G. WHITE.

LIGHT REGULATING DEVICE FOR FILM PRINTING MACHINES.

APPLICATION FILED JUNE 6, 1914.

1,154,820.

Patented Sept. 28, 1915.

4 SHEETS—SHEET 1.

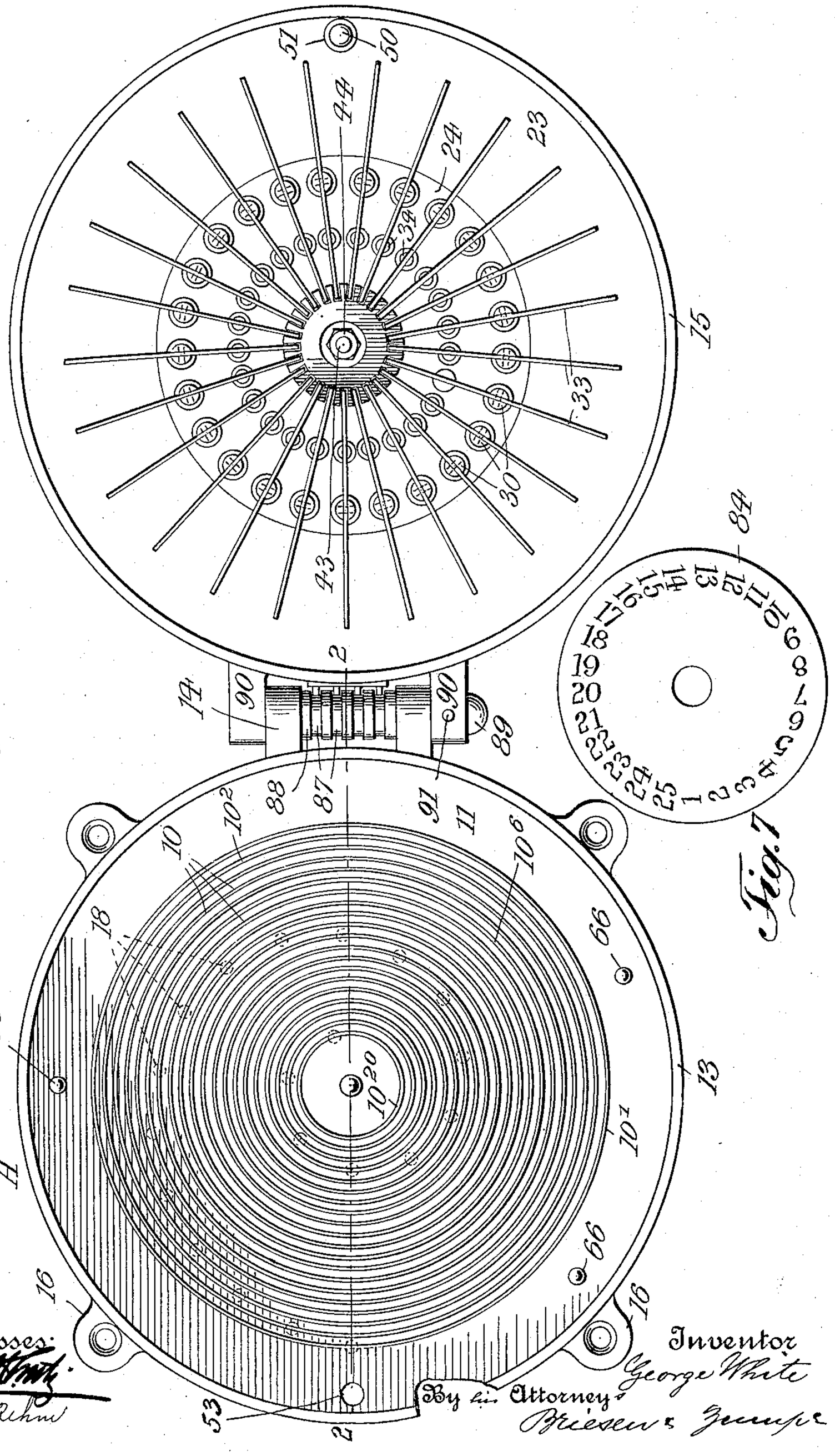

Fig. 1

Fig. 7

