

No. 756,963.

PATENTED APR. 12, 1904.

J. W. HOWELL.  
PHOTOMETRIC APPARATUS.  
APPLICATION FILED OCT. 17, 1903.

NO MODEL.

2 SHEETS—SHEET 1.

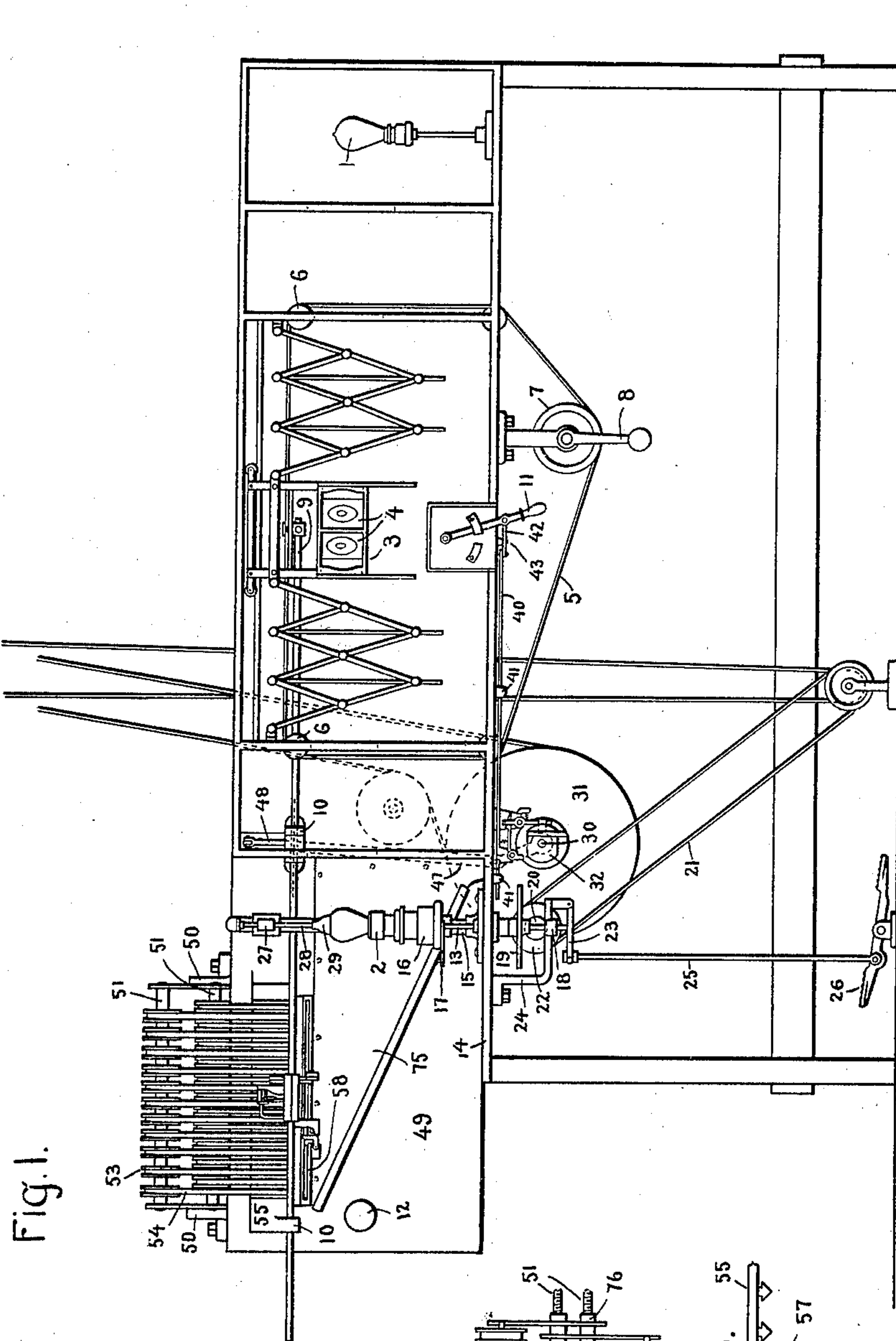
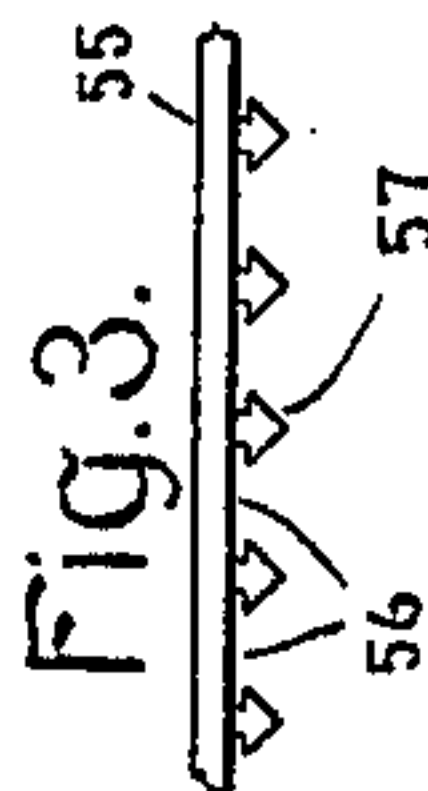
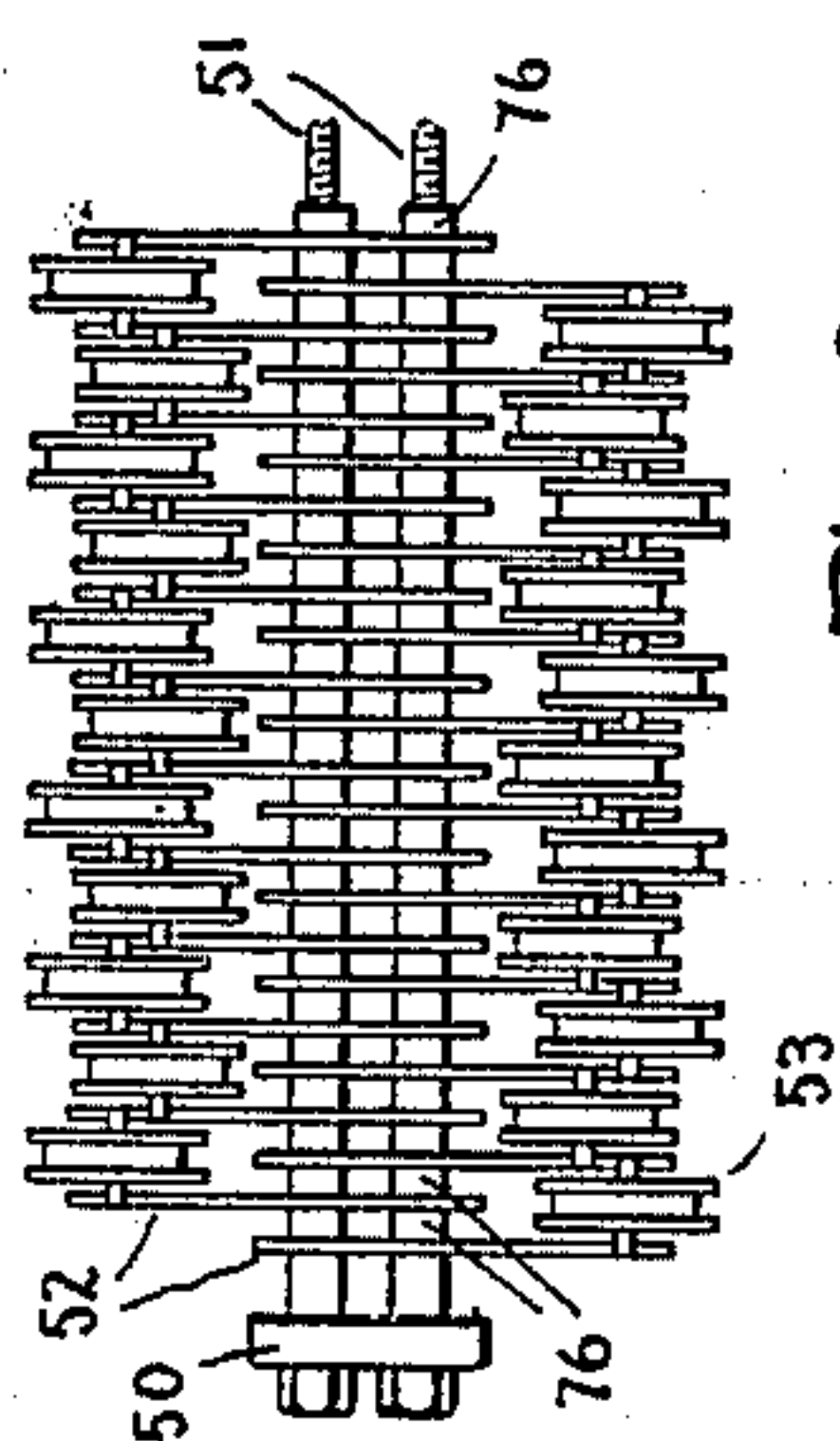


