

No. 656,977.

Patented Aug. 28, 1900.

L. HORWITZ.

ELECTRIC LAMP FOR MINERS' USE.

(Application filed Feb. 21, 1899.)

(No Model.)

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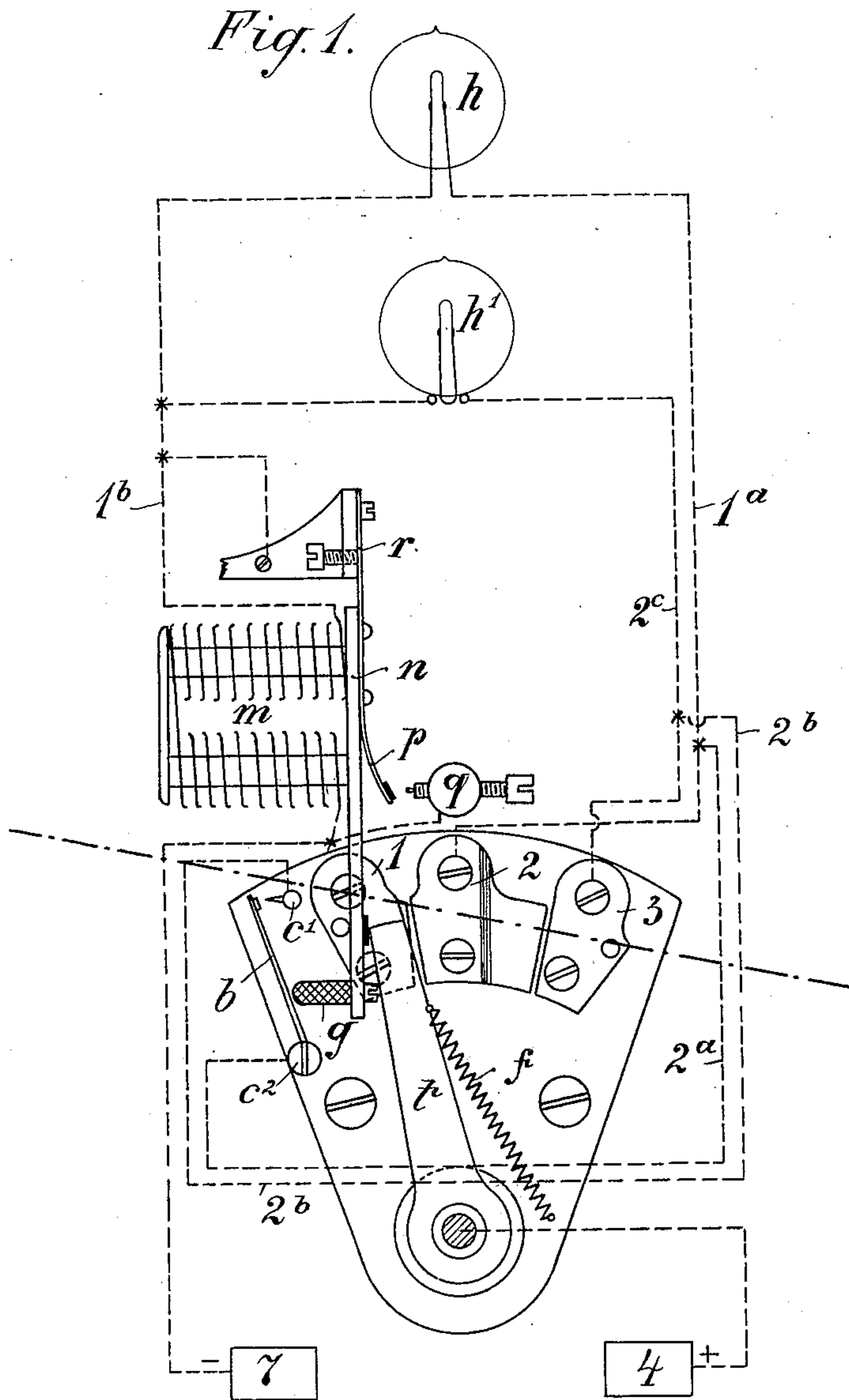
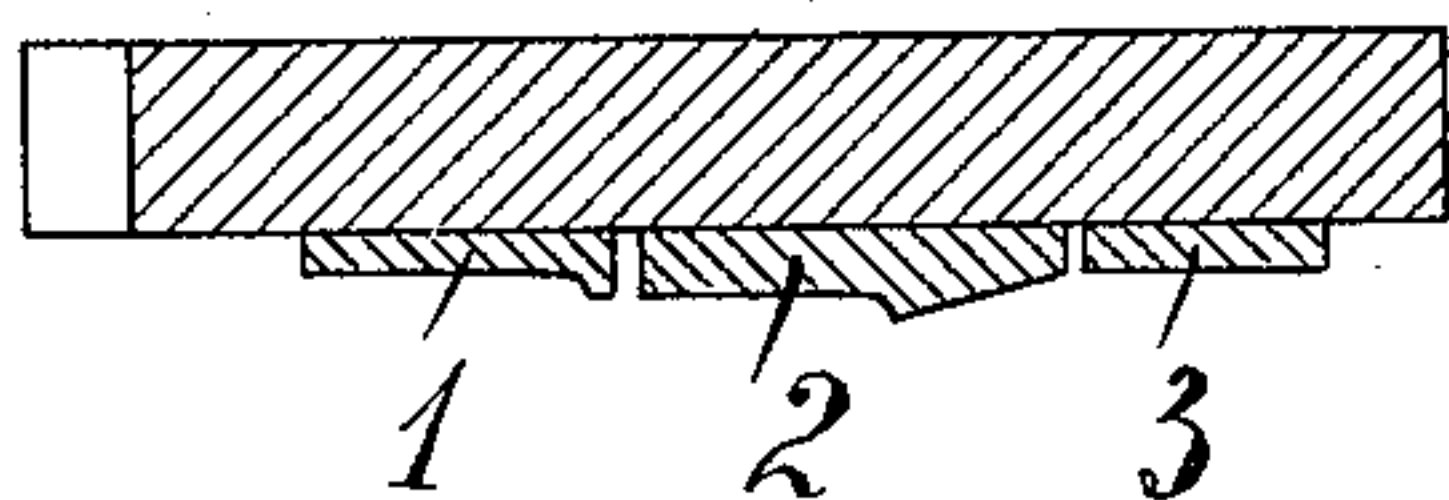