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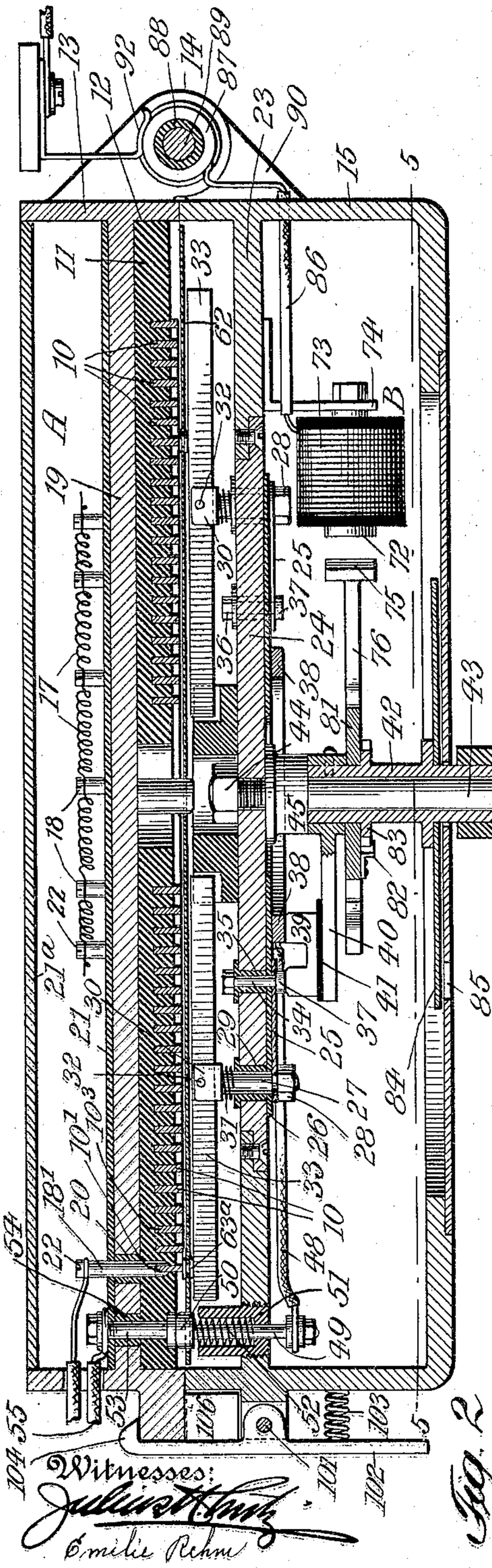

Fig. 2

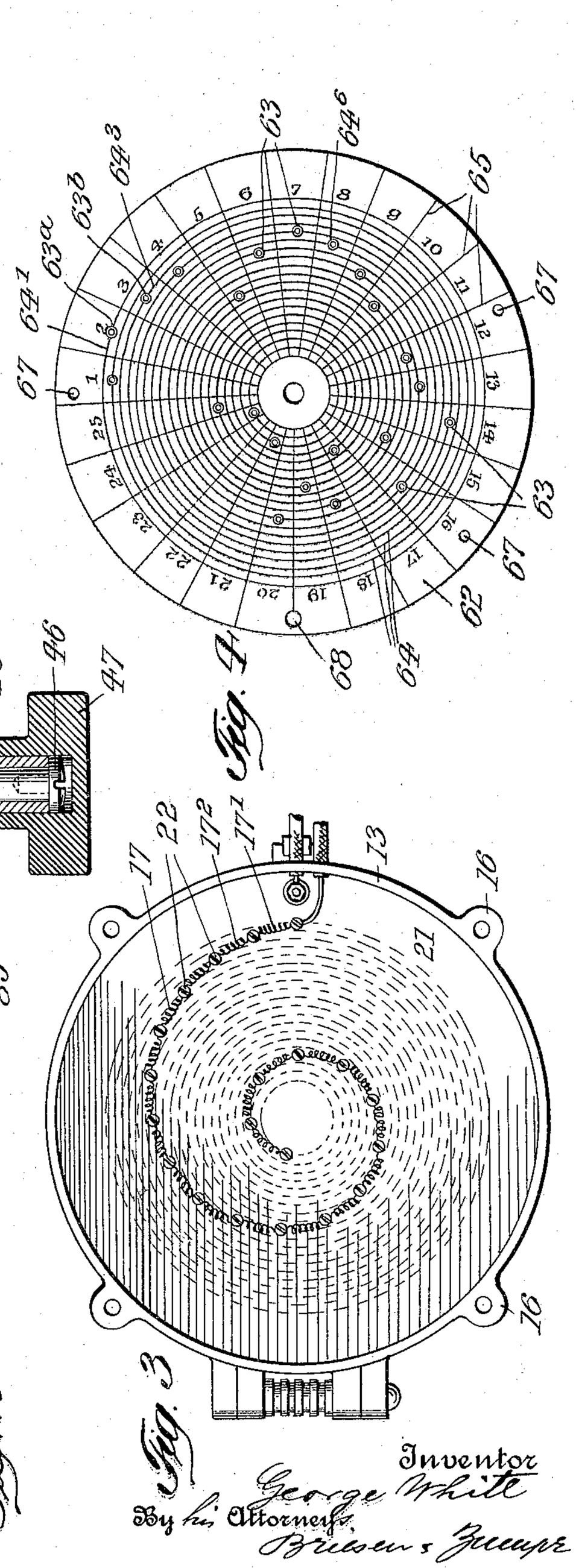

Fig. 4

Fig. 3

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4 SHEETS—SHEET 3.

