

No. 616,779.

Patented Dec. 27, 1898.

C. FRANCKE.

ELECTRICAL SAFETY LAMP FOR MINERS.

(Application filed Apr. 18, 1898.)

(No Model.)

Fig. 1.

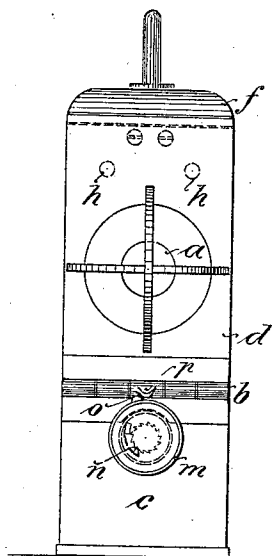


Fig. 2.

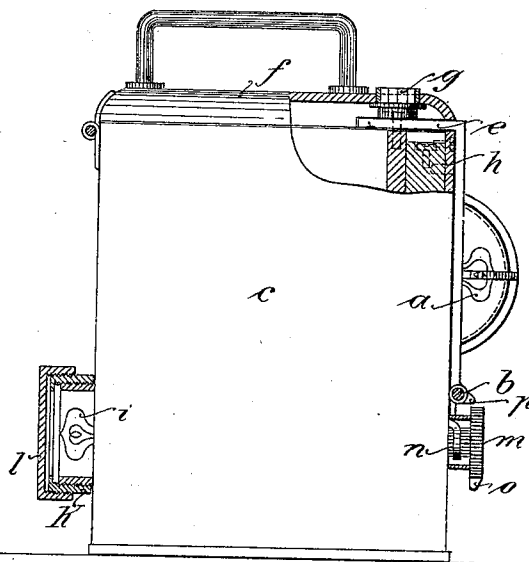


Fig. 3.

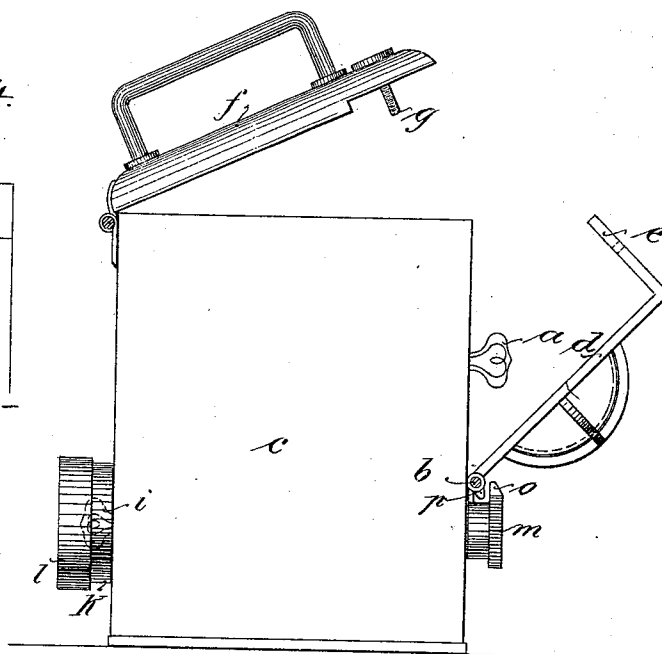
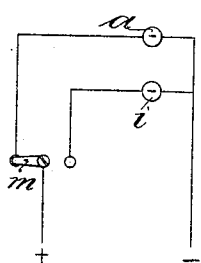


Fig. 4.



Witnesses.

Julius Lutz.

Isaac Muef

Inventor.

C. Francke.

per *mmuf*  
Attorney.

# UNITED STATES PATENT OFFICE.

CARL FRANCKE, OF BERLIN, GERMANY.

## ELECTRICAL SAFETY-LAMP FOR MINERS.

SPECIFICATION forming part of Letters Patent No. 616,779, dated December 27, 1898.

Application filed April 18, 1898. Serial No. 678,043. (No model.)

