(Model.)

3 Sheets—Sheet 1.

F. BLAKE.

Electric Switch Board.

No. 243,101. Patented June 21, 1881.

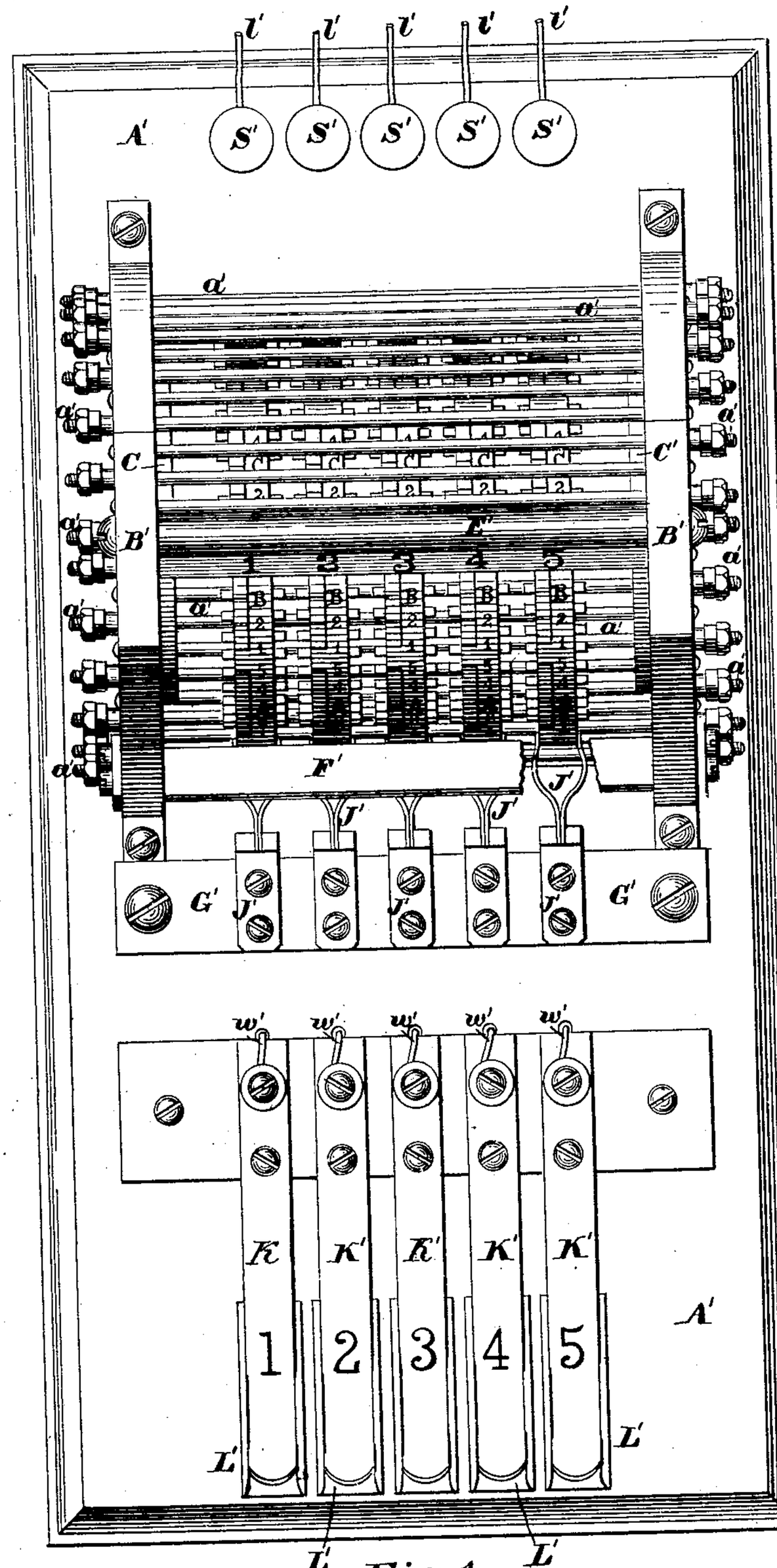

Fig. 1.