Fig. 8

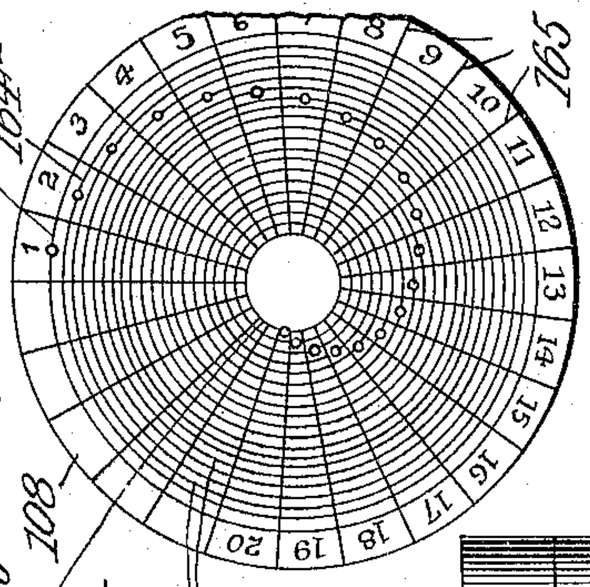
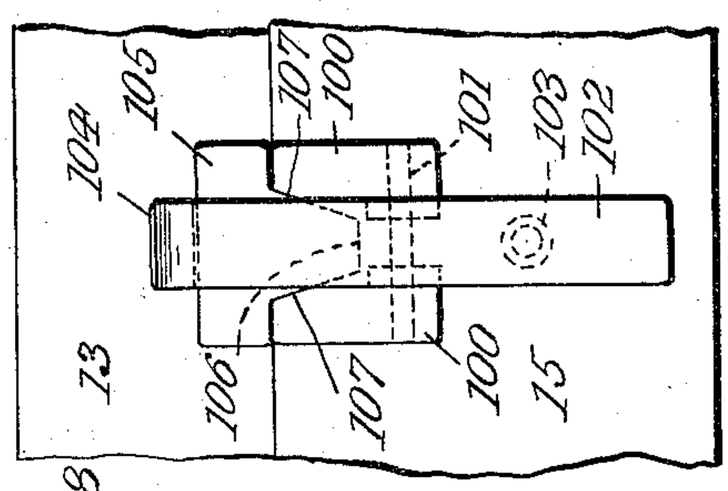
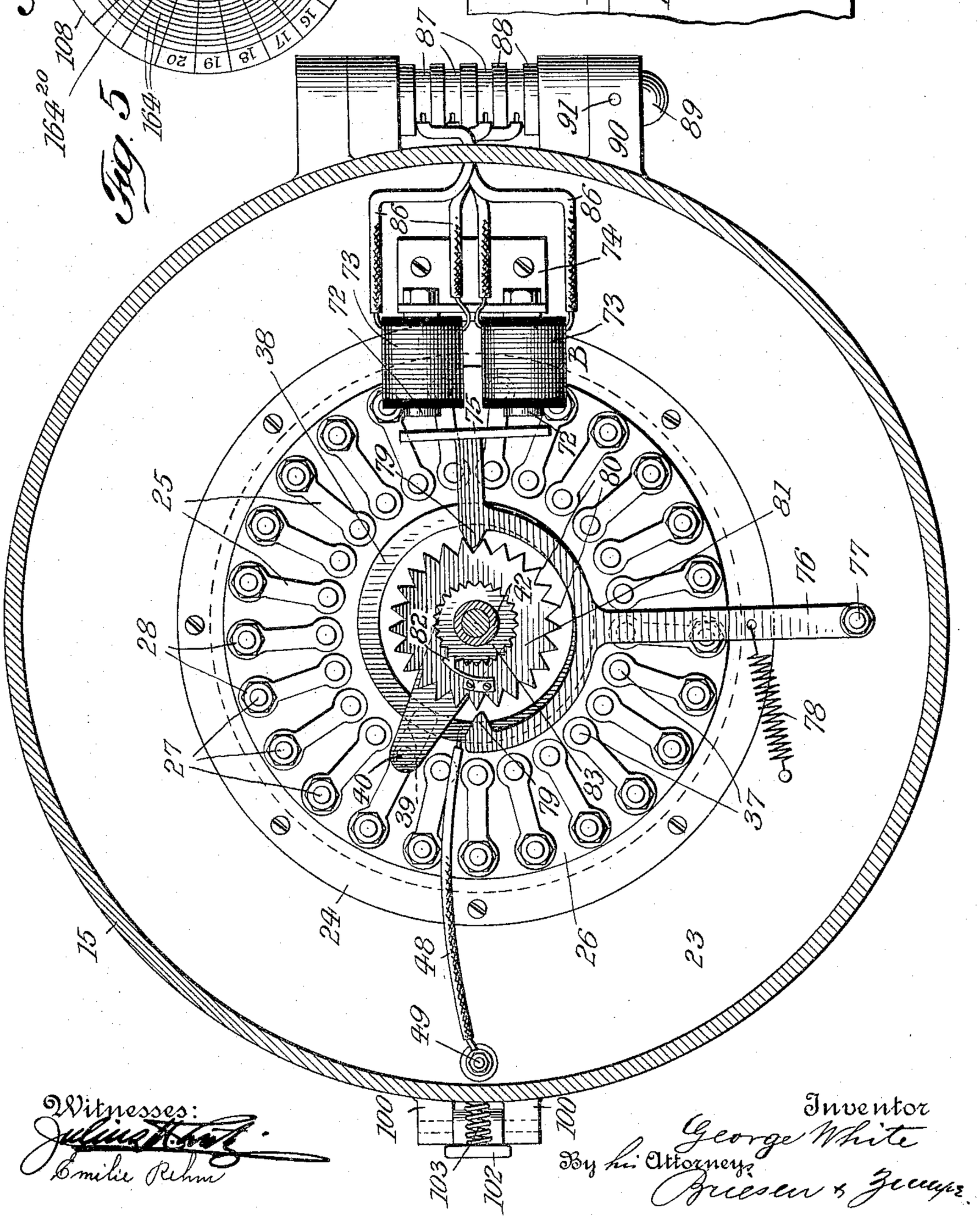