*To all whom it may concern:*

Be it known that I, CARL FRANCKE, a subject of the King of Prussia, Emperor of Germany, and a resident of 32 Andreasstrasse, Berlin, Germany, have invented certain new and useful Improvements in Electrical Safety-Lamps for Miners, of which the following is a full, clear, and exact specification.

All the attempts which have hitherto been made with the view of introducing electrical safety-lamps into practical use in the mining industry have been frustrated more or less completely by the brevity of the "life" or duration of illuminative effect of the lamps in question, being incandescent lamps. The reason why those lamps are comparatively short-lived is that their incandescent filaments, in order to be absolutely proof against any danger of explosion, must be charged with current not exceeding a predetermined amount, density or amperage, while on the other hand it is upon this amount of current that the strength and resisting force of the filament is dependent, this resisting force being at the same time influenced by the pressure of the current or electromotive force, which in the lamps referred to is limited, and also by the decline in the voltage occurring in the process of discharging the accumulator connected with the lamp. By way of example the average life of an incandescent lamp of that class of three candles' normal illuminating power may be said to attain one hundred hours at the outside, so that laying down the length of each work-day at eight hours and allowing one hour for rolling the wagons in and out and like accessory operations, such a lamp may be expected to last, approximately, eleven days. Assuming, then, that one thousand lamps of this description are regularly in use, the light of one hundred of those lamps will in consequence go out daily during working hours, and as many fresh lamps should be provided to supply the deficiency. This, however, even leaving the added cost of having spare lamps in readiness for such an emergency out of account, is in most cases occurring in actual practice found to be an impossibility.

According to the present invention it is proposed to remedy the drawback stated by providing the miner's lamp with two or more illuminant bodies supplied with current from the same accumulator or storage-battery, one of such bodies being designed to serve as the main light and the other as a reserve or emergency light. The life of a safety-lamp thus fitted with two light-emitting bodies may be determined by computation, as follows: One main light goes out on an average every eleventh day, when the reserve light must come into operation. On that eleventh day it will have to "burn," let us say, for an average space of five hours. When the work-day is over, the main light is provided by the attendant with a fresh globe or bulb and in each case at the beginning of the next work-day is connected to the battery as a "main" light. Seeing, therefore, that each reserve light only comes to be used every eleventh day and even then only for half the time of normal operation of the main light such reserve light will last twenty-two times as long as the main light, with the result that the average life of such a lamp provided with two illuminant bodies will in the hands of the miner be eleven multiplied by twenty-two, equaling two hundred and forty-two days, while, as a matter of course, the provision of any spare lamps is thereby rendered altogether superfluous.

Besides, the arrangement of the improved safety-lamp forming the subject of this invention is such that the lamp cannot be opened during working hours while underground. Accordingly it is not in any gallery or part of the mine that the bulb is renewed. In fact, the miner using the lamp is to be precluded from ever attempting arbitrarily to connect or disconnect the same. What will happen in practice is this. The lamp, with the main light "burning," will be handed to the miner, who subsequently, by means of a switch specially devised for the purpose, need only connect the reserve light to the current-supply when this becomes necessary; but having once done this he will be able to make no further connection either backward or

forward, owing to which provisions it may at any time be readily ascertained whether or not any abuse in the handling of the reserve light has been attempted.

- 5 The safety-lamp may be provided with two illuminant bodies, for example, in various ways, viz:

First. The incandescent lamp may be fitted with two filaments independent of each other, 10 each of which may be switched into a separate circuit. The disadvantage of this arrangement is, however, that the bulb after the extinction of the main filament only retains the reserve filament, so that it becomes unfit for 15 further use for any length of time and has to be exchanged at the completion of the work-day; or

Second. Under a protecting-glass two bulbs may be fitted with separate holders, an arrangement which, while it possesses the characteristics of great simplicity, is attended with the defect that the rays of light from one incandescent lamp are interfered with by the body of the other; or again

25 Third. The safety-lamp receives two illuminant bodies located apart from each other, each being placed under a separate protecting-glass and controlled by a separate switch, or one common switch may serve to operate 30 both.

The form of lamp represented, by way of example, in the accompanying drawings is supposed to be carried out in accordance with paragraph three.