Fig. 1.

Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 4.

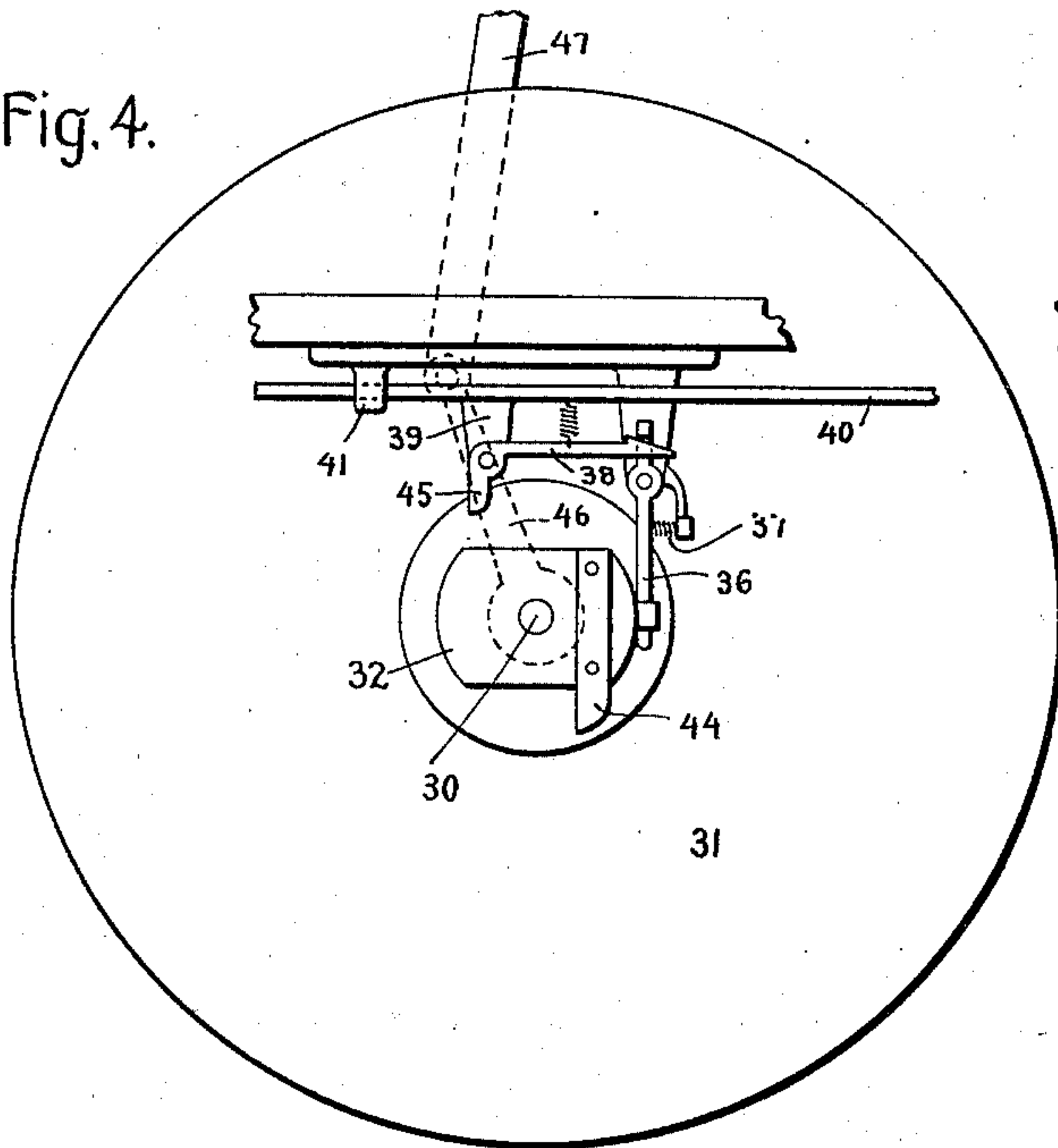


Fig. 5.

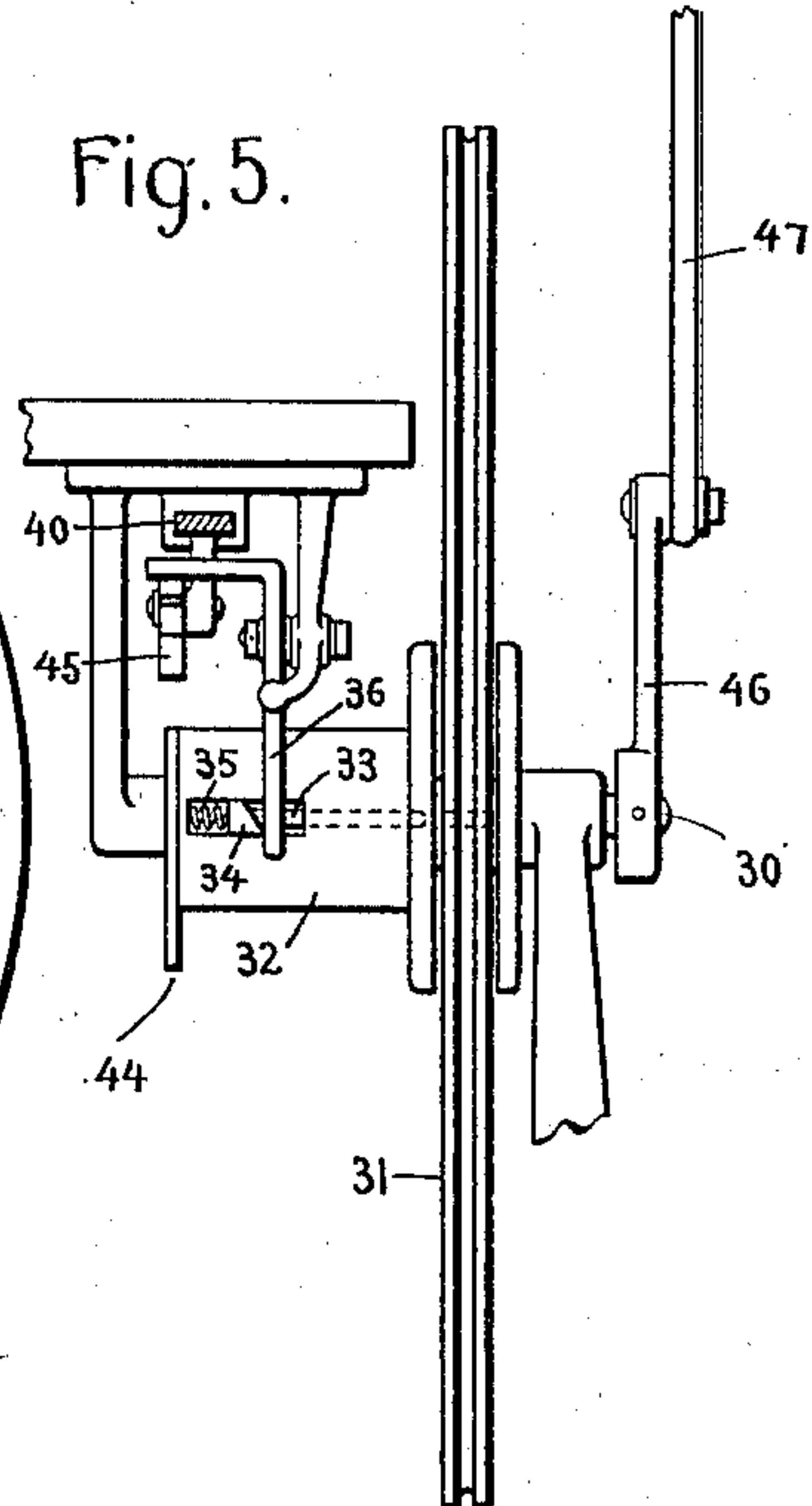


Fig. 6.

