyboard.

Figure 7 is a wiring diagram of the device.

The apparatus as herein shown and described consists of four units, namely,

(*a*) A uniquely designed keyboard of eight keys, separated by thick metal strips in such a way that when the fingers are placed upon the keys, the metallic strips do not interfere with the fingers but at the same time serve as an aid in keeping the fingers on the keys, and insure that a particular key is depressed by the proper finger and no other. The angles of divergence of these metal strips were determined by many experiments.

(*b*) A set of Veeder counters, one counter to correspond with each key, to which it is electrically connected, so that each time the key is depressed, it is registered on the counter. When a test has been completed, the exact number of times any particular key was struck or depressed can be ascertained by a glance at the corresponding counter.

(*c*) An ordinary metronome, with a special attachment for making and breaking an electrical circuit.

(*d*) A rotating aluminum disc, actuated by a small motor, the whole encased in a cylindrical box. The cover to the box has an aperture or window, and as the aluminum disc rotates, any symbols written in a proper position on the disc will appear at the window for a brief exposure, then move out of view, to be replaced by succeeding symbols. The rate of rotation of the disc is governed by the gait of the metronome—the time of exposure varying as desired from one-third of a second to almost three seconds.

The symbols on the disc are combinations of the numbers 1, 2, 3, 4, or letters a, b, c, etc., so selected and arranged sequentially as to bring about the desired finger play in operating the keyboard.

The general principle behind the device is to reproduce in miniature the operations involved in working a typewriter or similar keyboard by the "touch method", with a means of determining at a glance whether the operations have been performed without error, or to what extent errors were committed. Not more than five or ten minutes is required to learn to operate this device as against several weeks to learn the typewriter sufficiently well to establish with any assurance whether or not the individual typist has natural skill at the machine. The digitometer is therefore highly valuable for test purposes, particularly where training costs are borne by the commercial or industrial enterprise rather than by the student.

To operate the device requires precisely the same co-ordinations of eye, mind and hand that are required by the "touch method."

The keyboard and disc are mounted on a base 10 which carries eight keys 11 very similar to the ordinary telegraphic keys, each being provided with a finger button 12. These keys are arranged in sets of four, one set being for each hand, and are positioned so that, with the hands in normal or easy position, the four fingers of each hand will rest naturally on the four keys in the set. Guard strips 13 separate the keys of each set, and these strips are arranged at such angles as to conduce to easy positioning of the hand and operation of the fingers. This part of the device is inclosed in a case 14 opened at its front end and provided with a hinged top whereof the forward and movable portion 15 constitutes a shield which hides the keys from the vision of the operator and thus makes it necessary to operate the device entirely by touch.

Mounted on a base 16, which may be located at any desired point with reference to the base 10, is a casing 17 having windows or sight openings 18 in its front so that the ordinary Veeder counters 19 may be secured to carrying strips 20 within the casing and project through these openings 18. Each of these counters is provided with the usual ratchet wheel 21 actuated by a pawl 22 mounted on an oscillating lever 23 normally held raised by a spring 24. Each counter also is provided, in the usual manner, with a non-return pawl 25. As the lever 23 for a counter is oscillated a step by step movement will be imparted to the counting mechanism, not shown, and the number of oscillations will be indicated by the numbering on the counting dials 26 of the counters 19. Within the casing 17 is supported a series of magnets 27, one for each counter, and these magnets, when energized, attract armatures 28 carried by the levers 29 pivoted on posts 30 and having their arc of movement regulated by adjusting screws 31. Each lever 23 is connected to a respective lever 29 by a link 32. There is also preferably mounted on the base 16 a metronome 33 of the usual general construction common to metronomes used for regulating the tempo in playing musical compositions, and the speed to which this metronome operates is controlled by a weight 34 adjustable along the inverted pendulum 35 with which the metronome is provided. Carried by this pendulum is a bar 36 through which passes a contact pin 37 held in adjusted position at the bar by a set screw 38. This pin, as the metronome oscillates, dips in and out of the mercury in a mercury contact cup 39 so that electrical contact is intermittently established between the bar 36 and the cup or terminal 39.