35 In the said drawings, Figure 1 is a front elevation of the improved safety-lamp. Fig. 2 is a sectional side elevation of the same with the lid closed. Fig. 3 is a side elevation of the open lamp, and Fig. 4 is a diagram illustrating the manner in which the two illuminant bodies are connected.

40 *a* is the main lamp, which is protected from external influences by a protecting-cap *d*, hinged at *b* to the case *c* of the lamp. In the cap *d* there is provided a glazed or otherwise protected aperture or window exposing the lamp to view. By means of a flap or clasp *e*, bent at right angles thereto, the said cap engages with the upper edge of the lamp-case *c*, 45 so that by tightening the screw *g*, fitted in the lid *f* and terminating in a square or the like at its outward end, the said cap *d* may be firmly secured in its closed or "locked" position. Owing to the provision of this protecting-cap *d*, capable of being turned or folded 50 down, the globe or bulb *a* of the lamp may whenever required be readily and quickly exchanged. The pole-apertures *h* are formed in the front wall of the lamp and are rendered inaccessible from outside by the cap *d*, placed 55 over them.

60 *i* is the reserve light, which in the form of lamp here shown is located at the back of the lamp. It is surrounded by a glass case *k*, fitted with a protecting-glass, and while not

in use is covered over by a cap or lid *l*, screwed onto its case.

The lamps or lights *a* and *i* are connected in the manner illustrated in Fig. 4 and controlled by the switch *m*, placed below the 70 hinge *b*. The switch is connected with a ratchet *n*, which prevents it from turning rearward, and from its periphery there projects a nose or stop *o*, which in conjunction with another similar stop *p*, provided on the 75 hinge *b*, serves to hinder the lamp, while closed, from being switched on further when the reserve light has once been switched into contact. While the main light is turned on, 80 the stop *o* would occupy, say, the position indicated in Fig. 2, whence by turning the head or button of the switch it may be brought to the position in which it is represented in Fig. 1, thereby completing the connection of the reserve light. The moment this is done, 85 however, the stop *p* on the hinge *b*, against which the stop *o* is now resting, will prevent the switch *m* from being turned any further until the lamp is opened and the stop *p* moved out of engagement with the stop *o* by turning 90 down the protective cap *d*, as illustrated in Fig. 3. Owing to this arrangement the miner is allowed to make use of the reserve-light connection only once, while any possible attempt on his part to tamper with or 95 abuse the facilities afforded by such reserve light is effectually checked.

What I claim, and desire to secure by Letters Patent, is—

1. In a lamp, the combination of a main 100 and an auxiliary burner, a switch adapted to throw the auxiliary burner into operation upon the failure of the main burner, a cap mounted to swing and to inclose the main burner and having a stop thereon, the switch 105 also having a stop thereon adapted to engage the stop of the cap when the cap is in closed position, and a pawl-and-ratchet device co-operating with the switch to prevent the return thereof. 110

2. A lamp having a main and an auxiliary burner, a cap mounted to swing and to inclose one of said burners, and a switch controlling the circuits of said burners and having a stop-lug coacting with the cap to prevent the further movement of the switch after 115 the switch has been closed, substantially as described.

3. The combination with a casing, of a cap mounted to swing thereon, and a switch located adjacent to the cap, the switch and cap having coacting stop-lugs by which to prevent the movement of the switch when the switch is in a certain position, substantially 120 as described. 125

4. In a lamp, the combination of a main and an auxiliary burner, a switch controlling the circuit of said burners to throw the auxiliary burner into action upon failure of the main burner, and a cap covering one of said 130

burners, the cap and switch being juxtaposed to prevent the further movement of the switch after it has been closed.

5 5. A lamp having a main and an auxiliary burner, a switch controlling said burners so that the auxiliary burner may be thrown into action upon failure of the main burner, the switch having a stop-lug thereon, and a hinged

cap for the main burner, the cap also having a stop-lug and being juxtaposed to the switch to prevent the further movement of the switch after it has been closed. 10

CARL FRANCKE.

Witnesses:

C. H. DAY,

HENRY HASPER.