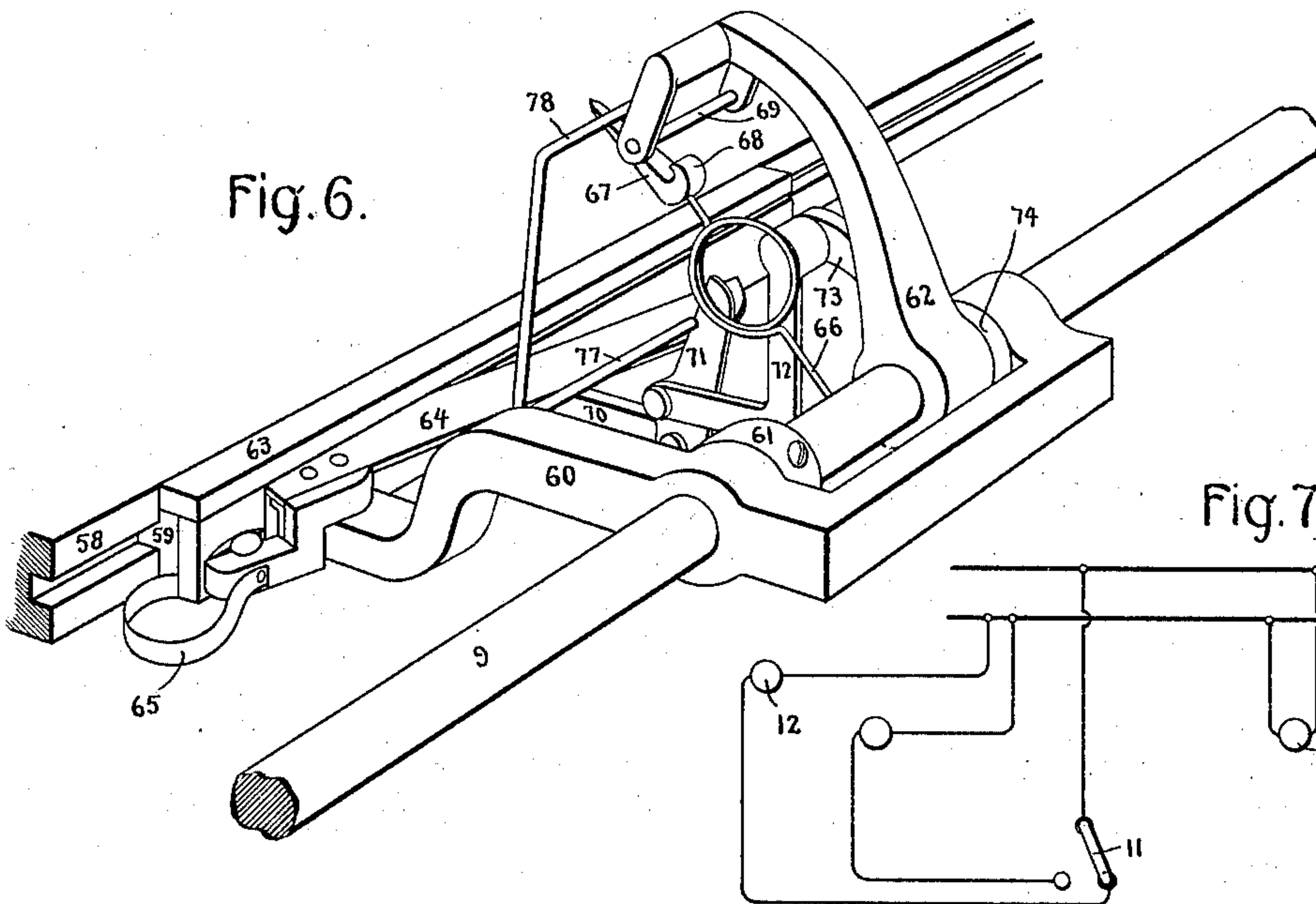
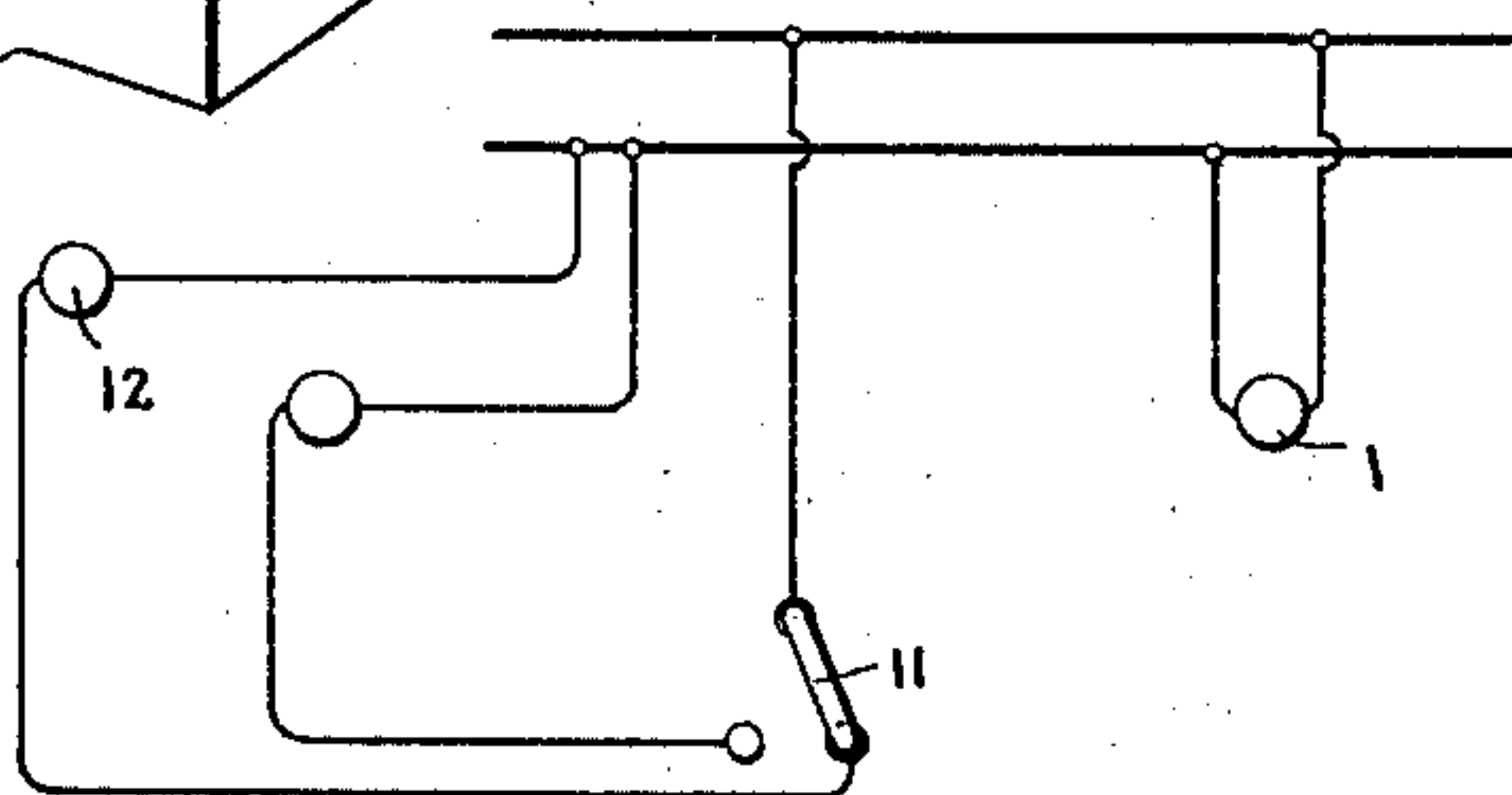


