

No. 629,291.

Patented July 18, 1899.

F. G. HALL, JR. & I. E. BURDICK.

ELECTRIC ARC LAMP.

(Application filed Oct. 6, 1898.)

(No Model.)

Fig. 1.

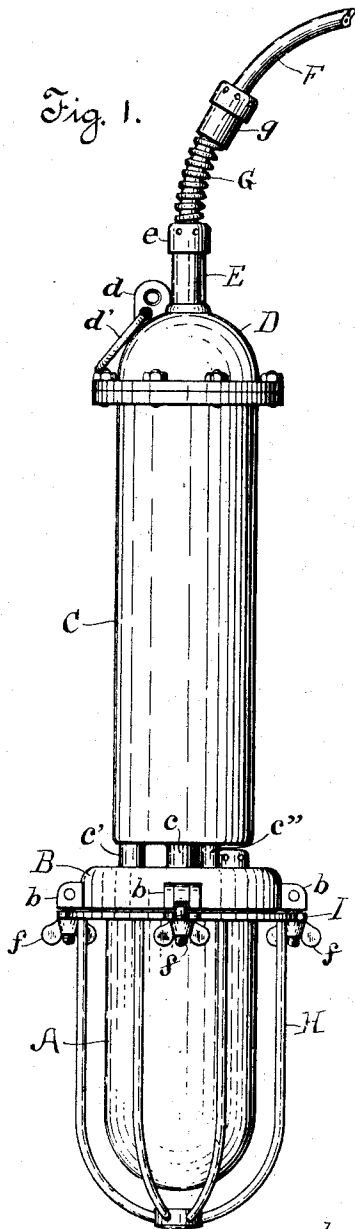


Fig. 2.

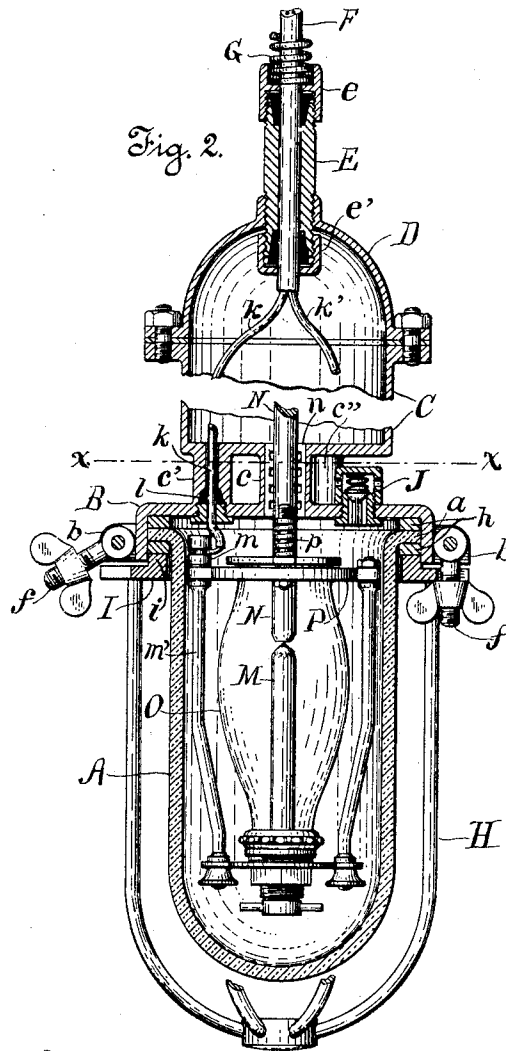
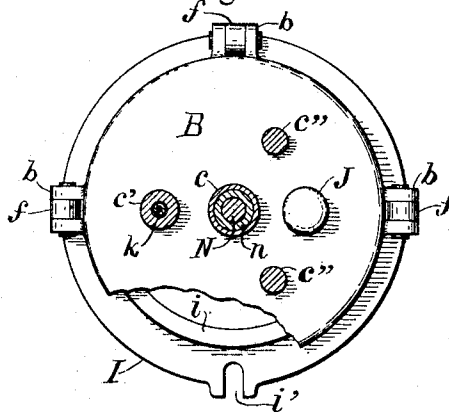


Fig. 3.



WITNESSES:

A. S. Diven

C. Tracey Stagg

INVENTORS

Francis G. Hall Jr.
and Irving E. Burdick
 BY *Eugene Diven*
 ATTORNEY

UNITED STATES PATENT OFFICE.

FRANCIS G. HALL, JR., AND IRVING E. BURDICK, OF DANSVILLE, NEW YORK.

ELECTRIC-ARC LAMP.