Fig. 5

Fig. 6





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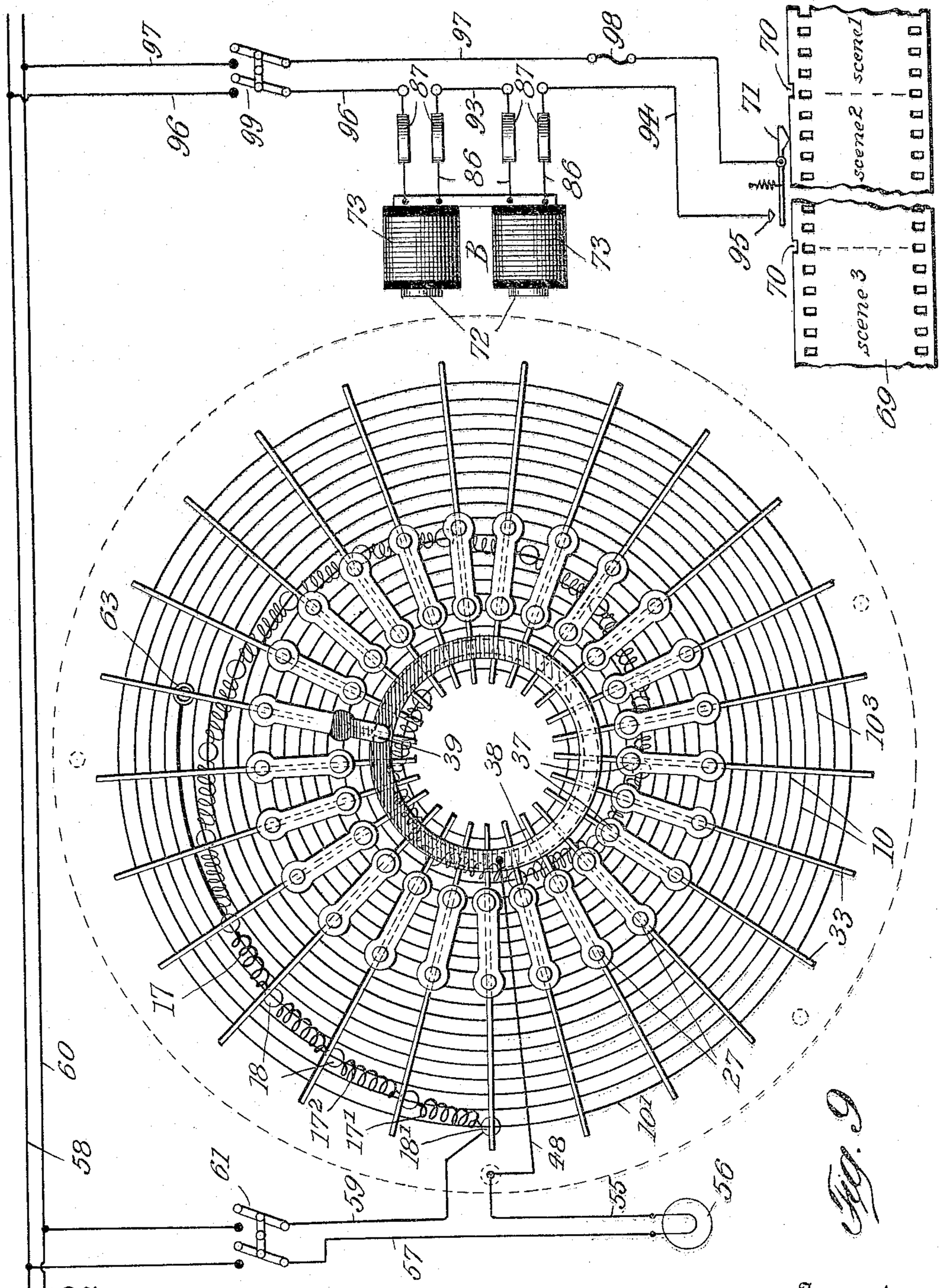

Fig. 9.