Fig. 2.



Witnesses

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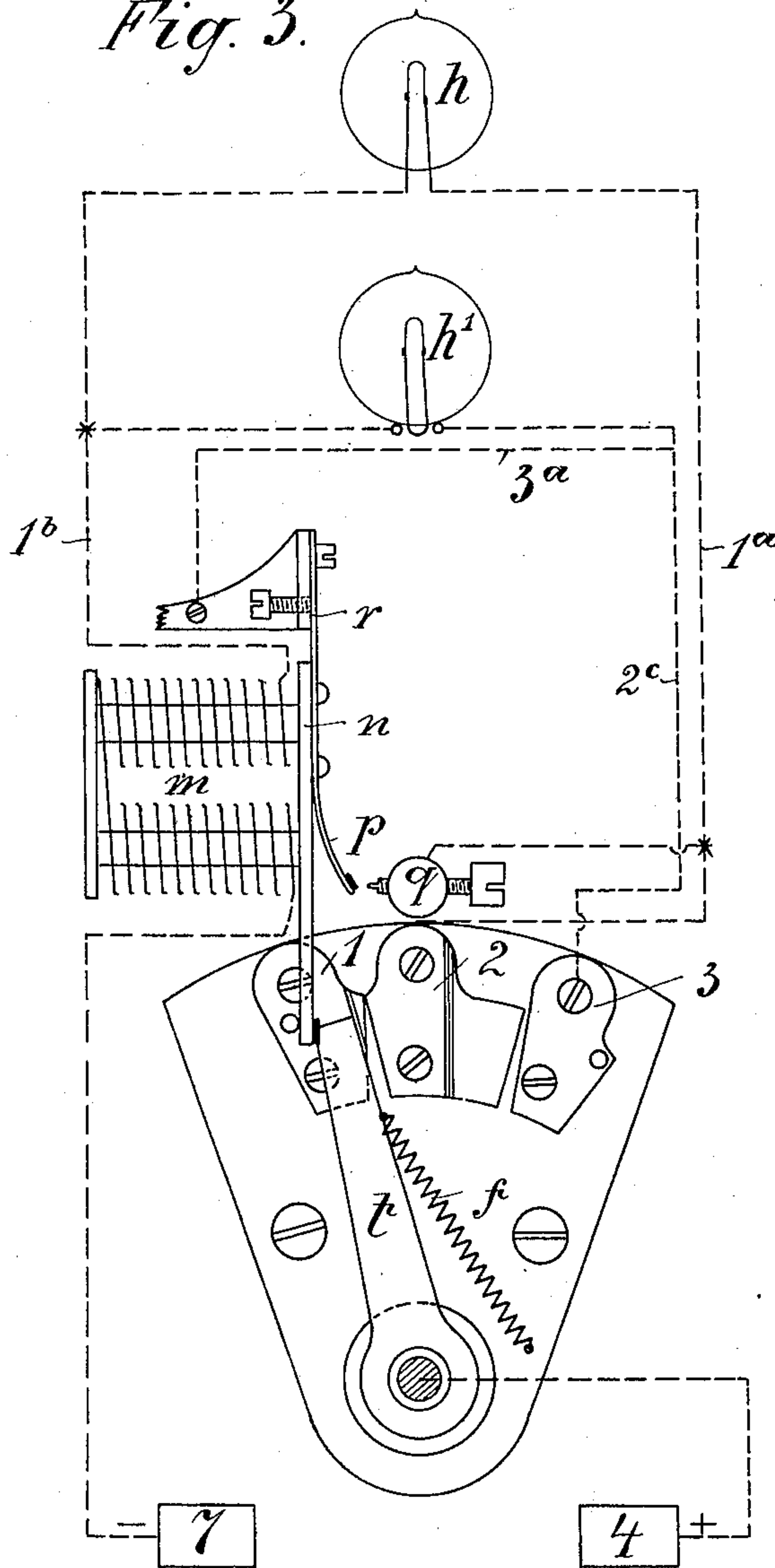
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Fig. 3.