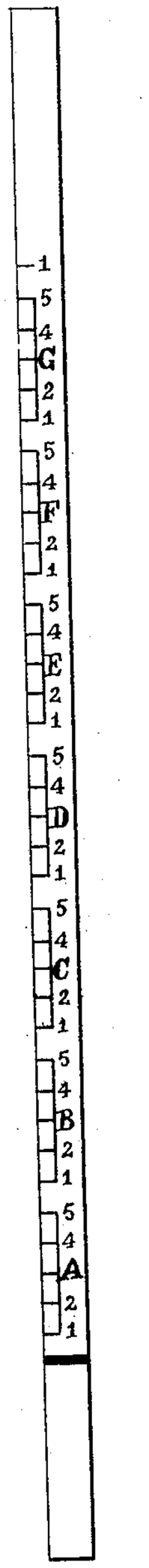

Fig. 6.

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Inventor:

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his atty

(Model.)

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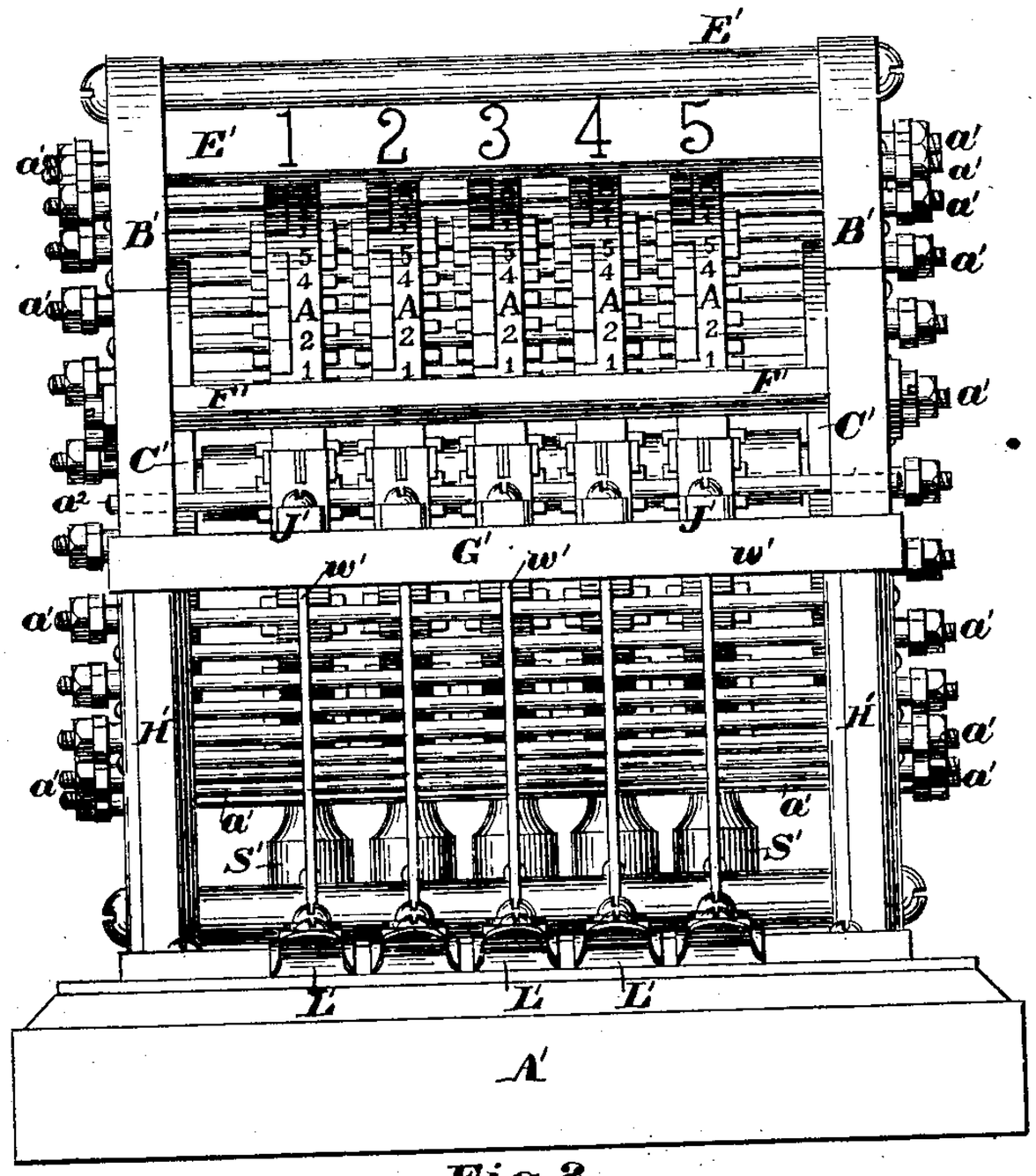