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UNITED STATES PATENT OFFICE.

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LIGHT-REGULATING DEVICE FOR FILM-PRINTING MACHINES.

1,154,820. Specification of Letters Patent. Patented Sept. 28, 1915.

Application filed June 6, 1914. Serial No. 843,585.

To all whom it may concern:

Be it known that I, GEORGE WHITE, a citizen of the United States, residing at Jersey City, county of Hudson, and State of New Jersey, have invented a new and useful Improvement in a Light-Regulating Device for Film-Printing Machines, of which the following is a specification.

This invention relates to a novel device for automatically regulating the strength of an electric current supplied to a lamp, thereby correspondingly varying the intensity of the light emanating from said lamp.

The device is more particularly designed for automatically changing the light necessary for properly printing consecutive scenes of moving picture films.

In the accompanying drawing: Figure 1 is a face view of a light-regulating device embodying my invention, with the casing open; Fig. 2 an enlarged cross section on line 2—2, Fig. 1 with the casing closed; Fig. 3 a rear view of the device with the asbestos closure removed; Fig. 4 a plan of the light regulating card; Fig. 5 a cross section on line 5—5, Fig. 2; Fig. 6 a detail of the case lock; Fig. 7 a face view of the dial; Fig. 8 a plan of a light-testing card, and Fig. 9 a wiring diagram.

My improved light-regulating device comprises essentially a plurality of spaced concentric metal rings or conductors 10 partly embedded within corresponding concentric grooves formed in a disk 11 of insulating material. This disk is firmly mounted within a recess 12 of the stationary part 13 of a preferably cylindrical casing A to which is hinged at 14 the movable part or cover 15, the part 13 being provided with lugs 16 by means of which it may be secured to a wall or another support.

Between each pair of adjoining rings 10, there is interpolated a resistance 17 for which purpose each of said rings is provided with a post 18 extending rearwardly through the circular web 19 of the casing. From this web the post is insulated by means of a bushing 20 of non-conductive material while the rear face of web 19 is covered with an asbestos disk 21. Resistances 17 are preferably made in the form of a continuous wire spiral which is at certain intervals clamped to posts 18 by screws 22 as clearly illustrated in Figs. 2, 3 and 9. Casing 13 is provided at its back with an asbestos disk 21[a], as shown in Fig. 2.

Into a suitable central opening of a web 23 of cover 15 is fitted a circular disk 24 carrying a number of radially extending resilient conductive strips 25 which are arranged in a circle and are mounted on an insulating ring 26 carried by disk 24. To the perforated outer end of each strip 25 is clamped a bolt 27 by a nut 28 said bolt extending through an insulated bushing 29 fitted into a corresponding bore of disk 24. At its free end, bolt 27 carries a fork 30 between which and bushing 29 there is interposed a spring 31. To fork 30 is pivoted, as at 32, a radially extending contact lever or bar 33 of a length to extend across all of the rings 10 at one side of their center.

The perforated inner end of each strip 25 is firmly held in position by a bolt 34 extending through an insulating bushing 35 of disk 24 and provided with a clamp nut 36 and a head 37 that constitutes a contact button. Ring 26 further carries a contact ring 38 arranged concentrically to strips 25. Ring 38 is adapted to be consecutively connected to the several buttons 37 by means of a conductive bridge 39 carried by a rotary arm 40 and insulated therefrom as at 41. Arm 40 is fast on a sleeve 42 that turns loosely on a fixed post 43 clamped to disk 24 by a nut 44, the sleeve 42 being prevented from axial displacement by means of a fixed collar 45 and a screw 46 tapped into the free end of post 43. Sleeve 42 projects outward through cover 15 and carries here a knob 47 for manually rotating said sleeve.

Ring 38 is connected through wire 48 with a pin or contact member 49 having a head 50 and slidably mounted in an insulating bushing 51 of web 23, a spring 52 tending to force head 50 rearwardly (Fig. 2). In the closed position of casing A, head 50 engages a fixed binding post 53 extending through disk 11 and through an insulating bushing 54 of web 19. Post 53 is connected through wire 55 with a tungsten lamp or other electric light source 56 adapted for film-printing purposes. Lamp 56 is in turn connected through wire 57 with a main 58, while the outermost post 18[1] is connected through wire 59 with a main 60, a bipolar switch 61 being interpolated in wires 57, 59.

