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S. ROGERS.

BLASTING APPARATUS.

APPLICATION FILED MAR. 19, 1904.

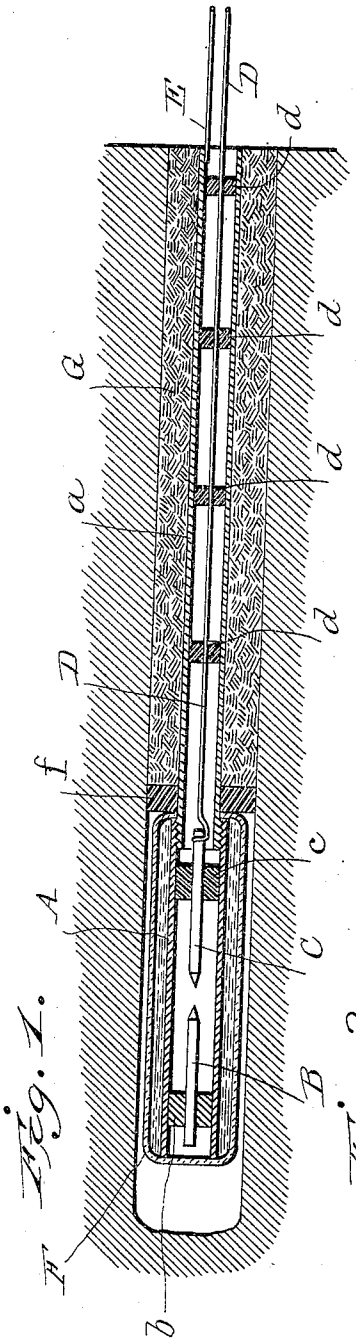


Fig. 1.

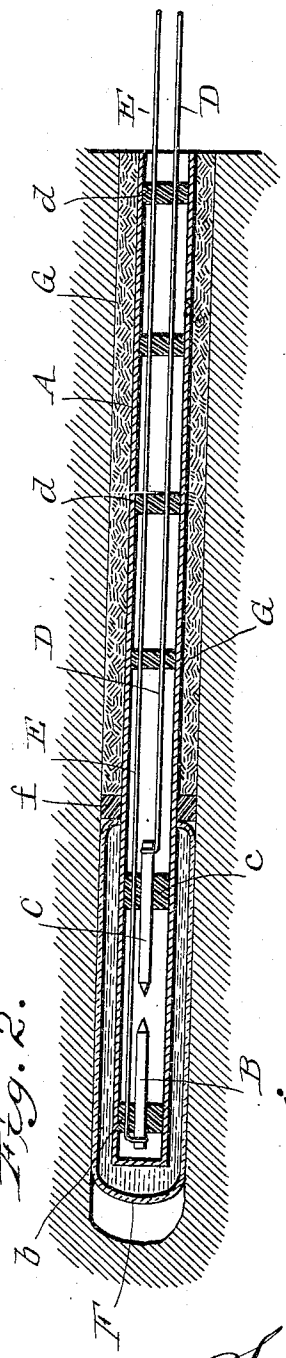


Fig. 2.

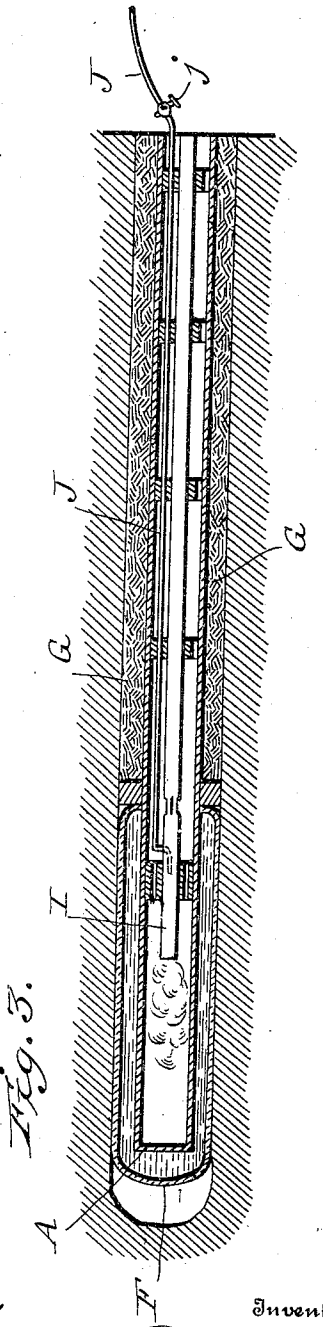


Fig. 3.

Witnesses

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No. 781,619. Patented January 31, 1905.

UNITED STATES PATENT OFFICE.

SAMUEL ROGERS, OF ANNISTON, ALABAMA, ASSIGNOR OF ONE-HALF TO ARTHUR ROGERS, OF BARNESVILLE, OHIO.

BLASTING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 781,619, dated January 31, 1905.

Application filed March 19, 1904. Serial No. 199,001.

To all whom it may concern:

Be it known that I, SAMUEL ROGERS, of Anniston, in the county of Calhoun and State of Alabama, have invented certain new and useful Improvements in Blasting Apparatus; and I hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form part of this specification.

This invention is an improved apparatus for blasting; and its object is to provide a simple and effective means for breaking down rocky strata in mines, quarries, and other places without the dangers attendant upon the use of high power explosives, so that the disruption will be effected by a gradual increase in pressure of a slowly-expanding medium instead of by instantaneous explosives, such as are ordinarily employed, thus particularly adapting the invention for use in quarrying or excavating in cities. The invention furthermore prevents the formation of noxious poisonous gases, thus rendering it particularly useful in mines and subterraneous work.