Fig. 2.

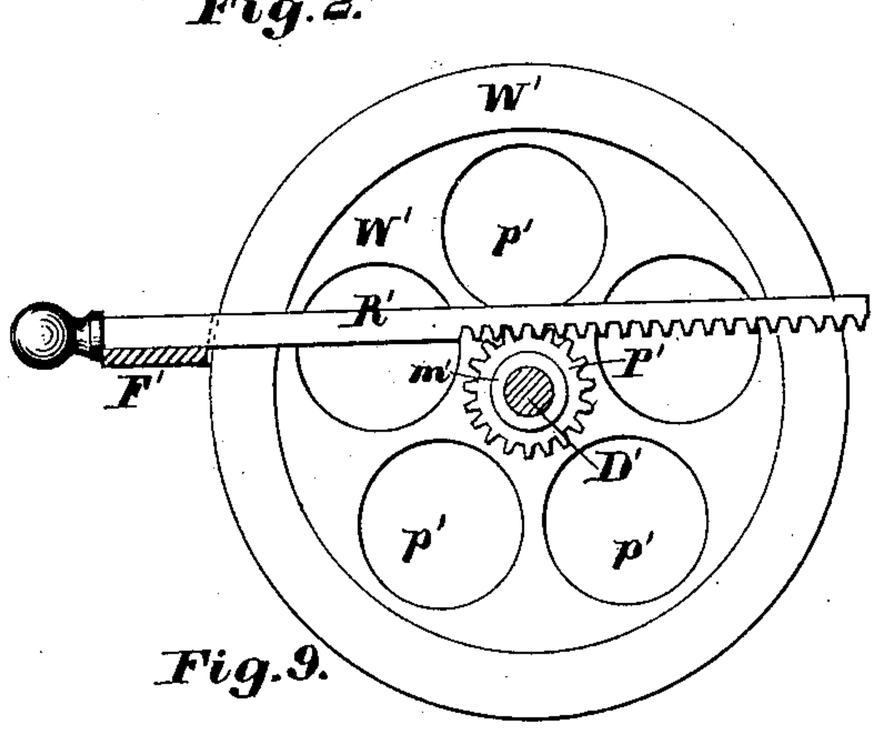

Fig. 9.

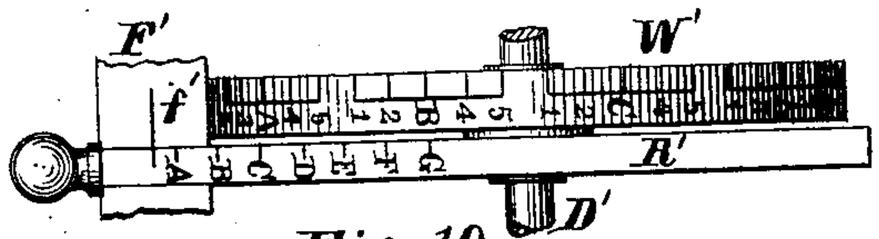

Fig. 10.