The means for making the necessary elec-

tric connections between rings 10 and contact bars 33 in order to complete the lamp circuit, consist of an exchangeable light-controlling disk or card 62 made of paper, card board or other insulating sheet material. Card 62 is provided with a number of metallic eyelets 63 each eyelet being adapted to form a metallic connection between a selected ring 10 and a selected bar 33. As is clearly illustrated in Fig. 4, the card 62 is provided with a plurality of concentric circles 64 that correspond in number and diameter to the number and diameter of the several rings 10, the drawings thus showing card 62 provided with twenty of such circles. Card 62 is further provided with a plurality of radially extending uniformly spaced lines 65 the number of which equals that of contact bars 33. As the drawing shows twenty-five of such bars, the card 62 is thus also provided with twenty-five lines 65, the fields between consecutive lines 65 being numbered 1 to 25, each of such fields corresponding to one of 25 scenes of a moving picture film.

According to the varying intensity of the light necessary for printing consecutive scenes, the eyelets 63 occupy different positions in the several fields of card 62. Thus if for a certain scene say scene 2, the full intensity of the light is required, the eyelet 63^a will be placed on the outermost circle 64^1. In this case, the current will flow from main 60 through wire 59 (switch 61 being closed), outermost post 18^1, eyelet 63^a, the contact bar 33 engaging said eyelet, bolt 27, the corresponding strip 25, button 37, bridge 39, ring 38, wire 48, pin 49, post 53, wire 55, lamp 56 and wire 57 to main 58. It will be seen that the circuit described does not include any of the resistances 17 whereby the full current is supplied to the lamp and the maximum light effect is obtained. If the next scene requires less light for printing say such an intensity as obtained by throwing two of the resistances 17 in series with the lamp, the eyelet 63^b is placed on line 64^3. In this case, the current flows from post 18^1 through the two outermost resistances 17^1, 17^2 (Fig. 9) to ring 10^3 and through the eyelet 63^b engaging said ring to the corresponding bar 33 which should now be connected to ring 38 by bridge 39 (the movement of said bridge being hereinafter more fully described). It will thus be seen that the closer an eyelet is placed toward the center of the card the more resistance will be interpolated in the lamp circuit, thereby obtaining the desired graduation of the light for printing the scenes embraced by the negative.

In order to insure the proper position of card 62 relatively to the scenes to be printed, disk 11 is provided with a number of outwardly extending guide pins 66 adapted to engage correspondingly arranged perforations 67 of card 62, the pins 66 being placed at different distances from each other. In order to still more safeguard against a wrong insertion of card 62, the latter is of a diameter to extend beyond binding post 53. In axial alinement with the latter, card 62 is provided with a perforation 68 of a size to permit the passage of the head 50 of pin 49. In this way a contact can only be made between the parts 50, 53 when opening 68 occupies the proper position, while in case the card is forced on pins 66 in a wrong position, an imperforate portion of the card will be placed between the parts 50, 53 thereby preventing a closing of the lamp circuit.

Automatic means are provided for intermittently advancing arm 40 together with bridge 39 whenever a change of scene takes place. These means are actuated by the advancing negative 69 to be printed and are shown to consist of notches 70 provided in the edge of the negative at the dividing lines between consecutive scenes. This notch is adapted to be engaged by a spring-influenced trip lever 71 or an equivalent member which closes the circuit of an electromagnet B whenever it enters one of the notches 70. This electromagnet consists of two poles 72 the coils 73 of which may either be connected in parallel or in series so as to adapt the device to a current of 110 and 220 volts. Coils 73 are supported by a bracket 74 of web 23 and influence a common armature 75 constituting part of a feed lever 76. The latter is pivoted as at 77 and is influenced by a spring 78 that tends to withdraw armature 75 from poles 72. The two opposed points 79 of lever 76 are adapted to alternately engage the teeth 80 of a star or feed wheel 81 which is loosely mounted on sleeve 42. Wheel 81 carries a spring-pawl 82 engaging a ratchet wheel 83 that forms part of said sleeve.

In order to be able to ascertain the position of sleeve 42 and consequently that of arm 40, the sleeve carries a relatively fixed dial 84 which is provided with the numbers 1 to 25 said numbers being consecutively exposed through a window 85. Each end of each coil 73 is, by a wire 86, permanently connected to a slip ring 87, which connections are preferably made by soldering the wires to said rings. The latter are fast on an insulating sleeve 88 which is in turn fast on the hinge bolt 89, the latter being secured to the lugs 90 of cover 15 by means of a transverse pin 91. It will thus be seen that whenever cover 15 is opened there will be no relative movement between the coils 73, wires 86 and slip rings 87. The latter are engaged by contact springs 92 which may be arranged in any suitable and convenient manner. In Fig. 9 the device is

shown to be adapted to current of 220 volts in which case the two inner slip rings are connected with each other by a conductor 93, while one of the outer slip rings is connected, by wire 94, to a contact 95 which is engaged by the trip lever 71 as soon as the latter engages a notch 70 of negative 69. The other outer slip ring 87, is, by wire 96, connected to main 58, while lever 71 is connected to main 60 through wire 97, a suitable fuse 98 and bipolar switch 99 being provided for the circuit described.

