

June 19, 1923.

1,459,677

H. KRUSKOPF

METHOD OF AND MEANS FOR EXTINGUISHING OR SMOTHERING EXPLOSIONS IN MINES

Filed Dec. 15, 1920

3 Sheets-Sheet 1

Fig. 1.

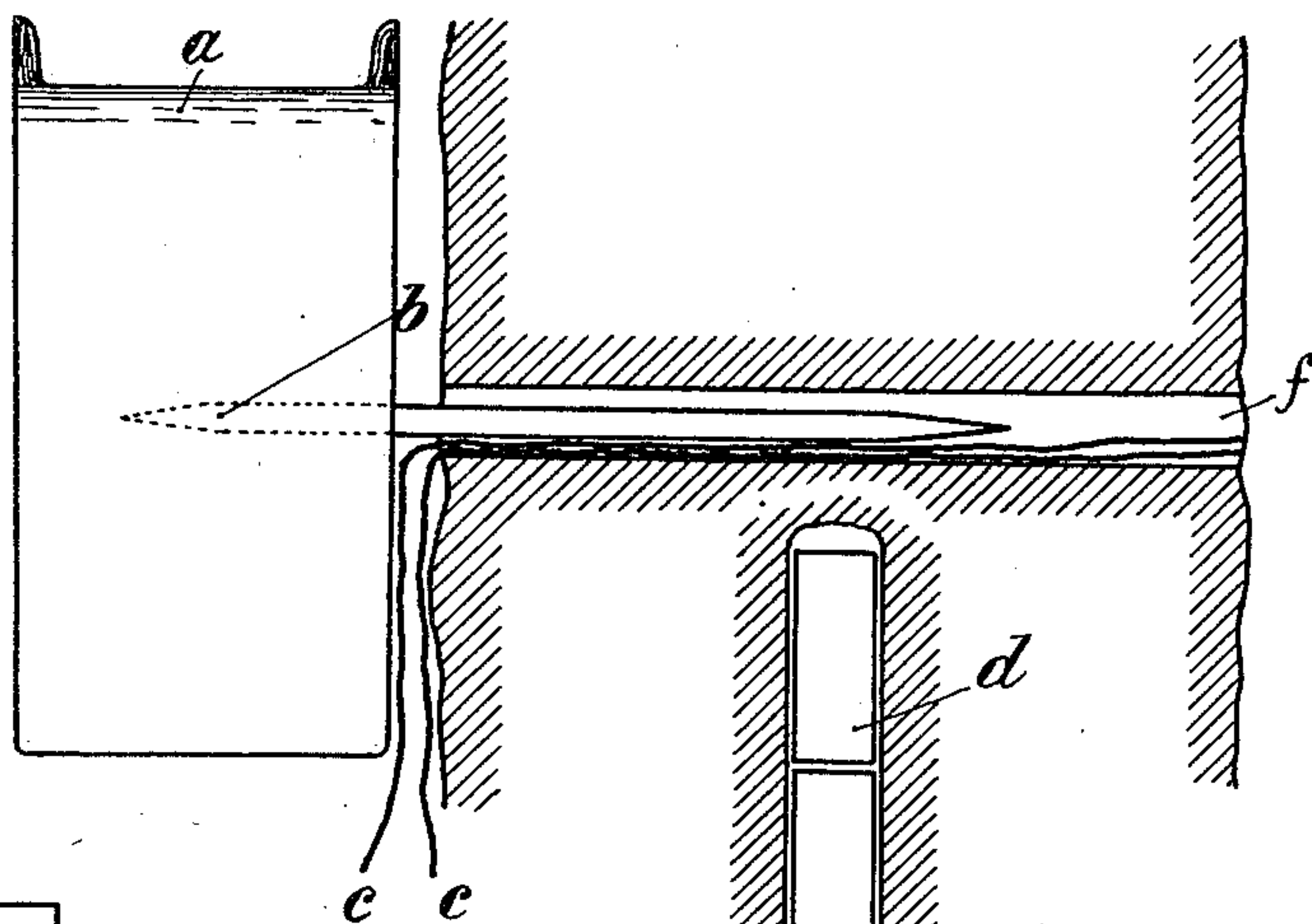


Fig. 2.