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(Model.)

3 Sheets—Sheet 3.

F. BLAKE.

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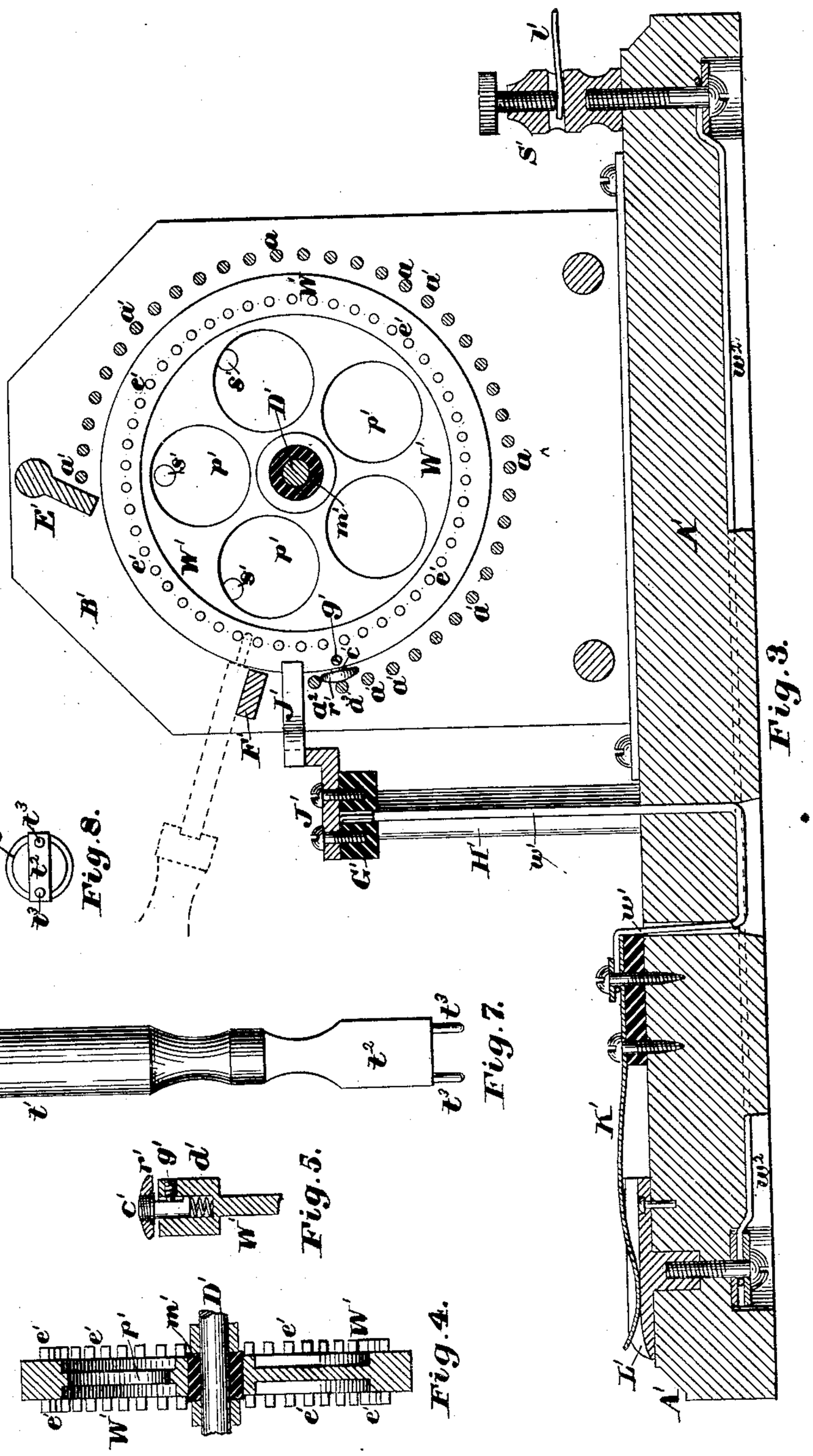

Fig. 3.