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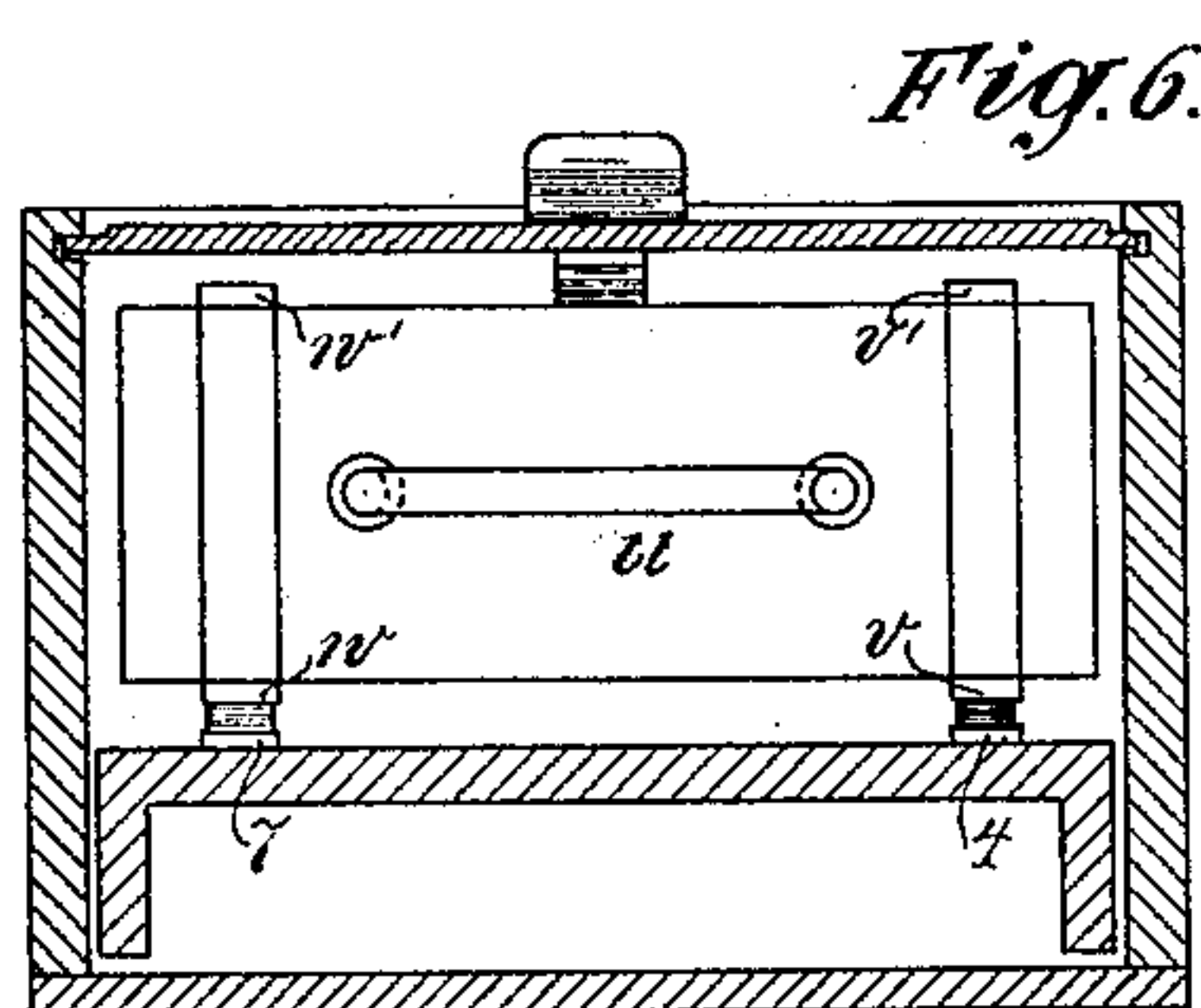