Fig. 7.



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# UNITED STATES PATENT OFFICE.

JOHN W. HOWELL, OF NEWARK, NEW JERSEY, ASSIGNOR TO GENERAL ELECTRIC COMPANY, A CORPORATION OF NEW YORK.

## PHOTOMETRIC APPARATUS.

SPECIFICATION forming part of Letters Patent No. 756,963, dated April 12, 1904.

Application filed October 17, 1903. Serial No. 177,435. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN W. HOWELL, a citizen of the United States, residing at Newark, county of Essex, State of New Jersey, have invented certain new and useful Improvements in Photometric Apparatus, of which the following is a specification.

This invention relates to photometric apparatus, and particularly to apparatus used in photometering incandescent electric lamps. Its object is to provide an attachment by which when the photometer-carriage has been adjusted to the position in which the standard lamp and the lamp to be gaged illuminate the grease-spot of the photometer equally a label on which is printed the voltage at which the lamp is to be used, as determined by the position to which the carriage has been adjusted, is released and carried to the operator, whose duty it is to place it in the stem or stick it on the bulb of the lamp.

Prior to my invention the practice in photometering incandescent lamps has been for one operator to adjust the photometer-carriage and an assistant operator to mark on the lamp bulb or stem the voltage at which the lamp is to be used, as indicated on a scale by a slide attached to the carriage. A number of disadvantages are incident to this practice. The responsibility for a mistake cannot be located, as it is impossible to tell whether an error is due to an incorrect figure put down by the assistant or to an incorrect adjustment of the photometer-carriage by the principal operator. In addition to this, marking the lamps by hand requires considerable time, and the marks detract from the appearance of the product. To obviate these disadvantages, I have provided a machine by which a label printed with the proper voltage-mark, as ascertained by adjusting the photometer-carriage, is automatically released and dropped to a position convenient for one of the operators. For this purpose I employ a number of reels each carrying a roll of paper tape on which a voltage-mark is printed in figures repeated throughout the length of the tape and mechanism so arranged that when the photometer-carriage has been adjusted by the operator to the proper

position a short section of one of the tapes selected by the position to which the carriage has been adjusted, and hence bearing the proper voltage-mark, is cut off and drops in front of the assistant, who inserts it in the stem of the lamp. The chances of a mistake are thus halved, and a mistake, if made, is due to incorrect adjustment of the photometer-carriage by the principal operator, as the duties of the assistant are merely to remove the photometered lamp, place in its stem the label cut off by the machine, and put another lamp in its place. The printed labels present a far more attractive appearance than marks made by hand, and the same number of operators can photometer and label more lamps in a given time than is possible by the old method.

My invention therefore comprises a photometer provided with a device by which a label marked in any way to correspond to the position to which the photometer-carriage has been adjusted is rendered accessible to the operator.

It also comprises other features of novelty which will be more fully described hereinafter and definitely indicated in the appended claims.

In the accompanying drawings, which illustrate one embodiment of my invention, Figure 1 is an elevation of my improved photometering apparatus. Fig. 2 is a top view of the reels. Fig. 3 is a plan view of a portion of the guide for the tapes. Figs. 4 and 5 are front and side elevations, respectively, of a part of the operating mechanism. Fig. 6 is a perspective view of the label-cutting device, and Fig. 7 is a diagram of the circuits.

Referring to the drawings, Fig. 1 shows a photometer having a standard lamp 1 mounted at one end, a support 2 for the lamp to be photometered near the other end, and an adjustable carriage 3 between the lamps provided with two mirrors 4 4 and a paper disk or screen on which is a grease-spot. Secured to the carriage 3 is a belt 5, passing over guide-sheaves 6 and a wheel 7, to the shaft of which is secured a handle 8 for adjusting the carriage 3 back and forth between the two



lamps. This construction is common in photometers and needs no detailed description. Secured to the carriage 3 and rotatable in its securing device is a rod 9, which extends out  
 5 beyond the lamp-support 2 and is arranged to slide in suitable bearings 10 as the carriage is moved back and forth. Mounted near the adjusting-handle 8 is a double-throw switch 11, arranged to close circuit through a lamp  
 10 in the support 2 when in one position and through a lamp 12 for lighting the assistant operator's table while inserting a label in a lamp when in the other position, as shown diagrammatically in Fig. 7.