Fig. 8.

Fig. 7.

Fig. 5.

Fig. 4.

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UNITED STATES PATENT OFFICE.

FRANCIS BLAKE, OF WESTON, MASSACHUSETTS.

ELECTRIC SWITCH-BOARD.

SPECIFICATION forming part of Letters Patent No. 243,101, dated June 21, 1881.

Application filed April 11, 1881. (Model.)

To all whom it may concern:

Be it known that I, FRANCIS BLAKE, of Weston, in the State of Massachusetts, have invented a new and useful Improvement in Electric Switch-Boards, of which the following is a specification.

In an application for a patent now pending I have described a rectangular frame or flat switch-board containing a series of movable line-rods and a series of fixed insulated rods, each line-rod being in an independent circuit, and having an independent movement over all the insulated rods, and furnished with a contact-point for making electric contact with any insulated rod.

The present invention, as distinguished from the one described in the said other application, consists in a number of fixed insulated rods arranged in the form of a cylindrical cage, and a number of metallic wheels revolving freely upon a fixed shaft within the cage, each wheel being in an independent line circuit and provided with a contact-point for making contact with any insulated rod, as determined by the position of the wheel on its shaft. There is a broad invention, however, which is or may be embodied in both forms of construction, but which is made the subject of a claim in this application only, the form herein presented being the one in which the invention was first conceived and put in practical operation.

The present invention consists, also, in certain details of construction.

It may be added that although the form of construction herein shown is much more expensive than the other, it permits a much larger number of fixed insulated rods to be brought under the control of the operator, and at the same time provides that he may do all his work within a much smaller reach.

In the drawings, Figure 1 is a plan of a switch-board of the construction herein particularly described. Fig. 2 is a front elevation of the same. Fig. 3 is a longitudinal section, taken between two of the line-wheels. Fig. 4 is a vertical section of one of the wheels and its shaft. Fig. 5 is an enlarged sectional view of a contact-pin and a part of a wheel. Fig. 6 is illustrative of a scale upon the periphery of each wheel. Figs. 7 and 8 are views of an instrument for automatically setting the wheels at any required positions. Figs. 9 and 10 are, respectively, a side elevation and a plan of a wheel similar to those shown in the other figures, but provided with a rack and pinion for turning the wheel, the rack carrying a scale for a purpose hereinafter explained. Figs. 9 and 10 represent a modification of the invention not shown in the other figures.

To avoid confusion some of the letters of reference are omitted in Figs. 1 and 2.

A′ is a wooden bed.

B′ B′ are two side-frame plates of hard rubber secured to the bed A′ in any proper manner.

C′ C′ are two brass plates, screwed to the hard-rubber plates B′ B′ by screws S′ S′, &c. The plates C′ C′ have holes at the center to furnish bearings for a fixed shaft, D′, the ends of which project through larger holes in the hard-rubber plates B′ B′. The fixed insulated rods are marked *a′ a′ a′*, &c., being a large number of stout brass wires secured to the hard-rubber plates B′ B′, each wire by a head at one end and a set-screw at the other, as shown. To avoid confusion these wires are but a few of them marked. They are not to be confounded with a ground-wire, a^3, nor with a stop-wire, a^2, which are distinctly marked in Fig. 3. The fixed insulated wires or rods *a′ a′*, &c., which may be termed "connecting wires or rods," are placed in the form of a cylinder, about five to an inch, and, for economy of space, of two successive wires the heads and set-screws are at opposite ends. There is, however, in the front of the cylinder a gap, the purpose of which will presently appear.

E′ is a cross-bar between the two hard-rubber plates B′ B′, provided with a flange, upon which are placed, as shown, numbers 1 2 3 4 5, appropriated to the several circuits for which provision is made upon the switch-board, a number for each circuit. In like manner F′ is a cross-bar serving as an index-bar, as will be hereinafter explained.