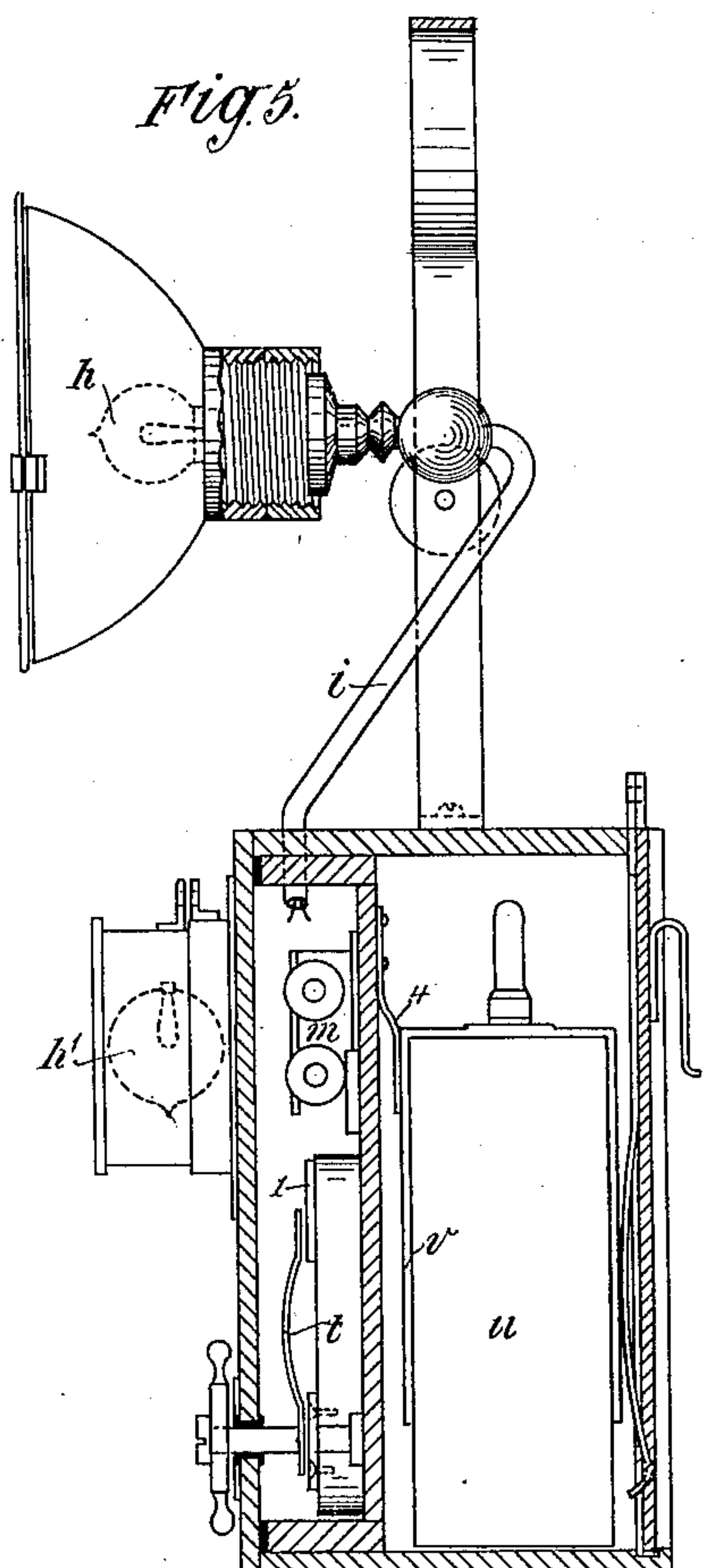
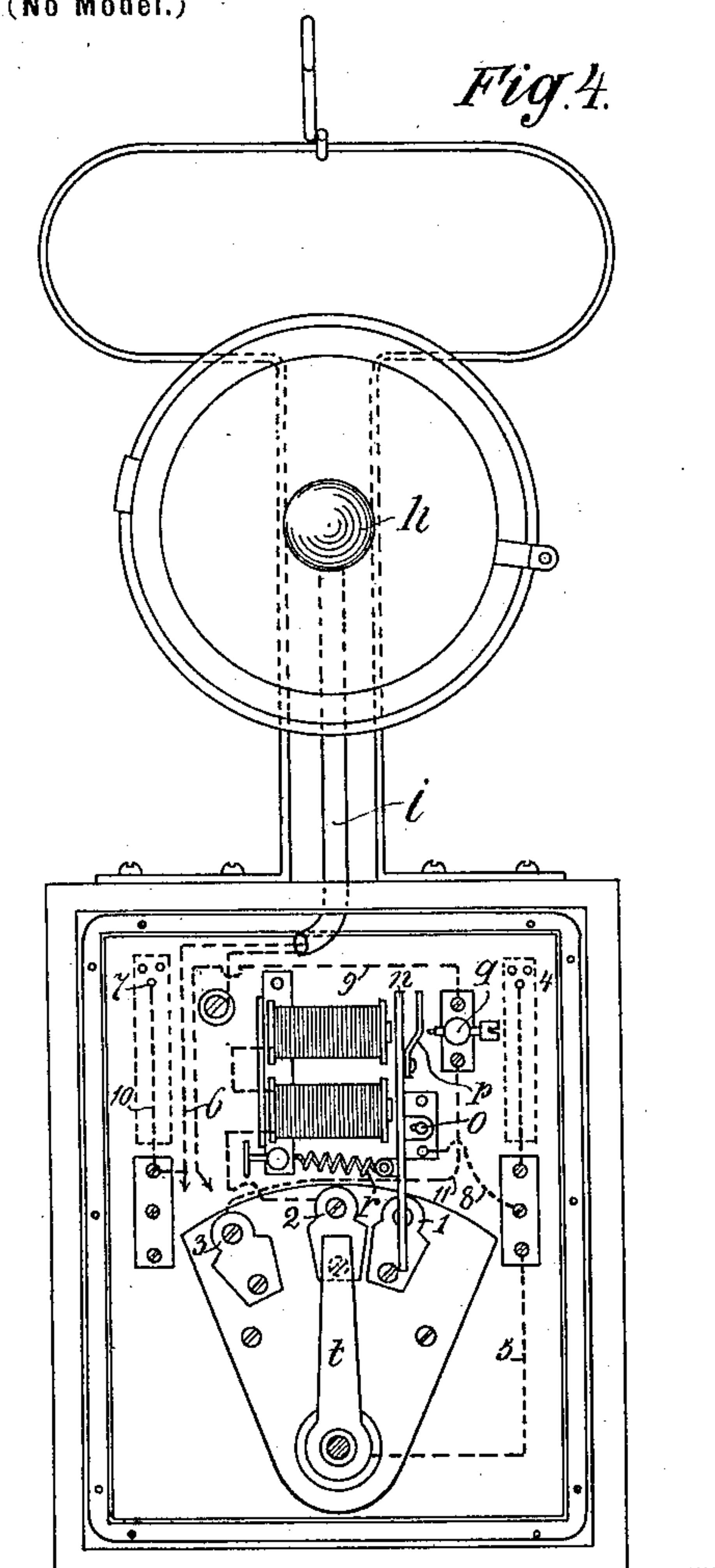
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3 Sheets—Sheet 3.



