(No Model.)

F. CLOWES & B. REDWOOD.

APPARATUS FOR ESTIMATING THE QUANTITY OF COMBUSTIBLE GAS OR VAPOR PRESENT IN AIR.

No. 502,173. Patented July 25, 1893.

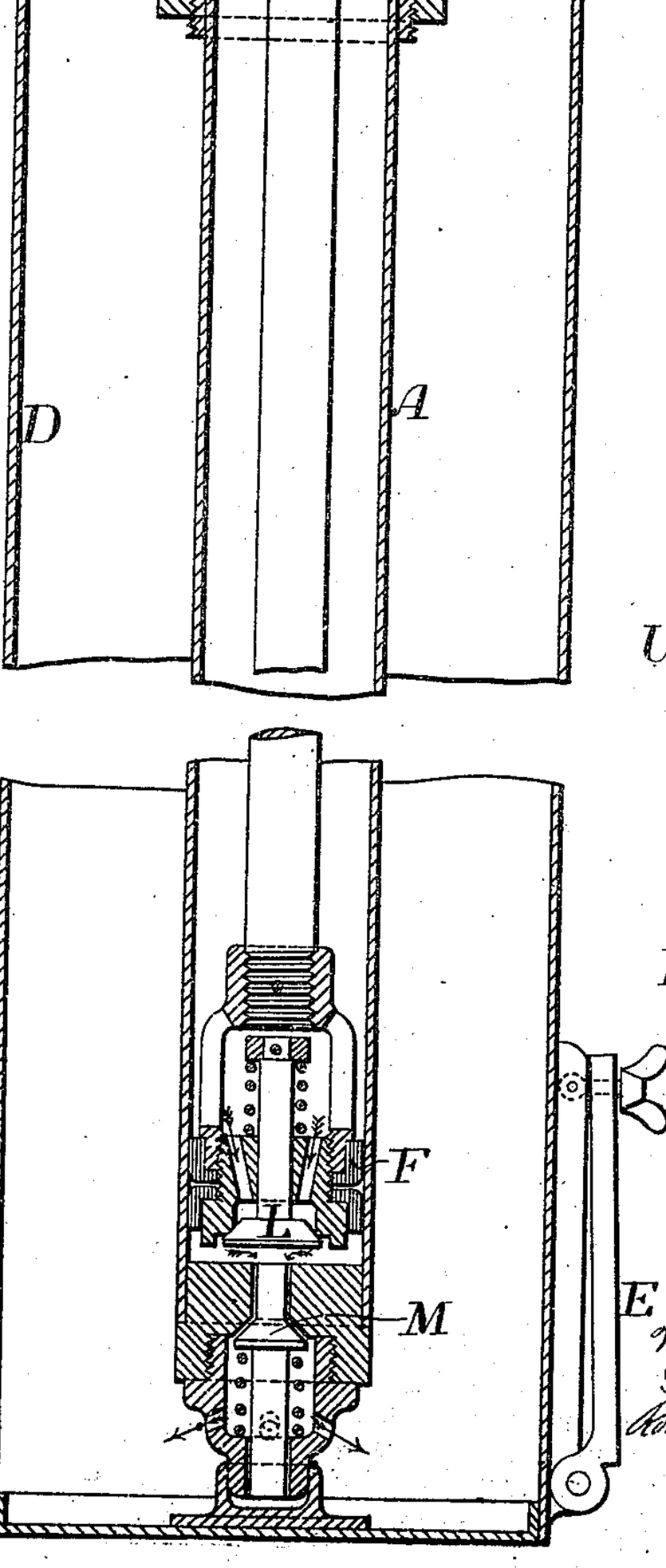

Fig. 2.