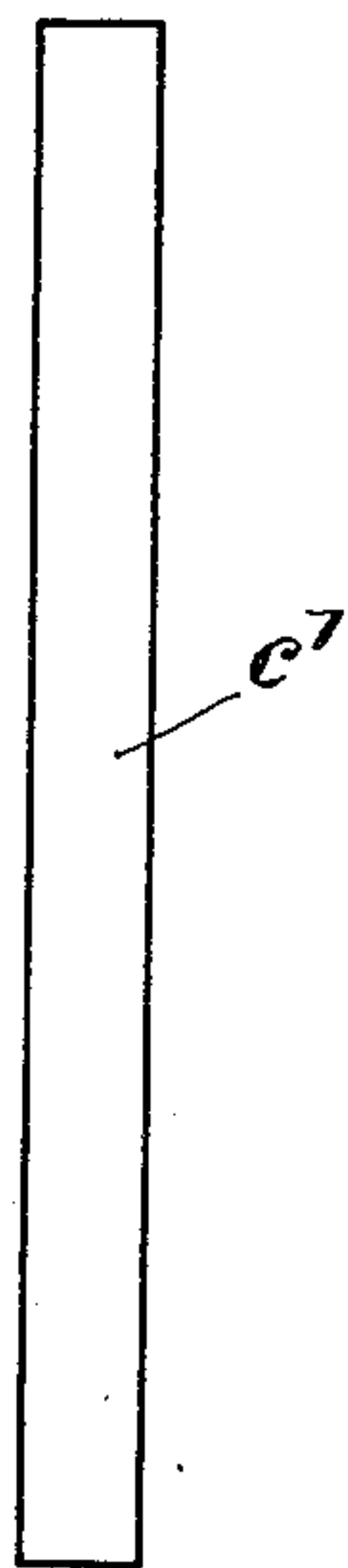
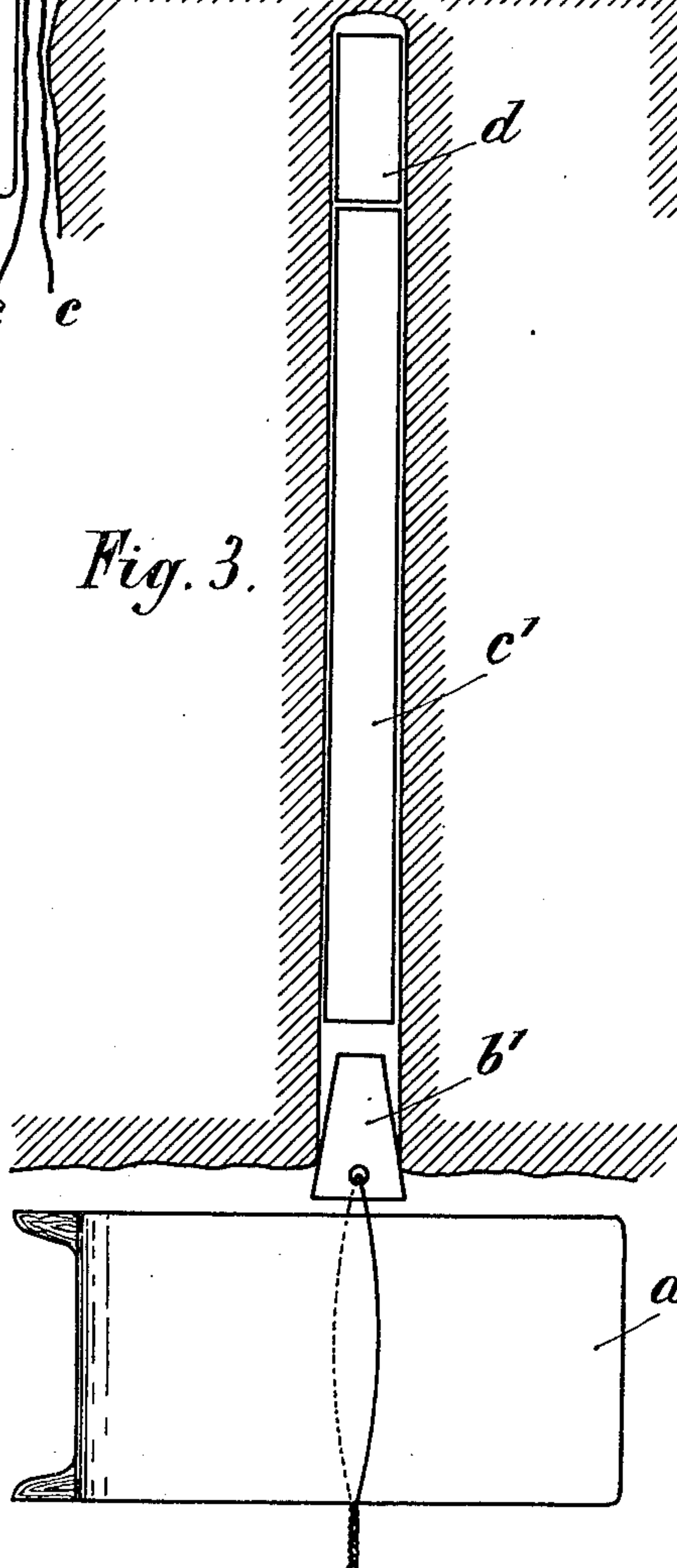