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UNITED STATES PATENT OFFICE.

LEO HORWITZ, OF BERLIN, GERMANY.

ELECTRIC LAMP FOR MINERS' USE.

SPECIFICATION forming part of Letters Patent No. 656,977, dated August 28, 1900.

Application filed February 21, 1899. Serial No. 706,398. (No model.)

To all whom it may concern:

Be it known that I, LEO HORWITZ, a subject of the King of Prussia, German Emperor, residing at Berlin, in the Kingdom of Prussia, Germany, have invented certain new and useful Improvements in or Relating to Electric Lamps for Miners' Use, (for which I have applied for a patent in Germany, filed July 22, 1898; in France, filed July 28, 1898, No. 280,069; in England, filed August 22, 1898, No. 18,057, and in Belgium, filed August 23, 1898, No. 137,545,) of which the following is a specification.

This invention relates to an electric switching device for two lamp-circuits, one of which is automatically switched in if the other is burned out or gets damaged through any cause or other, and vice versa.

This switching device is in particular suitable for electric lamps for miners' use, and in the accompanying drawings it is applied to such a lamp.

The switching device consists, essentially, of an electromagnet the armature of which actuates two contacts. The electromagnet attracts its armature when one lamp is burning; but it ceases to do so when the lamp is burned out, so that the two contacts are closed and the circuit passes through the other lamp. A hand-switch is also provided for the purpose of switching in one lamp or neither of the two lamps. The hand-switch has, moreover, for its purpose to press, prior to the switching in of one lamp, the armature against the cores of the magnet, and owing to its construction it prevents the armature when it is switched in from leaving the magnetic-attraction field and effects in consequence in switching in the attraction of the armature. In another modified construction the switching is arranged in such a manner that when one lamp is burned out the other lamp begins to glow; but the circuit of the latter is continually opened and closed, so that by the flickering of the light it is indicated that one lamp is burned out and the other is switched in. In the third modified construction the switching is so simplified that only when one lamp is burned out the other lamp is put in circuit, while the inverse does not take place in this construction.

The electric switching device is shown in the accompanying drawings.

Figure 1 represents a diagram of the circuits of the first form of the miner's lamp. Fig. 2 is a section through the contact-pieces of the hand-switch fitted to the miner's lamp for switching the lamp in and out. Fig. 3 shows a diagram of the electrical connections of the second form of the invention. Fig. 4 shows the miner's lamp in elevation, the front cover being removed to show the inner arrangement of the parts. The mode of connection corresponds to the simplest of the three forms of the invention. Fig. 5 is a longitudinal section through the lamps, showing the arrangement of the ball-joint for the reflector and that of the accumulator; and Fig. 6 is a section through the lamp, showing the connection of the accumulator with the same.