The invention consists in the novel apparatus hereinafter claimed, and it will be sufficiently understood from the examples of the apparatus illustrated in the drawings, which I will now describe in detail.

In the drawings, Figure 1 is a longitudinal section through an electrically-operated blasting apparatus which I now think the preferred form located within a drill-hole and ready to operate. Fig. 2 is a similar view of another electrical blasting apparatus. Fig. 3 is a similar view showing an oil or gasolene heater blasting apparatus.

Referring to Fig. 1, A represents a metal tube having a carbon or light terminal B attached in its inner end projecting within the tube and in electrical contact therewith through the collar *b*. Opposite terminal B is a similar terminal C, which is supported within but insulated from the tube by an insulating disk or stopple *c*, the terminals being in this instance separated sufficiently to form an arc if a powerful electric current is sent therebetween. The tube A may be long enough to extend the desired depth into a drill-hole; but as these vary in depth I preferably make the tube A short and attach it to a tube-section *a* of a length to locate the part A suitably in a drill-hole. The tube A may be secured to part *a* by threads or in other suitable manner. The terminal C is connected to a conductor D, which extends out of the tubes, suitably insulated therefrom, as at *d*, while the terminal B is likewise electrically connected with a conductor E, which may be connected to terminal B direct, as shown in Fig. 2, or, as in Fig. 1, to the tube A, which itself serves as a conductor. Surrounding the inner end of the tube so as to inclose the terminal B C is a vessel F, which may be of glass or any suitable material that will give way under pressure, and said vessel is filled with water or other medium or substance which will expand powerfully under the influence of heat. A collar *f* is preferably placed on the tubes in front of vessel F to protect the latter from injury and to form a stop for the tamping.

The apparatus thus constructed is used as follows: A hole or bore is drilled in the rock or body to be blasted. Then the tube is inserted in the hole with the vessel F inmost. Then the tube is tamped in the hole with any suitable material, as at G, so as to confine the tube securely therein and prevent escape of gases exterior to the tube. The conductors E F are then connected to a suitable source of electricity, and when the current is turned on an arc is developed between terminals B C, and the resultant heat is transmitted through the walls of the tube to the material in the vessel F, which expands and first breaks the the vessel F and then further expands until the pressure breaks down the rock walls. As this increase of pressure is gradual and slow, (as compared with blasting-powders and higher explosives,) the rock is ruptured and broken down without the dangers incident to the use of the high explosives, and when water is used as the expansive agent no poisonous gases are generated.

I do not restrict myself to any particular form of the vessel F or any particular material therefor. In some cases—for instance,

where the holes bored in rocks are vertical—the vessel F may be dispensed with, as the expansive fluid can be first poured into the hole and the tube afterward inserted therein, the inner end of the bore serving the functions of the vessel; but where the bore is horizontal or upwardly inclined the vessel is needed to retain the liquid in position during the tamping processes.

In Fig. 2 the terminal B is shown as supported on an insulating-collar *b* opposite the terminal C, and the conductor E is directly connected to the terminal B and led out through the tube, but insulated therefrom in the same manner as conductor D. The device shown in Fig. 2 is used in the manner already described.

I do not wish to restrict myself to heating by electrical arcs, as other well-known modes or means of electrical heating may be used. Neither do I wish to restrict myself to electrical heating, and I have indicated an apparatus in Fig. 3 in which oil or gasolene is used as the heating agent. In this instance the electrical conductors and terminals are replaced by a burner I, to which oil or gasolene may be fed through a pipe J, controlled by a valve *j*. The particular construction of the burner, however, is not material to the present invention, provided that it is adapted to apply heat to the inner end of the tube, so as to cause the medium in the vessel F to expand, as above described. The apparatus shown in Fig. 3 is used in the same manner as that shown in Fig. 1.

It will be noted that in the particular embodiments of the invention illustrated in the drawings the heat-generator is protected from direct contact with the expanding medium by the metal walls of the tube, and this I consider an advantage, particularly where electricity is employed as the heating agent.

Having thus described my invention, what I therefore claim as new, and desire to secure by Letters Patent thereon, is—

1. In a blasting apparatus the combination with a metal tube provided with an electric heating-chamber at its inner end, of a closed casing surrounding the same, composed of fragile material, and adapted to contain a liquid which when heated to the proper temperature will disrupt the casing, all constructed and arranged to operate as and for the purpose set forth.

2. In a blasting apparatus, the combination of a tube adapted to be tamped within a bore in the material to be blasted, means for heating the inner end of said tube, and a vessel containing an expansible material surrounding the inner end of the tube and inclosing the heating-chamber.

3. In a blasting apparatus, the combination of a tube adapted to be tamped within a bore in the material to be blasted, electrical means for heating the inner end of said tube and inclosed therein, and a vessel surrounding the inner end of the tube and containing a medium slowly expansible by heat.

4. In a blasting apparatus, the combination of a tube adapted to be tamped within a bore in the material to be blasted, a vessel attached to and inclosing the inner end of said tube, containing water or material expansible by heat, and means for applying heat to the inner end of the tube, and within the said vessel, substantially as described.

5. In a blasting apparatus, the combination of a tube adapted to be tamped within a bore in the material to be blasted, a vessel attached to and inclosing the inner end of said tube, containing a medium slowly expansible by heat, an electric heater within the inner end of the tube and within said vessel, and electrical conductors connected with said heater.

In testimony that I claim the foregoing as my own I affix my signature in presence of two witnesses.

SAMUEL ROGERS.

In presence of—
E. M. THOMAS,
CHAS. D. KLINE.