W′ W′, &c., are insulated wheels, turning freely and separately on the fixed shaft D′, a wheel for each circuit, and each wheel under the number for its circuit on the flange of the cross-bar E′. In construction the wheels shown are cast of brass, with holes *p′* to lessen the weight. They are also bored out at the center, and the hole made by thus boring is filled with hard rubber *m′*, which, in turn, is bored out to

fit with sufficient accuracy upon shaft D′. The wheels are confined to their proper places on the shaft D′ by collars, in turn held in place on the shaft between the wheels by set-screws. For a purpose to be hereinafter described each wheel has projecting from either side, near the rim, a series of pins, e' e', &c. Each wheel is also provided with a brass adjustable contact-pin, c', which is set in its rim, as shown in Fig. 5, a coiled spring, d', tending to throw it out, and a set-screw, g', holding it in a required position. Each contact-pin c' has a collar, r', of insulating material. The stop-wire a^2, before mentioned, which, like the wires a' a', &c., is between the hard-rubber plates B′ B′, but a little within their circle, and against which the collar r' strikes, limits the motion of each wheel W′ in one direction. In the other direction the motion of the wheels is limited by the flange of the bar E′, against which the collar r' strikes. Each wheel has etched upon its periphery a scale graduated to the distances between the centers of the insulated rods a' a', which are of uniform diameter and at uniform distances apart. The scale is best shown at Fig. 6, which may be taken as the rim of a wheel straightened out. It is first divided into several sections, designated by letters A B C, &c., and each section has five lines numbered as shown. The periphery of each wheel has also a heavy black line just below the first line (marked 1) in section A of the scale, as shown; and the positions of this line 1 of the scale, the heavy black line, the contact-pin c', and its collar r' on each wheel, and of the stop-rod a^2, grounding-rod a^3, and first insulated rod a' of the cage are such that when the heavy black line is in the plane of the upper surface of the index-bar F′ the collar r' is against the stop-rod a^2, and the contact-pin c' is in contact with the ground-rod a^3, (the normal position of each wheel,) and when line 1 of section A of the scale is in the plane of the upper surface of the index-bar F′ the contact-pin c' is in contact with the first of the connecting-rods—that is, the first of the a' rods. It follows that when line 2 of section A of the scale is in the plane of the index-bar the contact-pin c' is in contact with the second connecting-rod, and so on through all the graduations of the scale, there being, in practice, a separate connecting-rod for each graduation. It follows, further, each wheel being in an independent circuit, as will be more particularly pointed out, that any two wheels can be disconnected from the ground-rod a^3 and thrown together into a common circuit by means of any of the connecting-rods, and that the operator, although not seeing the contact-pins c', may select and use any connecting-rod at will by bringing the corresponding graduations of the scales of two wheels in line with the index-bar F′.

Although but five wheels are shown, it is evident that the connecting or fixed insulated rods may be of any required length, and that there may be any number of wheels; and, further, that connection may be made between any two of the wheels, even when there are so many as to require more than one operator to turn them.

In practice, when the number of wheels is so great as to require several operators, each operator will appropriate a section of the scale to himself—that is, all connections made by one operator, or by himself and another operator under his direction, will be made in section A of the scale. All connections made or caused to be made by a second operator will be made in section B, and so on. For instance, circuits 1 and 2 of the drawings may be supposed to belong to one operator or to one division of the insulated rods; circuits 3 and 4 to a second division, and circuit 5 to a third division. The operator in the first division wishing to connect his circuits 1 and 2 will turn the two wheels till the same line in section A of both scales is in line with the index-plate F′. In like manner the operator in the second division wishing to connect circuits 3 and 4 will turn the wheels of those circuits till the same line in section B of both scales is in line with the index-plate; and so the operator in the third division wishing to connect his circuit No. 5 with some circuit—say No. 3 of the second division—will turn the wheel of circuit 5 until some line in section 3 of the scale is in the plane of the index-plate, and will then direct the operator in charge of circuit 3 to turn the wheel of that circuit so as to bring the same line of section C of the scale to the plane of the index-plate.