In the position shown in Fig. 1 of the hand-switch *t* the latter presses against the armature *n* of the electromagnet *m*, so that the contact is opened at *p q*. At the same time the insulated screw *g*, provided on the armature *n*, presses against the plate-spring *b*, so that simultaneously the contact is also opened at *c'*. For rendering the lamp *h* glowing the hand-switch *t* is placed on the contact-piece 2. The armature *n* under the action of the plate-spring *r* will be retracted a little from the magnet *m*; but the dimensions are so that the switch *t* will come in contact with the piece 2 before the contacts *p*, *q*, and *c'* are closed. By the connection of *t* and 2 the electromagnet *m* is energized and attracts at once its armature *n*, holding it fast as long as the lamp switched in is burning. The current flows then from the positive terminal 4 of the source of the current through the switch-lever *t*, the contact-piece 2, to the wire-circuit 1^a, into the lamp *h*, and thence it returns through the circuit 1^b and the electromagnet *m* to the negative terminal 7. If the lamp becomes now burned out, owing to the destruction of the bulb or of the filament, the electromagnet ceases to attract its armature, and the contacts *p*, *q*, and *c'* are closed by the action of the spring *r*. The current flows now from 4 through *t* 2 2^a *c'* *b* *c'* 2^b to the lamp *h'* and thence through *r p q* back to the negative terminal 7. The lamp *h'* is therefore now burn-

ing in place of lamp *h*, but the magnet-coil is not switched in and the armature attracted, as the coil is in shunt to the circuit, and the coil offers to the current a greater resistance than the circuit. If it is desired from the first to use only the second lamp *h'*, so that the lamp *h* serves as a reserve lamp, when the first is burned out the hand-lever *t* is brought from the position shown in Fig. 1 over the contact 2 on the contact 3, the current then flowing from 4 through *t*, 3, conducting-wire 2^c, lamp *h'*, circuit 1^b, electromagnet *m*, and thence back to the negative terminal 7. If this lamp *h'* is burned out, the electromagnet ceases to attract its armature, the contacts *p*, *q*, and *c'* are then closed, and the current runs from 4 through *t* 3 circuit 2^b *c'* *c* 2^a 1^a to the lamp *h* and thence through *r p q* back to the terminal 7. The electromagnet is also in this case not energized, because it is in shunt to this circuit and offers to the current a greater resistance than the circuit. The contact-pieces 1 2 3 of the hand-switch *t* are cut in or curled in such a manner, Fig. 2, that they offer to the movement a certain resistance, but do not hinder the lever from moving from one contact-piece to the other, so that the spring *f* can rapidly pull the switch-lever from one contact-piece to the other.

In the simpler modified construction illustrated in Fig. 3 the armature *n* is provided only with a contact *p q*. If the switch-lever *t* is brought from the position shown in Fig. 3 from the contact-piece 1 to the contact-piece 2, the current runs from 4 through *t*, 2, circuit 1^a, lamp *h*, and thence back through the circuit 1^b and the electromagnet *m* to the terminal 7. If the lamp *h* is burned out, the magnet ceases to attract its armature, and the current runs from 4 *t* through 2, *q p*, *n*, 3^a, lamp *h'*, and 1^b through the electromagnet *m* to the terminal 7. The armature is therefore attracted again and the play is repeated anew, so that a to-and-fro motion is imparted to the armature *n* and the contact *p q*, and in consequence also the circuit passing through the lamp *h'* is continually closed and broken, so as to cause the light to flicker, indicating thus that the lamp *h* is burned out. In the same manner the lamp *h'* may be switched in in placing the switch-lever on contact-piece 3. The circuit is then as follows: 4, *t*, 3, circuit 2^c, lamp *h'*, circuit 1^b, electromagnet *m*, and terminal 7. Here also the armature *n* is continually attracted and set free, and the flickering of the lamp *h* indicates that the lamp *h'* is destroyed.