Supported on the base 10 behind the casing 14 is a casing 40 of flat cylindrical form and centrally of this casing there is a shaft 41 carrying the aluminum disc 42 bearing the numbers or symbols 43 which are successively exposed, by the rotation of the disc, through a window or sight opening 44 in the front of the casing 40. This casing with its window is so positioned as to be easily visible to the eye of the operator. On the shaft 41 is also fixed a ratchet wheel 45 which is engaged by a pawl arm 46 pivoted to a lever 47 adjacent its free end and pressed towards the ratchet wheel by a spring 48. The lever 47 is supported on a standard 49 and adjacent the standard is an operating magnet 50 positioned to attract an armature 51 carried by the lever 47. A spring 52 normally holds the armature away from the magnet. A stop or non-return pawl 53 also engages the ratchet wheel 45. Energization of the magnet 50

moves the lever 47 and this in turn rotates the ratchet wheel 45 one step, thus moving the exposed symbols 43 and bringing a second set of symbols into registration with the window 44. The coordination of the various parts of the apparatus is effected by the wiring connections shown in Figure 7. In this figure said wires 54 and 55 lead from a suitable source of energy through the fuses 56 and switch 57. The wire 54 is branched to provide supply lines 58 and 59 which are thus in parallel. Suitable resistances 60 may be employed in these lines. Wire 58 is connected to the mercury terminal 39. The bar 36 is connected by a wire 65, through a switch 66, which may be an ordinary snap-switch, with one terminal of the magnet 50, the other terminal of this magnet being connected by a wire 61 with the wire 55. Thus each time the metronome oscillates circuit will be established as follows: from the wire 54, through wire 58, terminal 39, contact 37, bar 36, wire 65, magnet 50, wire 61, to wire 55. Thereby each oscillation of the metronome will energize the magnet 50 and thus will cause the disc 42 to rotate one step. Connected in multiple to the wire 55 are the fixed contacts 62 of the switches 11, each of which has its movable contact connected in series to a respective magnet 27, all of the magnets being connected in multiple to the wire 59. Accordingly, as each key 11 is operated a circuit will be closed from the wire 55, through the fixed contact 62 of the respective switch 11, its magnet 27, the wire 59 and back to the wire 54. Accordingly, as a respective key is depressed the Veeder counter controlled by that key will advance in its indication one step.

Let it now be supposed that a person is to be examined to ascertain her potential ability as a keyboard operator.

The examinee is told to place her fingers on the keys, and to number them mentally the same on each hand—usually the forefinger is designated as 1, the little finger as 4, the intermediate fingers as 2 and 3. The shield is placed over the keys in such a way as not to interfere with the freedom of movement of the fingers but at the same time concealing them from view. In other words, the fingers must be picked out mentally and operated without the aid of sight. Two numbers appear at the little window 44, say 3—4. The number to the left of the dash indicates a finger on the left hand, and the number to the right of the dash indicates the finger on the right hand. So the two numbers just given mean, that the third finger on the left hand is to press the key, followed by the fourth finger on the right hand. The numbers remain exposed for a moment, then automatically change, say to 4—1, which change in turn etc. until the test has been completed. If the test has been performed correctly, all the Veeder counters will read alike. This is so because the numbers or symbols 54 are so distributed on the disc 42 that each of said numbers occurs an equal number of times for both the right and the left hands. If an error has been made, the particular finger at fault is known immediately.

Having thus described the invention, what is claimed as new, is:

1. In a device of the kind described, a keyboard, display means for successively displaying characters corresponding to the respective keys of said keyboard, means operatively connected to said display means to time the intervals for the exposure of said numbers, whereby whether or not the operator strikes the designated keys at the proper instant will be indicated by the counter, and means operatively associated with the keyboard for registering the number of times the respective keys of the keyboard have been depressed.

2. In a device of the kind described, a keyboard having keys each positioned for engagement by a selected finger of an operator, means to conceal said keys from the operator during manipulation thereof, and means to guide the operator's fingers to proper position relative to said keys.

3. In a device of the kind described, a keyboard having keys each positioned for engagement by a selected finger of an operator, means to conceal said keys from the operator during manipulation thereof, means to guide the operator's fingers to proper position relative to said keys, display means for successively displaying numbers corresponding to the positions of said keys and means operatively connected to said display means to time the intervals for the exposure of said numbers, whereby whether or not the operator strikes the designated keys at the proper instant will be indicated by the counter.

4. In a device of the kind described, a keyboard having keys each positioned for engagement by a selected finger of an operator, means to conceal said keys from the operator during manipulation thereof, means to guide the operator's fingers to proper position relative to said keys, counters corresponding to the number of keys and each operatively connected to a respective key for actuation thereby, display means for successively displaying numbers corresponding to the positions of said keys and means operatively connected to said display means to time the intervals for the exposure of said numbers, whereby whether or not the operator strikes the designated keys at the proper instant will be indicated by the counter.

In testimony whereof I affix my signature.

HORACE B. McCHESNEY.