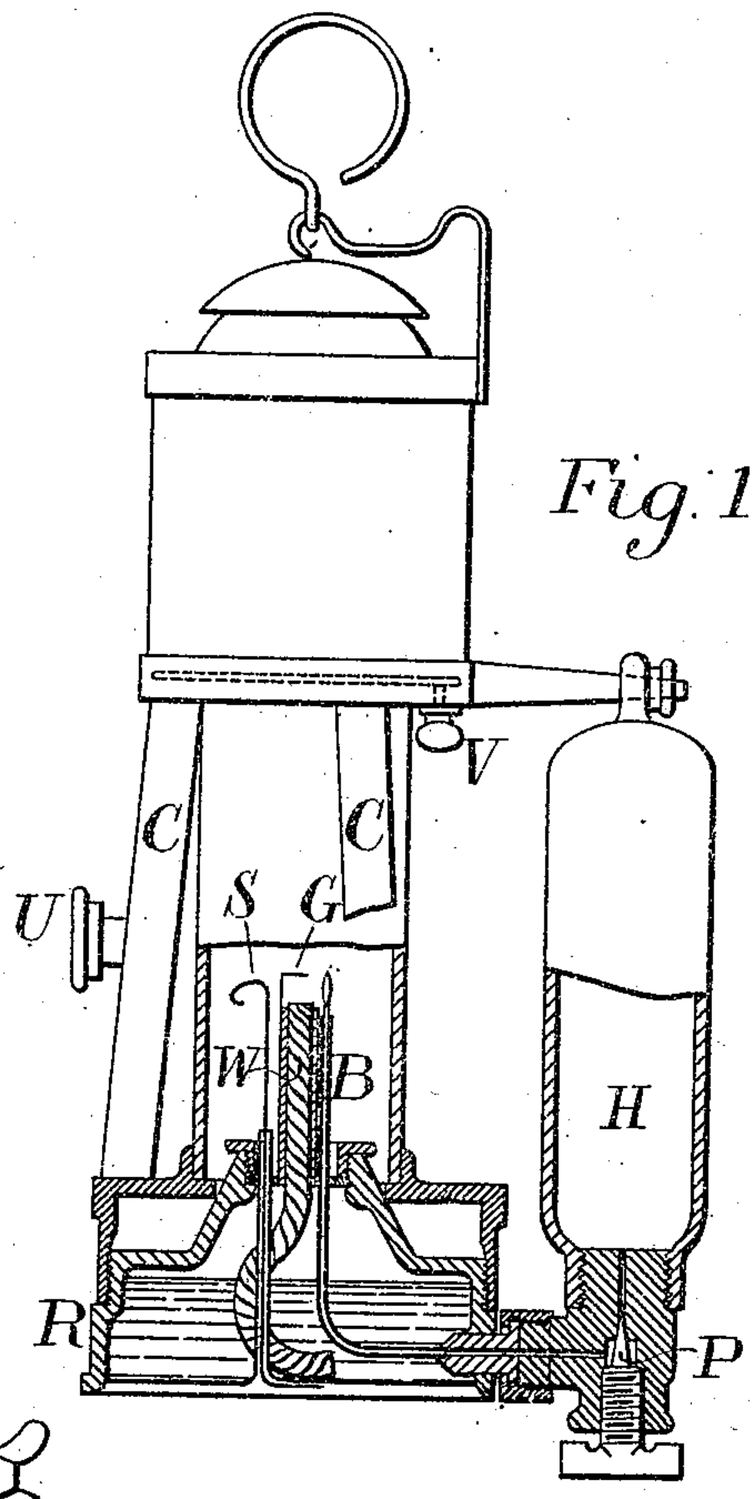

Fig. 1.

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UNITED STATES PATENT OFFICE.

FRANK CLOWES, OF NOTTINGHAM, AND BOVERTON REDWOOD, OF LONDON, ASSIGNORS OF A PART TO SIDNEY WATERS, OF LONDON, ENGLAND.

APPARATUS FOR ESTIMATING THE QUANTITY OF COMBUSTIBLE GAS OR VAPOR PRESENT IN AIR.

SPECIFICATION forming part of Letters Patent No. 502,173, dated July 25, 1893.

Application filed February 6, 1893. Serial No. 461,156. (No model.) Patented in England January 4, 1893, No. 187; in France January 4, 1893, No. 226,916, and in Belgium January 4, 1893, No. 102,867.

To all whom it may concern:

Be it known that we, FRANK CLOWES, residing at Waterloo Crescent, Nottingham, county of Notts, and BOVERTON REDWOOD, residing at 4 Bishopsgate Street Within, London, England, have invented a new and useful Apparatus for Estimating the Quantity of Combustible Gas or Vapor Present in Air, (for which I have obtained Letters Patent in Great Britain, No. 187, dated January 4, 1893; in France, No. 226,916, dated January 4, 1893, and in Belgium, No. 102,867, dated January 4, 1893, of which the following is a specification.)