The third modification of the switch is shown in Fig. 4 as applied to an electric miner's lamp. The other two modifications may, however, also be used in such lamps. The current flows here from the terminal 4 through *t*, contact-piece 2, electromagnet *m*, wire *i*, and lamp *h* and thence back to terminal 7. The magnet attracts its armature, thus opening the contact *p q*. If the lamp *h* becomes burned out, the lamp *h'* is switched

in through the contact *p q* in the same manner as described in the other modifications. If it is desired to use the lamp *h'*, the switching-lever *t* is placed on contact 3. Also in this arrangement it may particularly be pointed out, as in the other two modifications, that the sure switching in is effected by the fact that prior to and during the switching in of the lamp *h* the switching-lever *t* strikes against the armature *n* and holds it within the magnetic field so long as it receives electromagnetism.

As it is very important for the electric switching device above described to keep the iron parts free from any residual magnetism, there is provided a particular arrangement of a storage battery for the miner's lamp. The accumulator *u* is fitted on each side with two lead-strips *v w v' w'*, each pair of which *v v'* and *w w'* is connected with the accumulator. If the accumulator is so put in the apparatus that the lead-strips *v* and *w* come in contact with plate-springs 4 and 7, the current runs in a given direction—for instance, from the positive pole *v* of the accumulator over plate-spring 4, through the whole apparatus, and through the plate-spring 7 back to the negative pole *w* of the accumulator. If now after the accumulator has been charged afresh it is put back in the apparatus in such a manner that strip *w'* comes in contact with spring 4 and lead-strip *v'* with spring 7, the current runs in a direction that is the reverse of that in which it ran before—that is to say, from positive terminal *v'* over 7, through the apparatus, and back over 4 to the negative terminal *w'*. Any traces of magnetism (the residual magnetism) that might remain in the iron parts of the electromagnets are thus neutralized, so that an adherence of the armatures to the magnets is prevented.

It may still be mentioned that in these miners' lamps one lamp *h* is connected, by means of a ball-joint, to the handle, which serves for carrying or hanging the lamp, while the second lamp *h'* is fitted to the front of the box or casing. According as the workman will use one lamp or the other he switches it in by means of the hand-switch. If the lamp becomes burned out, he is not in the dark, as at once the second lamp is automatically switched in.

It is evident that the switching device may be used also for many other purposes where an instantaneous substitution of one lamp by another is required.

I claim—

1. In a portable electric lamp, the combination with a switch-lever in the main circuit of an automatic switching device, comprising an electromagnet energized by the main current controlled by said switch-lever and including a glow-lamp, of a spring-actuated armature automatically opening and closing a shunt-circuit and provided with an extension to be engaged by said switch-lever, a second

glow-lamp in the shunt-circuit and connected with another shunt-circuit controlled by the said switch-lever and allowing either lamp to be thrown into circuit by the operator, and a
5 battery for supplying the main circuit, substantially as described.

2. A miner's lamp, comprising two glow-lamps, a hand-switch, a battery, a casing therefor, contacting strips for the battery and
10 casing, and an automatic switching device comprising an electromagnet the armature of which actuates a contacting device switching in or out either lamp, the contacting strips of the battery and casing being arranged in
15 such a manner that after each fresh charge of the battery the latter may be placed in the apparatus so that one pair of strips on the battery comes in contact with a different pair
20 of strips on the casing whereby the direction of the current is reversed and any residual

magnetism in the apparatus is neutralized, substantially as described.

3. In a miner's lamp, the combination with two glow-lamps, of a hand-switch, a battery, circuits and connections substantially as described, and an automatic switching device
25 comprising an electromagnet the armature of which actuates the contacts controlling the circuits in such a manner that when one lamp goes out the other one is successively
30 and alternately switched in and out of the circuit so as to cause this lamp to flicker, substantially as described.

In witness whereof I have hereunto signed my name in the presence of two subscribing
35 witnesses.

LEO HORWITZ.

Witnesses:

GUSTAV GOHOUL,
GUSTAV HÜLSMANN.