SPECIFICATION forming part of Letters Patent No. 629,291, dated July 18, 1899.

Application filed October 6, 1898. Serial No. 692,799. (No model.)

To all whom it may concern:

Be it known that we, FRANCIS G. HALL, JR., and IRVING E. BURDICK, citizens of the United States, residing at Dansville, in the county of Livingston and State of New York, have invented certain new and useful Improvements in Electric-Arc Lamps, of which the following is a specification.

Our invention relates to improvements in arc-lamps, whereby they shall be adapted more particularly for submarine lighting; and the object of our improvements is to provide such a lamp with an inclosing case wherein an arc of high candle-power may be formed under water at any desirable depth and for any desirable and reasonable continuous period of time.

Heretofore electric lamps have been in use for submarine purposes; but for the most part they have been of the incandescent type, and all, so far we are aware, have been found unsuited for practical and efficient purposes on account of their low candle-power. By our improvements we are enabled to use an arc-lamp of two thousand five hundred candle-power and over.

We attain the object in view by the construction of the lamp-case and other details as illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation of an arc-lamp embodying our improvements; Fig. 2, a vertical section of the same on a larger scale; and Fig. 3, a transverse section of Fig. 2 on the line *xx*, looking downward.

Similar letters refer to similar parts throughout the several views.

A represents the outer inclosing globe, of glass, which is made of suitable thickness to withstand heavy pressures and shocks.

B is a cap into which the globe A is fitted with a water-tight joint, globe A and cap B forming together what we will hereinafter term the "combustion-chamber" of the lamp. Above the cap B and integrally united thereto by means of the studs or columns *c c' c'' c'''* is a chamber C, which contains the regulating or feed mechanism for the upper carbon and which we will hereinafter term the "mechanism-chamber." The chamber C is provided with a cap D, bolted or otherwise fastened thereto with a water-tight joint. The

cap D is provided with an ear *d*, to which is secured the chain or cable by which the lamp is lowered into the water and held in position therein, a ring *d'* being also provided for manipulating the lamp. At the top of the cap D is an extension E, through which the cable F, carrying the conduit-wires, enters the mechanism chamber. This extension E is provided at the top with a stuffing-box *e* of any desired construction, whereby a water-tight joint is made around the cable, and for safety we may also provide a second stuffing-box *e'* where the cable passes into the interior of the chamber. In the cap of the stuffing-box is fastened a coil of spring-wire G, which passes up for a suitable distance around the cable and terminates in a collar *g*, which is clamped to the cable F by means of a stuffing-box constructed similar to *e* in Fig. 2. This coiled spring G protects the cable where it enters the extension E and prevents it from being bent abruptly, so as to break the cable.

Chamber C may be made of any form and dimensions suitable to receive any desirable feed mechanism for the upper carbon, this mechanism and other details of the lamp forming no part of our present invention. After entering the mechanism-chamber through the cap D the wires of the cable F are separated, the one, *k*, being connected to the solenoid and thence to the upper carbon and the other, *k'*, being carried down alongside the mechanism and passed through a hole in the stud *c'*, whence it is carried to the binding-post *m*, from which the current is conducted down the post *m'* to the lower carbon M. This lower carbon and the inner or arc-inclosing globe O are supported from the plate P, which in turn is fastened, by means of studs *p*, (only one of which appears,) to the cap B. The manner of supporting and attaching the globe O and lower carbon herein shown, as already stated, are old and do not form part of our invention, the lamp with which we have experimented and for which the case herein illustrated was designed being one manufactured by the General Electric Company, of Schenectady, New York. The upper carbon N passes down through a central stud *c*, which is provided with a bushing *n*, of lava or other material which will be proof against the heat and gases of combustion which are generated

within the combustion-chamber when the lamp is in operation. This bushing *n* is provided with a number of transverse annular grooves which form a gas packing, as will appear later on. The studs *c' c''* are solid and are designed solely to form strengthening-supports between the cap B and the case C, and more or less of them may be used. A check-valve J of any suitable construction leads out from the cap B, any excessive gas-pressure within the combustion-chamber being relieved through said valve. The globe A is flanged at the top where it enters the cap B and is held therein by means of the ring I, the gland *i* on which is adapted to enter the cap B and compress the flange of the globe between the gaskets *h*. The ring I is secured in place and the gland *i* forced up within the cap by means of the thumb-screws *f*, which are pivoted in lugs *b*, cast on the periphery of the cap B and adapted to swing in and out of slots *i'* in the ring I. We have shown four of these thumb-screws; but any desirable number may be used, whereby a tight joint may be secured. Other clamping devices may also be used to accomplish this end. A heavy wire guard or cage H depends from the ring I to protect the globe A. To trim the lamp, it is only required to remove the ring I and globe A, after which both carbons may be removed and fresh ones substituted, the upper carbon being passed up through bushing *n* into its holder in the feed mechanism.

