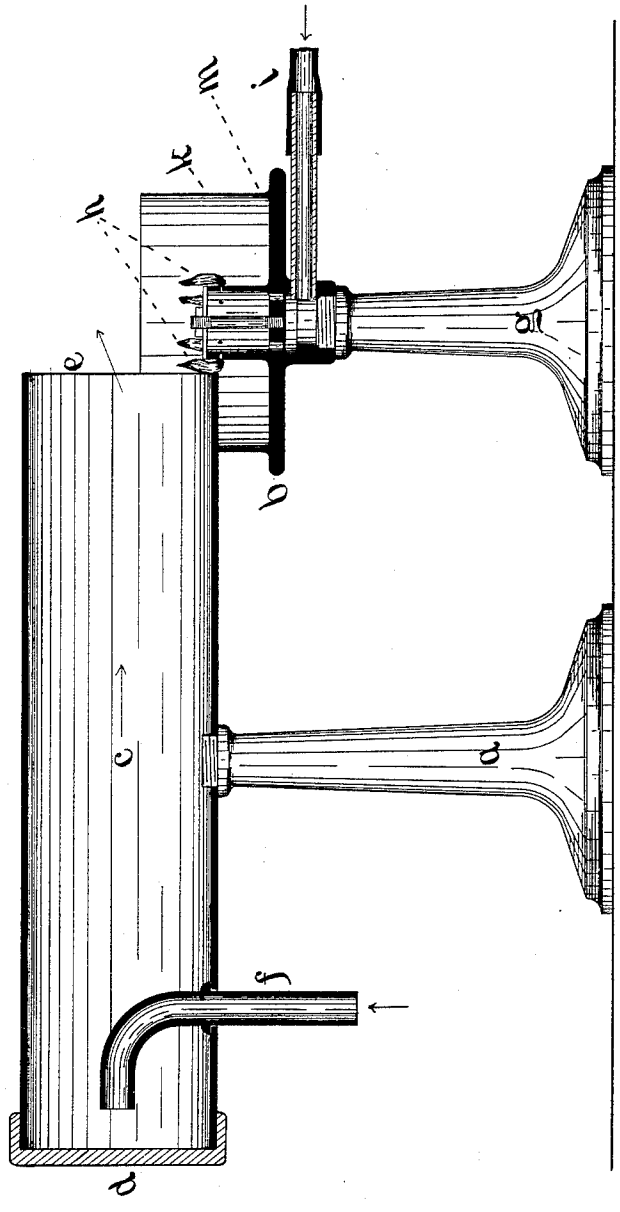
(No Model.)

T. SHAW.

APPARATUS FOR TESTING MINE GASES.

No. 394,215. Patented Dec. 11, 1888.



Witnesses,
J. Logan Fitts.
Wm. Garwood.

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UNITED STATES PATENT OFFICE.

THOMAS SHAW, OF PHILADELPHIA, PENNSYLVANIA.

APPARATUS FOR TESTING MINE-GASES.

SPECIFICATION forming part of Letters Patent No. 394,215, dated December 11, 1888.

Application filed February 6, 1888. Serial No. 263,069. (No model.)

To all whom it may concern:

Be it known that I, THOMAS SHAW, a citizen of the United States, and a resident of the city and county of Philadelphia, and State of Pennsylvania, have invented certain new and useful Improvements in Testing Mine-Gases, of which the following is a specification.

The object of this invention is to detect dangerous gases or mixtures of air and gas or other material—as, for instance, gases or mixtures passing from mines, known as "choke-damp," (CO_2), and "white-damp," (CO,) or "fire-damp," or the air-mixtures passing from flour-mills and woolen-mills; and my invention consists in an apparatus, fully set forth hereinafter, which, when supplied with portions of such gases or mixtures, will at once indicate their character.

One form in which my apparatus may be embodied is illustrated in a longitudinal sectional elevation in the accompanying drawings.

My improved apparatus consists, essentially, of a cylinder or tube closed at one end and open at the other, and communicating near the closed end with a pipe for conducting the gases or mixtures to be tested, and arranged preferably in a horizontal plane, and a flame arranged adjacent to the mouth of the tube, so as to be met by the gases passing from said mouth. These features may be embodied in apparatus of different forms; but, as shown in the drawings, the testing-tube is in the form of a plain cylinder, *c*, closed at the rear end by a cap, *d*, and supplied with the gases to be tested by a tube, *f*, passing through the side of the cylinder and curved inward toward the closed end, so as to avoid projecting the said gases in a stream forward. The tube *c* is supported by a standard, *a*, and another standard, *g*, supports a burner, *h*, in position opposite the open mouth of the tube and adjacent to the lower portion thereof. The burner *h* is surrounded by a shield or guard, *k*, to prevent the flame from being deflected by currents of air, and the said burner, as shown, consists of a hollow shell with lateral perforations, through which the gases pass, the gases being supplied to the interior of the shell through a supply-pipe, *i*, so that said burner shall constitute a heater.