It will be seen that whenever a notch 70 of negative 69 passes by trip lever 71, the latter will be temporarily tilted to close a circuit, the current flowing from main 60 through wire 97 (switch 99 being closed), lever 71, contact 95, wire 94, coils 73 of electromagnet B, and wire 96 to main 58. In this way, armature 75 together with feed lever 76 will be attracted. Immediately after this attraction, lever 71 will be returned to its original position owing to the continued advance of negative 69, thereby breaking the previously established circuit and permitting spring 78 to return lever 76 to the position shown in Fig. 5. The to and fro movement thus imparted to lever 76 will cause wheel 81 to be advanced for one tooth, which movement will be imparted to arm 40 and bridge 39 through spring pawl 82, ratchet wheel 83 and sleeve 42. In this way, bridge 39 is advanced from one button 37 to the succeeding button whenever a notch 70 passes by lever 71.

Diametrically opposite hinge 14, cover 15 is provided with a pair of lugs 100 to which is fulcrumed at 101 a catch 102 influenced by a spring 103. The hook 104 of catch 102 is adapted to engage a projection 105 extending outwardly from casing 13. In order to properly center the cover 15 upon casing 13, projection 105 is provided with a wedge-shaped nose 106 which engages two correspondingly tapering inner faces 107 of lugs 100 as clearly illustrated in Figs. 2 and 6.

If a certain negative is to be printed, cover 15 is opened and the light-controlling card 62 pertaining to this particular negative is properly placed upon pins 66 whereupon cover 15 is closed and locked. In this way the several swiveled contact bars 33 will be brought into engagement with the corresponding eyelets 63 of card 62, each of which eyelets in turn engages a selected ring 10, the springs 31 insuring a positive contact between the coöperating parts. Knob 47 is now turned until the number "1" of dial 84 is exposed through window 85, thereby indicating that the bridge 39 is in the proper position to complete the circuit closed by the first eyelet, *i. e.* by the eyelet pertaining to scene 1 of card 62. This adjustment of arm 40 independent of the feed mechanism 76, 80, is rendered possible by the interpolated pawl and ratchet mechanism 82, 83 as will be readily understood. Switches 61, 99 are now closed and the negative 69 is advanced by starting the printing mechanism proper (not shown). At each engagement between a notch 70 and lever 71, electromagnet B becomes temporarily energized to advance bridge 39 from one button 37 to the succeeding button, thereby automatically causing the desired change of light-intensity at each change of scene.

The apparatus may also be employed for ascertaining the proper intensity of light necessary for the various scenes, the results of such tests serving as a guide for properly eyeleting the previously blank cards 62. For this purpose a test card 108 is provided that corresponds to card 62, it being also provided with twenty circles 164 and with twenty-five radial lines 165. Of the twenty-five fields thus produced, but twenty fields are provided with eyelets, the eyelet of field 1 being placed on the outermost circle 164^1, the next eyelet on the second circle 164^2 etc., the eyelet of the twentieth field being finally placed on the innermost circle 164^{20}. In this way, each field corresponds to one of the rings 10, field 1 corresponding to ring 10^1, field 2 to ring 10^2, field 20 to ring 10^{20}. Thus if the operator finds that for a certain scene, the printing of the negative is correct when number 6 is exposed through window 85, the eyelet 63 for this scene should be placed on circle 64^6 of card 62. After the operator has thus ascertained the consecutive numbers for the consecutive scenes, the eyelets 63 are correspondingly punched into a blank card 62, which operation is preferably performed by an eyeleting machine, not shown and not forming part of the present invention.

It is obvious that various changes may be made in the construction of the device, and that the peculiar contact selecting, etc., device may be applied to apparatus other than that above described without departing from the spirit of my invention.

I claim—

1. In a device of the character described, a plurality of spaced parallel conductors, resistances intermediate said conductors, a plurality of conductive bars extending across said conductors and spaced therefrom, means located intermediate said conductors and bars for conductively connecting a selected conductor with a selected bar, and an electric lamp interpolable between said conductors and bars.

2. In a device of the character described, a plurality of spaced parallel conductors, resistances intermediate said conductors, a plurality of conductive bars extending across said conductors and spaced therefrom, a card located intermediate said conductors and bars and having a plurality of metallic eye-

lets, each eyelet being adapted to conductively connect a selected conductor with a selected bar, and an electric current consuming device interpolable between said conductors and bars.