15 The support 2 for the lamp to be photometered is made of two semicircular metallic parts separated by insulating material and supported on a shaft 13. Mounted on the table 14, behind shaft 13, is a standard 15, carrying a stationary disk 16, of insulating material, which is provided with two concentric circular grooves in its upper face filled with mercury and a central opening through which  
 20 shaft 13 extends. Attached to the two parts of the support 2 are two wires, each of which extends down through the lower part of the support and into the mercury in one of the grooves to connect the lamp-filament in circuit while it is rotating, the circuit to the  
 25 mercury being completed by wires leading to two strips 17, each extending into one of the grooves. The shaft 13 is slidably mounted in suitable bearings 18 and near its lower end carries a disk 19, mounted in coöperative relation to a wheel 20, driven by a belt  
 30 21 and pulley 22 from any suitable source of power. The shaft 13 and parts carried thereby are arranged to be shifted vertically over a small range by a pedal 26, connected by a  
 35 rod 25 to a lever 23, which is pivoted in a bracket 24, secured to table 14, and on which the end of shaft 13 rests when the lever is in the raised position. Pressing pedal 26 therefore lowers lever 23 and allows shaft 13 and  
 40 the parts carried thereby to drop by gravity in bearings 18 until disk 19 bears on wheel 20, causing the shaft to rotate, and when pedal 26 is raised, either by a spring or by depressing a portion of the pedal on the other  
 45 side of the pivot, lever 23 lifts the shaft and the various parts supported thereon, separating disk 19 and wheel 20 and arresting the rotation of the shaft. The standard 15 extends upward and near its upper end carries a bearing 27, in which a rod 28, carrying  
 50 a cap 29 at its lower end, is mounted to rotate freely and to slide vertically. Cap 29 fits over the bulb of the lamp and steadies it in its support while rotating.

60 Mounted in bearings under the table 14 is a shaft 30, on which is a loose wheel 31, driven by a belt from any suitable source of power, as shown in detail in Figs. 4 and 5. Rigidly secured to shaft 30 is a member 32, having an  
 65 opening parallel to its axis, in which a pin 33,

having an inclined head 34, as shown, is arranged to slide. This pin is pressed forward by a spring 35, and wheel 31 is provided with a number of openings, into one of which the  
 70 end of pin 33 is adapted to extend to lock member 32 and wheel 31 together and cause shaft 30 to rotate. The pin 33 is held in the back position by a pivoted arm 36, which is pressed against member 32 by a spring 37 and  
 75 against which the head 34 of the pin rests. Coöperating with a projection on arm 36 is a pivoted spring-positioned hook 38, mounted on a projection 39 on a rod 40, which slides back and forth in suitable bearings 41 and is  
 80 connected to the switch-arm 11 by a link 42, pivoted at 43. Secured to member 32 is a finger 44, adapted to abut against a projection 45 on hook 38 to turn the hook on its pivot against the tension of its spring. Thus when  
 85 the switch 11 is thrown to the left rod 40 and hook 38 are drawn to the right and the hook catches on the projection of arm 36, it being drawn up by its spring. When switch 11 is thrown to the right, rod 40 and hook 38 are  
 90 moved to the left, and the hook turns arm 36 on its pivot until the lower end of the arm releases the head 34 of pin 33 and allows spring 35 to press the pin forward into one of the openings in wheel 31. Member 32 and wheel  
 95 31 are thus locked together and shaft 30 is rotated. After a half-revolution finger 44 engages projection 45, turning hook 38 on its pivot until it releases the projection on arm 36, and the latter is pressed by spring 37 to  
 100 its former position, with its lower end bearing against the periphery of member 32. When almost a complete revolution has been made, the inclined head 34 of the clutch-pin abuts against the end of arm 36, and the pin is drawn  
 105 backward against the tension of spring 35 until its end is free from wheel 31. Member 32 and shaft 30 are thus brought to rest after having made one complete revolution. Rigidly secured to shaft 30 is an arm 46, to which  
 110 a rod 47 is pivotally connected. This rod extends upward and is connected to rod 9 by a link 48, splined to rod 9. Throwing switch 11 to the right therefore causes rod 9 to be turned on its axis through a portion of a revolution and then turned back to its original position, and the connection to the rod for accomplishing these movements leaves it free to move back and forth axially in its bearings 10 as the photometer-carriage is adjusted back and forth by handle 8.

120 On the top of a panel 49, back of the bulb-support 2, are two standards 50, carrying rods 51, on which are a plurality of arms 52, extending out in opposite directions alternately and regularly positioned on the rods  
 125 by spacers 76, as shown in Fig. 2. In the upper edge of each arm near its outer end are two notches. Between adjacent arms 52, with their shafts resting in the notches cut in the arms, are reels 53, wound with paper tape 54.  
 130



In Fig. 1 the reels in the back row are shown below those in the front merely for the sake of clearness. By mounting the reels 53 in this manner they are held close together. Those on one side of rods 51 are staggered relatively to those on the other, and any reel may be removed and replaced to supply a new roll of tape without disturbing another. Below the reel-support and mounted on the panel 49 is a guide 55 for the tapes, having a number of passages 56, corresponding to the number of reels 53. The adjacent passages of guide 55 are separated by strips 57, which overhang the passages slightly and are beveled off to slope away on either side from the center of the face, as shown in Fig. 3. From each reel the tape is brought down through the passage in guide 55, directly below it, with its edges under the overhang of the strips 57 on either side of the passage. Mounted on panel 49, directly under the guide 55, is a grooved guide 58, (shown in detail in Fig. 6,) cooperating with which is a tongued strip 59, carried by a frame 60, which is loosely mounted on rod 9, but arranged to be moved back and forth with the rod by a collar 61 and an arm 62, rigidly mounted on the rod. Secured to strip 59 is a metallic strip 63, accurately machined and so positioned that the lower edge of guide 55 overhangs it slightly, and with this strip a knife-blade 64, pivoted on frame 60, cooperates to cut off a section of the paper tape. The knife-blade 64 is normally held in the open position by a spring 65. Secured in an opening in rod 9 is a spring 66, carrying at its outer end a finger 67, provided at one end with a sharpened point and at the other with a hook 68, the upper side of which is rounded off. Arm 62 carries a cross-rod 69, adapted to abut against the rounded side of hook 68 when movement of the finger is resisted and force it forward and when the finger is tilted to slide over the side and under the hooked portion. Two stops 77 and 78 are mounted on frame 60 and arranged so that the end of finger 67 contacts with them at the limits of its movement. Secured to the under side of the tongued strip 59 is a support 70, to which is pivoted a lever 71, by which knife-blade 64 is pressed forward to cut the tape. Pivoted to lever 71 is a link 72, which is pivoted at its other end to an arm 73, the hub 74 of which is loose on rod 9. The connection between link 72 and arm 73 is so constructed that it lies in the path of movement of arm 62, which when turned by rod 9 presses the end of link 72 down, thus forcing lever 71 and knife-blade 64 forward. On each tape 54 is printed in figures repeated throughout the length of the tape the voltage at which a lamp should be used when the finger 67 is in front of that tape and the standard lamp and the lamp to be gaged illuminate the grease-spot equally. Below the label-cutting device is a chute 75, which catches the label and car-

ries it down to the side of the lamp-support 65 within easy reach of the operator.