In operating the device for the purpose of testing gases or air-mixtures, the gas or mixture to be tested is passed through the pipe *f* into the gun *c*, being driven by a blower, pump, or in any suitable way, but at a very moderate speed, so as to create a very slow current flowing from the closed end toward the mouth of the cylinder and gradually expelling the air therefrom. As the gas or mixture reaches the mouth of the cylinder it contacts with the flame, and the results which ensue from such contact will indicate the character or condition of the gas or mixture. By the use of a burner constructed in any way to constitute a heater the mixture is raised in temperature as it passes over the heater sufficiently to cause combustion and ignition whenever the gases are in the least possible degree ignitible, and when they would not ignite if they had not been preliminarily raised in temperature by the heater, so that the character of a very low per cent. of gas is visibly indicated when otherwise it could not be ascertained. When the proportions of gas and air in the mixture are such as to constitute an explosive mixture, the combustion will take place in the cylinder, the force of the detonations or rapidity of combustion indicating the character of the explosive or non-explosive mixtures, and, as the end of the cylinder is not contracted and the gases can escape freely, explosive mixtures can be ignited without danger or disagreeable results. Intermediate mixtures will be indicated by floating or rolling flames, accompanied or not by slight detonations. The indications of white-damp are similar to those of fire-damp, being a cloud of gas in a state of ignition over the heater, while choke-damp flowing over the heater fills the space within the shield *k* and extinguishes the flame entirely when the gas is in sufficient excess to be dangerous.

In the case of air charged with very fine material in a state of suspension and liable to produce injurious results from its ignition—as the air-mixtures from flour-mills, woolen-mills, and from mines, where there are fine particles of carbon in suspension—the dangerous character of the mixture will be indicated by the ignition of the material in suspension and the flame produced thereby.

While I have shown a heater consisting of a perforated shell, any other suitable form of

heater may be employed presenting an extended flame-surface which will both heat and ignite the gases passing over the same. The shield *k*, while desirable in some cases, is not always essential and may be dispensed with, and the gases may be conducted to the gun or cylinder *c* in any suitable manner, so as to be evenly distributed within the rear portion of the same and flow outward in a slow continuous stream; and, if desired, the said gun or cylinder may be placed vertically, so that the gases will flow downward. I prefer, however, to place the same horizontally, as it permits a better inspection of the character of the flame within the cylinder.

While I prefer to use a burner in the form of a heater when the gases or mixtures are likely to be of such a character as to require an increase in temperature in order to facilitate the detection of its dangerous qualities, a simple burner for producing a flame at the mouth of the cylinder may be used in other cases.

In the device described in Letters Patent No. 359,102, granted to me March 8, 1887, the cylinder, instead of being uncovered at one end, is covered with only a small perforation or igniting-opening. In such construction it is not possible to secure the results obtained by the use of a cylinder with the end wholly uncovered, so as to expose the whole interior, and permit the burning of the gases at the top of the cylinder and within the same to be seen.

Without limiting myself to the precise construction and arrangement of the parts herein set forth, I claim—

1. The within-described apparatus for testing gases and air-mixtures, the same consisting of a cylinder uncovered at one end and communicating at the other end with a pipe for supplying the mixture to be tested, and a burner adjacent to the open end of the cylinder, substantially as set forth.

2. The combination, in an apparatus for testing gaseous mixtures, of a cylinder closed at one end and communicating with a pipe for supplying the mixture to be tested, and uncovered at the other end, and a burner arranged adjacent to the open end of the cylinder, substantially as set forth.

3. The combination of the cylinder closed at one end and uncovered at the other, a supply-pipe, a burner, and a shield surrounding the burner, substantially as and for the purpose specified.

4. The combination, with the cylinder uncovered at one end and closed at the other, and with a burner adjacent to the open end, of a supply-pipe extending into the cylinder, and constructed and arranged to distribute the gas uniformly within the latter, substantially as set forth.

5. The combination of a cylinder closed at one end and uncovered at the other, and arranged horizontally, a supply-pipe communicating with the cylinder near the closed end, and a burner arranged opposite the open end and adjacent to the lower part of the cylinder, substantially as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

THOMAS SHAW.

Witnesses:
J. LOGAN FITTS,
WM. GARWOOD.