3. In a device of the character described, a plurality of spaced parallel conductors, resistances intermediate said conductors, a plurality of conductive bars extending across said conductors and spaced therefrom, a card located intermediate said conductors and bars and having a plurality of metallic eyelets, each eyelet being adapted to conductively connect a selected conductor with a selected bar, a movable member adapted to be conductively connected to consecutive bars, and an electric lamp interpolable between said conductive rings and said movable member.

4. In a device of the character described, a plurality of spaced concentric conductive rings, resistances between said rings, a plurality of conductive bars extending radially across said rings and spaced therefrom, a non-conductive card interposed between said rings and bars, a plurality of eyelets provided in said card, each eyelet being adapted to conductively connect a selected ring with a selected bar, a movable member adapted to be conductively connected to consecutive bars, and an electric lamp interpolable between said rings and said movable member.

5. In a device of the character described, a plurality of spaced concentric conductive rings, resistances between said rings, a plurality of conductive bars extending radially across said rings and spaced therefrom, an exchangeable non-conductive card interposed between said rings and bars, a plurality of eyelets in said card, each eyelet being adapted to conductively connect a selected ring with a selected bar, contact buttons connected to said bars, an additional conductive ring, a bridge adapted to connect consecutive buttons to said additional ring, and a lamp interpolated between said first named rings and said additional ring.

6. In a device of the character described, a plurality of spaced concentric conductive rings, resistances between said rings, a plurality of conductive bars extending radially across said rings and spaced therefrom, an exchangeable non-conductive card interposed between said rings and bars, a plurality of eyelets in said card, each eyelet being adapted to conductively connect a selected ring with a selected bar, contact buttons connected to said bars, an additional conductive ring, a bridge adapted to connect consecutive buttons to said additional ring, film-controlled means for advancing said bridge, and a lamp interpolable between said first named rings and said additional ring.

7. In a device of the character described, a plurality of spaced concentric conductive rings, resistances between said rings, a plurality of conductive bars extending radially across said rings and spaced therefrom, an exchangeable non-conductive card interposed between said rings and bars, a plurality of eyelets in said card, each eyelet being adapted to conductively connect a selected ring with a selected bar, contact buttons connected to said bars, an additional conductive ring, a bridge adapted to connect consecutive buttons to said additional ring, a film-controlled electromagnet, a spring-influenced feed lever actuated by said electromagnet, a feed wheel engaged by said lever, a rotary sleeve loosely supporting said wheel, means for transmitting movement from the wheel to said sleeve, and an arm fast on the sleeve for supporting the bridge.

8. In a device of the character described, a plurality of spaced concentric conductive rings, resistances between said rings, a plurality of conductive bars extending radially across said rings and spaced therefrom, an exchangeable non-conductive card interposed between said rings and bars, a plurality of eyelets in said card, each eyelet being adapted to conductively connect a selected ring with a selected bar, contact buttons connected to said bars, an additional conductive ring, a bridge adapted to connect consecutive buttons to said additional ring, a film-controlled electromagnet, a spring-influenced feed lever actuated by said electromagnet, a feed wheel engaged by said lever, a rotary sleeve loosely supporting said wheel, means for transmitting movement from the wheel to said sleeve, an arm fast on the sleeve for supporting the bridge, a dial also fast on the sleeve, and a knob for manually rotating said sleeve.

9. In a device of the character described, a casing composed of a stationary part and a movable part, a plurality of spaced concentric conductive rings supported by the stationary casing-part and insulated therefrom, resistances intermediate said rings, an exchangeable non-conductive card adapted to be placed upon said rings, metallic eyelets extending through said card and engaging selected rings, radially extending conductive bars carried by the movable casing-part and adapted to engage said eyelets, a movable member adapted to be conductively connected to consecutive bars, and an electric lamp interpolable between said member and the outermost ring.

10. In a device of the character described, a casing composed of a stationary part and a movable part, a plurality of spaced concentric conductive rings supported by the stationary casing-part and insulated therefrom, resistances intermediate said rings, an exchangeable non-conductive card having a perforation and adapted to be placed upon said rings, metallic eyelets extending

through said card and engaging selected rings, radially extending conductive bars carried by the movable casing-part and adapted to engage said eyelets, a movable member adapted to be conductively connected to consecutive bars, an electric lamp in circuit with said member and the outermost ring, and means extending through the card-perforation for closing said circuit.

11. In a device of the character described, a plurality of spaced conductors, resistances intermediate said conductors, a plurality of conductive bars extending across said conductors and spaced therefrom, an exchangeable card located intermediate said conductors and bars and having a plurality of conductive members extending through said card, each of said members being adapted to conductively connect a selected conductor with a selected bar, and an electric current consuming device interpolable between said conductors and bars.

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."