In a lamp of this nature it is quite essential for the best results that the gases of consumption shall be excluded from the mechanism-chamber and also that said mechanism-chamber shall be kept at a low temperature. This we attain by separating the mechanism and combustion chambers in the manner shown. The water or air surrounding the lamp will circulate across the top of the cap B and around the studs *c c' c'' c'''*, cooling the space between said chambers and preventing the heat imparted to the cap B from being conducted to the chamber C. The walls of this chamber C may also be corrugated to provide further cooling-surface for said chamber. In order to prevent the heated gases from rising into the chamber C, we provide a suitable stuffing-box *l* around the wire *k*, which stuffing-box may be packed with asbestos or other suitable packing, and around the carbon N we provide the grooved bushing *n*, already described, which is of a diameter just sufficient to allow the carbon to pass freely therethrough. As the gases rise around the carbon they will enter the annular grooves in the bushing, and by reason of the surrounding cool fluid, whether air or water, will become condensed therein and provide a packing around the carbon, which will prevent the escape of gas into the mechanism-chamber C. When the lamp is burned in air, the excess of heated gases of combustion and the internal pressure attendant thereon will be relieved through the check-valve J, and also

where the lamp is used under water at shallow depths. Where the lamp is immersed to greater depths, the pressure within the lamp will become equalized by the pressure of the water outside, and the lamp will be at equilibrium inside and out. We have found that a lamp constructed upon these principles will burn under water for any desirable period and that an arc of very high candle-power may be used, thus lighting up a large area and enabling divers and other marine investigators to carry on their work with much greater facility than hitherto. Although an arc-lamp inclosed in this manner is especially designed and adapted for submarine lighting, it may also be used in the atmosphere with equally good results.

While we have hereinabove described our preferred form and construction of the lamp-case and one that we believe will give the best results, we do not wish to be confined to the exact details as set forth, since deviations therefrom may be made without departing from the spirit of our invention—as, for instance, the circulating-space between the mechanism and combustion chambers might be dispensed with and the cap B united directly to chamber C; also, other forms of water-tight couplings between cap B and globe A may be employed, and the guard H may be attached to the cap B instead of to the packing-ring I.

We are aware that arc-lamps of the inclosed type have been made heretofore with a practically air-tight inclosing globe and a relief-valve; but such lamps have not, so far as we are aware, been made adaptable for submarine lighting.

Having thus described our improvements, what we claim as our invention, and desire to secure by Letters Patent, is—

1. A two-part inclosing case for arc-lamps comprising a combustion-chamber and a mechanism-chamber, said chambers being separated and spaced apart the one from the other by studs or columns, whereby a circulation of the surrounding fluid is effected between said chambers, a passage for the upper carbon through one of the studs, a passage for a current-conductor through another of the studs, and gas-excluding packings in said passages.

2. The combination, with an arc-lamp, of a water-tight inclosing case or chamber for the lamp mechanism, a passage therein provided with a stuffing-box through which the cable containing the current-conductors enters said chamber, a combustion-chamber comprising a metallic cap and glass globe depending from the mechanism-chamber and spaced apart therefrom, a water-tight coupling between said globe and cap, water-tight connections between the two chambers through which the upper carbon and a current-conductor pass, and gas-excluding packings around said carbon and conductor.

3. In an inclosing case for arc-lamps, the

combination of a flanged globe forming a part of said case around the arc, a cap or socket piece to receive the flange of the globe, packing-gaskets on each side of said flange, a ring
5 provided with a gland to compress said gaskets, clamping devices for securing said ring in place, and a protective cage depending from the ring and surrounding the globe.

4. In combination with an arc-lamp, a water-tight and pressure-proof inclosing case wherein an arc of high candle-power may be produced at considerable depths under water, said case comprising a glass globe inclosing the arc, a metallic case inclosing and sup-
10

porting the lamp mechanism, a water-tight 15 coupling between the two, also a water-tight passage between the two for the upper carbon and a current-conductor to the lower carbon, and a water-tight packing-box through which the current-conductors enter the mech- 20 anism-chamber.

In testimony whereof we have affixed our signatures in presence of two witnesses.

FRANCIS G. HALL, JR.

IRVING E. BURDICK.

Witnesses:

JAS. E. O'CONNOR,

NELLIE J. KANE.