The lamps are preferably photometered before the base is put on, and the leading-in wires are bent back on opposite sides of the bulb to make contact with the two metallic parts of the support 2. One operator adjusts the carriage 3 back and forth by manipulating handle 8 until the proper position is found, the rod 9 and label-cutting device moving back and forth with the rod, and an assistant operator puts the lamps in the support 2, sets the cap 29 in place on the top of the bulb, removes the lamps from the support after they have been photometered, and puts the labels in the stems. In the position of switch 11 shown in Fig. 1 circuit is completed to lamp 12 to illuminate the assistant operator's table 14, and the terminals of support 2 are dead. The assistant operator puts a lamp in support 2 after having bent the leading-in wires back, lowers cap 29 down on the bulb, and presses pedal 26. This lowers the free end of lever 23, allowing shaft 13, the lamp in support 2, and rod 28 to drop by gravity until disk 19 bears on wheel 20 and the shaft and parts supported thereby are rotated. The principal operator then throws switch 11 to the left, breaking the connection to lamp 12 and completing circuit through the lamp in support 2. Moving switch 11 to the left draws rod 40 and hook 38 to the right until the hook catches the projection of arm 36. The principal operator then turns handle 8 to adjust carriage 3 until the proper position is found, and in doing this rod 9 moves the label-cutting device, secured thereto, back and forth in front of the tapes. When the proper position of carriage 3 is found, finger 67 is in front of that tape which is marked with the voltage at which the lamp in support 2 should be used. The principal operator then throws switch 11 to the right, cutting out the lamp in support 2, lighting lamp 12, and drawing rod 40 and hook 38 to the left, and the hook carrying the projection of arm 36 with it turns the arm on its pivot until it releases pin 33. This connects wheel 31 into driving relation to shaft 30, as above described, until the shaft has made one revolution, and by means of the connecting-links 46, 47, and 48 rod 9 is caused to turn on its axis through a portion of a revolution, unwinding one of the reels and cutting off a label, and then turn back to its former position. The free end of arm 62 and the finger 67 being supported on rod 9 are caused to descend as the rod turns, and the sharpened end of finger 67 comes against the tape which is directly in front of it. If the finger is between two of the tapes, it strikes on the strip 57, separating them, and is guided by the sloping face of the strip onto the tape to which it is nearer. When in this position, the finger presses the tape



against the back of the passage, which checks its movement until cross-rod 69, carried by rod 62, abuts against the side of hook 68 and forces the finger downward, its sharpened end carrying the tape with it. The tape is thus pushed through the passage, its end passing down over the cutting edge of strip 63, which lies directly under the end of the passage. When nearing the end of its downward movement, arm 62 abuts against and carries with it the end of link 72, turning lever 71 on its pivot and closing knife-blade 64 on strip 63, thus cutting off that portion of the tape which finger 67 has pushed down over the edge of strip 63. It will be noted that as finger 67 is forced down by arm 62 after having caught the tape the distance between the point of support of spring 66 on rod 9 and the point of contact of the end of finger 67 with the tape lessens steadily, putting spring 66 under tension and tilting finger 67 until at the end of the downward movement cross-rod 69 slides over the side of hook 68 and under the hook. Stop 77, on which the end of finger 67 hits at the end of its downward movement, insures sufficient tilting of the finger to allow cross-rod 69 to slide under hook 68. Rod 9 then turns back to its former position, raising the free end of arm 62, and during this upward movement of the arm the tension of spring 66 holds the hook 68 of finger 67 on the cross-rod 69, and hook 68 is made shallow enough to hold the finger back from guide 55, so that it leaves the tape immediately after the upward movement begins and is free from it throughout the movement. As the arm nears the limit of its upward movement the end of finger 67 hits stop 78, releasing the hook from cross-rod 69 and allowing all parts to take their former positions. The label which is cut off falls into chute 75 and is carried down beside the lamp-support 2. The assistant operator then raises lever 23 by pedal 26, separating disk 19 and wheel 20 and bringing shaft 13 and the lamp in support 2 to rest. He then removes the lamp from the support, inserts the label which has been cut off in the stem, and puts another lamp in the support, whereupon the operation is repeated.

Many modifications can be made in the apparatus shown and described herein without departing from the spirit of my invention, and I do not wish to be understood as limited in any way to what is shown. I have described herein the form of my invention which I prefer to use; but my improvements may be carried out in machines of many different types which will occur to skilled engineers. For instance, the previously-printed label is not essential to the label-delivering attachment. Instead of that the figures may be printed by the machine on a blank tape or on small tags, the type being selected by the position to which the photometer-carriage is ad-

justed. I therefore consider that any system in which a marked label is rendered accessible to the operator would be within the scope of my invention.

What I claim as new, and desire to secure by Letters Patent of the United States, is—

1. The combination of a photometer, and means for producing a label marked to correspond to the position to which the photometer has been adjusted.

2. The combination of a photometer having an adjustable screen, and means for delivering a label marked to correspond to the position of the screen.

3. The combination of a photometer having an adjustable member, and means for rendering accessible to the operator a label marked to correspond to the position to which said member has been adjusted.

4. The combination of a photometer, and means for releasing a label marked to correspond to the position to which the photometer has been adjusted.