Fig. 3.



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Fig. 4.

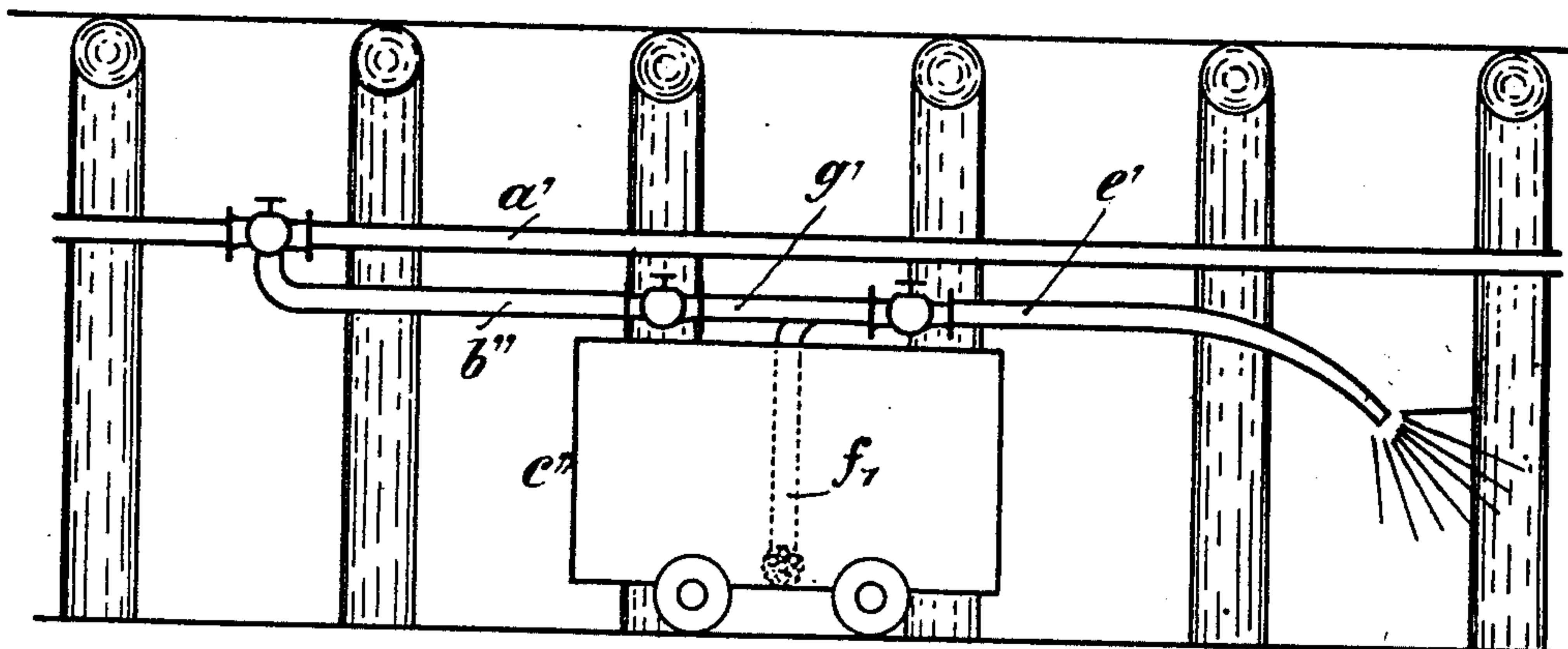
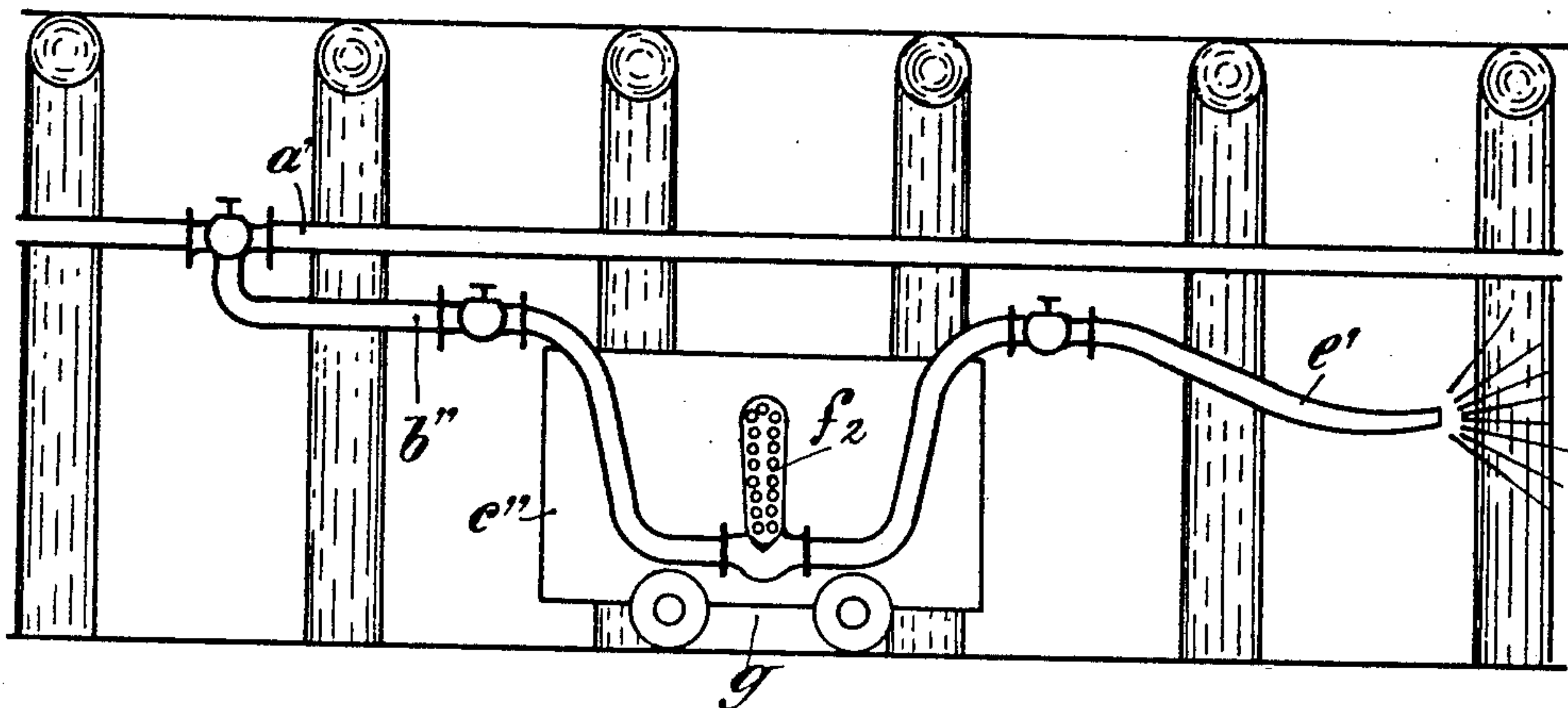