Our invention relates to means of estimating the quantity of combustible gas or vapor in the atmosphere of a mine or in petroleum vessels or receptacles, so as to ascertain whether such atmosphere can be safely entered by a light or by heated metal such, for instance, as rivets employed in repairs.

The method of testing is founded on the known physical fact that a hydrogen flame supplied with air containing combustible gas or vapor presents above it a bluish grey colored cap of a height depending on the quantity of combustible gas present in the air and on the size of the hydrogen flame. We therefore regulate the hydrogen flame to some standard height, and by measuring the height of the cap produced above it, we ascertain approximately the percentage of combustible gas or vapor contaminating the air which supplies the flame. For testing in this manner, we employ apparatus consisting of two parts, a safety lamp provided with a hydrogen reservoir and burner, with means of taking the air supply for the flame either from the atmosphere surrounding the lamp or from the other part of our apparatus, a receptacle into which some of the air to be tested for contamination has been compressed by a pump inclosed in the receptacle.

Figure 1 of the accompanying drawings is a vertical section, partly in elevation, of the safety lamp adapted for testing, and Fig. 2 is a vertical section of the pump and receptacle for the air to be tested.

The miner's safety lamp shown in Fig. 1 is in its general character of known construction, with all the usual provisions for safety, and also with modifications for testing purposes which we shall now describe. Close beside the wick W is fixed a small tube B which extends down through the oil reservoir R and out at the side where it is connected to a reservoir H of compressed hydrogen attached to the side of the lamp. In the passage from the reservoir H to the tube B there is a screw plug P by which the flow of hydrogen can be delicately adjusted. The ordinary air supply to the lamp is from the upper part down through hollow columns C. We provide a valve V by partly turning which the upper mouths of these columns can be closed and then on unscrewing a cap U covering a lateral opening into one of the columns, and connecting to this a tube, which may be flexible, we can admit a supply of air from a vessel containing it.

In testing for inflammable gas or vapor in the atmosphere of a mine or other space, or in a vessel connected to the lamp at U we proceed as follows: Having, in the first place, kindled the wick in the usual way, in a safe place, and closed the lamp, we partly turn the screw plug P so as to allow hydrogen to pass to the tube B, at the top of which it is kindled by the wick flame, which we then extinguish in the usual way by drawing down the wick by the bent wire or pricker S. We then, by means of the plug P, adjust the hydrogen flame to a standard height which is determined by the bent wire G forming a gage. Having observed the cap on the hydrogen flame, we rekindle the wick from this flame, which we then extinguish by screwing up the plug P.

For collecting compressed samples of air, contaminated by admixture of combustible gas or vapor, we employ the compressing pump and receptacle shown in Fig. 2.

A is the pump barrel situated centrally within a strong cylindrical vessel D which has hinged pedal arms E that can be folded down to the ground so that the operator can place his feet on them, thus holding the apparatus down while he works the pump. As the piston F is drawn up by the handle J the air to be compressed enters by the nozzle K to which a flexible tube can be connected, and

descends the barrel A, passes through the piston F, and past the suction valve L into the space of the barrel below the piston; then, during the down stroke, the air is forced past the discharge valve M into the annular space surrounding A. When the apparatus is not in use the pedal arms E are turned up and held by nuts *e*.

Having thus described the nature of this invention and the best means we know of carrying the same into practical effect, we claim—

1. For estimating the quantity of combustible gas or vapor present in air, a miner's safety lamp provided with a hydrogen burner and gage wire close to the oil wick, and a reservoir of compressed hydrogen with regulating valve, substantially as described.

2. For estimating the quantity of combustible gas or vapor present in air, a miner's safety lamp provided with a hydrogen burner and gage wire close to the oil wick, a reservoir of compressed hydrogen with regulating valve, a valve to close the ordinary air supply, and a capped nozzle for connecting to a tube for separate air supply, substantially as described.

In testimony whereof we have signed our names to this specification, in the presence of two subscribing witnesses, this 12th day of January, A. D. 1893.

FRANK CLOWES.
BOVERTON REDWOOD.

Witnesses to the signature of Frank Clowes:
PHILIP H. STEVENSON,
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Both of University College, Nottingham.

Witnesses to the signature of Boverton Redwood:
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Both of No. 17 Gracechurch Street, London, E. C.