I proceed to describe the line-connections of the several wheels. (See Fig. 3.)

G′ is a bar of hard rubber screwed to two posts, H′ H′, which are set into the bed A′. J′ is a spring-yoke, its stem screwed to the hard-rubber bar G′, and its arms embracing the two sides of the rim of the wheel W′. The yoke J′ is connected by a wire, w', with an insulated spring, K′, of a spring-jack, the contact-plate L′ of which is connected by wire w^2 with a screw-cup, S′, at which the line-wire l' enters. Each wheel W′ has its J′ w' K′ L′ w^2 S′ and line-wire. The connection of the grounding-rod a^3 with ground, which rod is common to all the wheels W′, through their contact-pins c', is not shown.

Where small wheels are used the operator may easily turn them by pressing with his finger against their peripheries. For use with larger wheels, however, I have provided an instrument, (shown in Figs. 7 and 8, and also in dotted lines in Fig. 3,) consisting of a handle, t', a blade, t^2, and two pins, t^3 t^3. By applying this instrument, as shown in Fig. 3, so that its pins pass between the e' pins, the wheels may readily be turned in either direction. There is an e' pin for each graduation of the scale on a wheel, the graduation being in a radial plane which lies half-way between two e' pins on the same side of a wheel, and the blade t^2 of the

hand-instrument is of such thickness that when the instrument is inserted between two e' pins on one side of a wheel and turned until its blade t^2 rests squarely upon the index-bar F′, as shown in Fig. 3, the graduation above the lower of the two e' pins will be in the plane of the upper surface of the index-bar, and the contact-pin c' will be in contact with a corresponding insulated rod.

In Figs. 9 and 10 I have shown a contrivance by which large wheels may be worked still more easily, consisting essentially of a rack-bar, R′, and pinion P′. The rack-bar R′ has a scale, as shown, which, as compared with the scale on the wheel, is graduated proportionately to the distances traveled by the rack-bar and wheel. Sections only are shown, however, and the index-bar F′ is provided with an index-line, f'. The scales on the wheel and on the rack-bar are so located that when a graduation of the rack-bar scale is in line with the index-line f', the section of the wheel-scale having the corresponding letter is at the front of the instrument—that is, at the gap in the cage of insulated wires. The wheel may then be set more exactly by means of the larger scale on the wheel, although it may be more convenient to change somewhat the position of the index with which that scale is used.

It will be observed that when the wheels move within their cage the contact-points c' strike successively against all the wires along their path. It is found, however, that this does not interfere with the proper working of the apparatus, since the wheels move so rapidly. To more easily carry the contact-points by the wires their collars r' are beveled slightly, as shown. As the contact-points wear away they may be readjusted by means of set-screw g' and spring a'.

It is evident that line-rods, constructed substantially as described in my said other application, but with fixed contact-points like those shown herein, might be used in small boards, sliding under fixed insulated rods in a rectangular frame, without departing from the broad feature of my invention.

I claim—

1. A number of fixed insulated rods arranged in the form of a cylindrical cage, and a number of metallic wheels revolving within the cage, each wheel being in an independent line-circuit and provided with a contact-point for making contact with any insulated rod, according to the position of the wheel on its shaft, substantially as described, for the purpose specified.

2. A number of fixed insulated rods arranged in the form of a cylindrical cage, and a number of wheels in independent circuits and revolving within the cage, each wheel provided with a contact-point for making contact with the insulated rods, and having upon its periphery a scale graduated to the distances between the rods, substantially as described, for the purpose specified.

3. In combination with the insulated rods a' and the wheels W′, the contact-points c', provided with collars r', substantially as described, for the purpose specified.

4. In combination with the insulated rods a' and wheels W′, the contact-points c', set-screw g', and springs d', substantially as described, for the purpose specified.

5. The hand-instrument herein described, consisting essentially of the blade t^2 and pins t^3 t^3, in combination with the wheels W′, pins e', and index-bar F′, all substantially as described, for the purpose specified.

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