5. The combination of a photometer having an adjustable carriage, and means controlled by the operator for releasing a label marked to correspond to the position of the carriage.

6. The combination with a photometer having an adjustable member, of a plurality of labels, and means for releasing a label selected by the position to which said member has been adjusted.

7. The combination with a photometer, of a plurality of labels, and means controlled by the operator for releasing a label selected according to the photometer adjustment.

8. The combination with a photometer, of a reel, a tape wound thereon, and means for automatically cutting off a section of the tape.

9. In combination with a photometer having an adjustable member, a plurality of tapes, and means for cutting off a section of a tape selected by the position to which said member has been adjusted.

10. The combination with a photometer, of a reel, a tape wound thereon, and means for automatically unwinding a section of the tape.

11. The combination with a photometer having an adjustable member, of a plurality of reels, tapes thereon, and automatic means for unwinding a section of a tape selected by the position of said member.

12. The combination of a photometer for incandescent lamps, a plurality of labels for the lamps, and a feeding device operating on the labels.

13. The combination with a photometer having a standard light, an adjustable member, and a support for a light to be tested, of means for opening and closing circuit to said support, and means operated by opening said circuit for releasing a label marked to correspond to the position to which said member has been adjusted.

14. The combination with a photometer



having a standard light, an adjustable carriage, and a support for a light to be tested, of means for opening and closing circuit to said support, a plurality of labels, and means  
5 operated by opening said circuit for releasing a label selected by the position to which the carriage has been adjusted.

15. The combination with a photometer having a support for a light to be tested, of  
10 means for opening and closing circuit to the support, a tape, and means operated by opening said circuit for cutting off a section of the tape.

16. The combination of a photometer having an adjustable carriage, a standard light and a support for a light to be tested, means  
15 for opening and closing circuit to said support, a plurality of tapes, and means operated by opening said circuit for cutting off a section of a tape selected by the position of the carriage.

17. The combination with a photometer having a support for a light to be tested, of means for opening and closing circuit to the  
25 support, a tape and a feed device therefor, operated by opening said circuit.

18. The combination with a photometer, and a support for a light to be tested, of means for opening and closing circuit to said  
30 support, a plurality of reels, tapes thereon, and means operated by opening said circuit for unwinding a section of a tape selected by the adjustment of the photometer.

19. In combination with a photometer having an adjustable carriage, a rod attached to said carriage and movable longitudinally  
35 therewith, means for turning said rod, and means operated by said rod when turned for releasing a label marked to correspond to the position to which the carriage has been adjusted.

20. In combination with a photometer having an adjustable member, a rod attached to said member and movable longitudinally  
45 therewith, means for turning said rod, a tape, and means operated by said rod when turned for cutting off a section of the tape.

21. In combination with a photometer having an adjustable carriage, a rod attached to said carriage and movable longitudinally  
50 therewith, means for turning said rod, a plurality of tapes, and means operated by said rod when turned for cutting off a section of a tape selected by the position of the carriage.

22. In combination with a photometer having an adjustable carriage, a rod attached to said carriage and movable longitudinally  
55 therewith, means for turning said rod, a tape, and a feed device therefor operated by said rod when turned.

23. In combination with a photometer having an adjustable carriage, a rod attached to said carriage and movable longitudinally  
60 therewith, means for turning said rod, a plu-

65 rality of reels, tapes wound thereon, and means operated by said rod when turned for unwinding a section of a tape selected by the position of the carriage.

24. The combination with a photometer, of a plurality of tapes, and means for feeding a  
70 tape selected by the photometer adjustment and cutting off a section of the tape.

25. The combination with a photometer having an adjustable carriage, means for automatically releasing a label marked to correspond to the position to which the carriage  
75 has been adjusted, and a chute for carrying the label to a position convenient for the operator.

26. In combination with a photometer, a label-releasing device comprising a plurality of  
80 reels mounted in two rows, the reels of one row being staggered relatively to those of the other, tapes on the reels, a guide having passages for the tapes, and a cutting device in  
85 proximity to the guide.

27. In combination with a photometer, a label-releasing device comprising a plurality of reels mounted so as to be individually removable, tapes on the reels, and a cutting device  
90 for the tapes.

28. In combination with a photometer, a reel, tape thereon, a rotatable rod, a finger mounted thereon, and means for rotating the rod, whereby the finger draws the tape from  
95 the reel.

29. In combination with a photometer, a plurality of tapes, a finger movable back and forth before the tapes, and means for moving the finger into engagement with a tape.  
100

30. In combination with a photometer, a plurality of reels, tapes thereon, a guide for the tapes having a plurality of separate passages, a finger movable back and forth before the guide, and means whereby the finger draws  
105 a tape through a passage of the guide.

31. In combination with a photometer, a plurality of reels, a guide, a cutting device in proximity to the guide, a finger movable back and forth before the guide, means for moving the finger toward the guide, and means  
110 for operating the cutting device.

32. In combination with a photometer, a label-releasing device comprising a tape, a finger, means for moving the finger in one direction in contact with the tape, and means  
115 for moving it in the opposite direction out of contact therewith.

33. In combination with a photometer, a label-releasing device comprising a reel, a tape  
120 thereon, a finger, means for moving the finger to draw the tape from the reel, and stops for the finger at the limits of its movement.

34. In combination with a photometer, a label-releasing device comprising a plurality of  
125 tapes, a guide therefor having a plurality of separate passages, a spring-finger, means for moving the finger to draw a tape through a

passage of the guide, and means for insuring contact of the finger with a tape.

35. In combination with a photometer having a support for a light to be tested and an  
5 adjustable carriage, a rod attached to the carriage and movable longitudinally therewith, means for opening and closing circuit to said support, means operated by opening said cir-

cuit for turning the rod, and means operated by the rod when turned for releasing a label. 10

In witness whereof I have hereunto set my hand this 15th day of October, 1903.

JOHN W. HOWELL.

Witnesses:

JOHN E. MITCHELL, Jr.,

MONTGOMERY MAYNARD.