Fig. 5.



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Fig. 6.

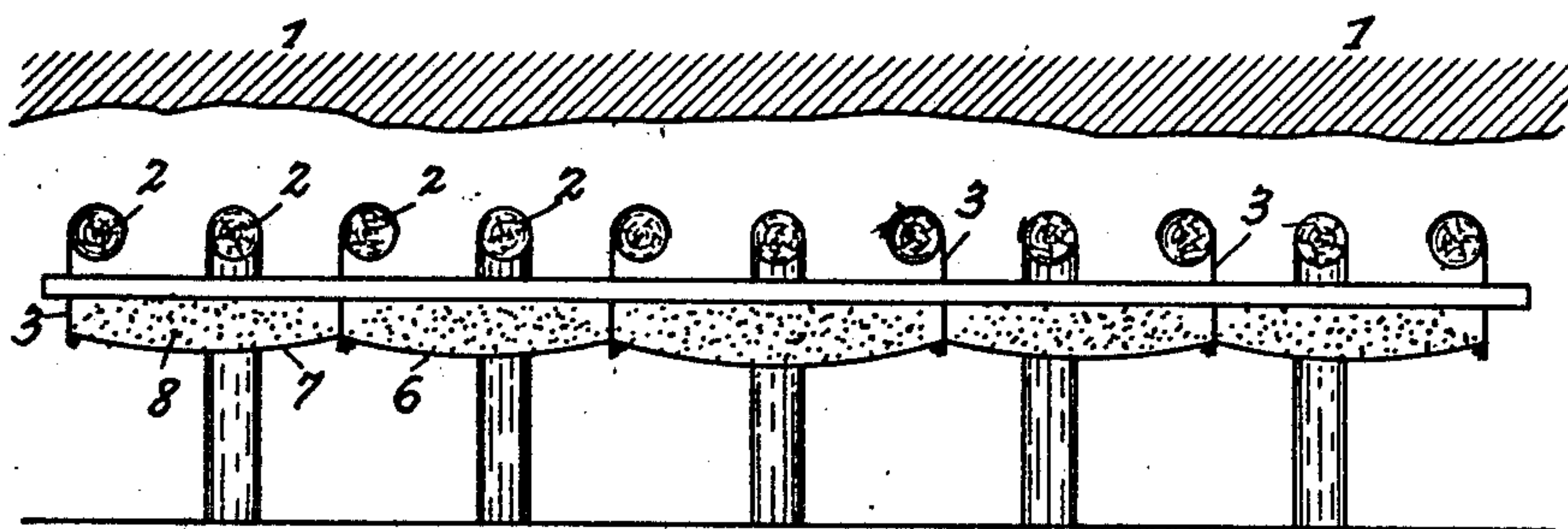


Fig. 7.

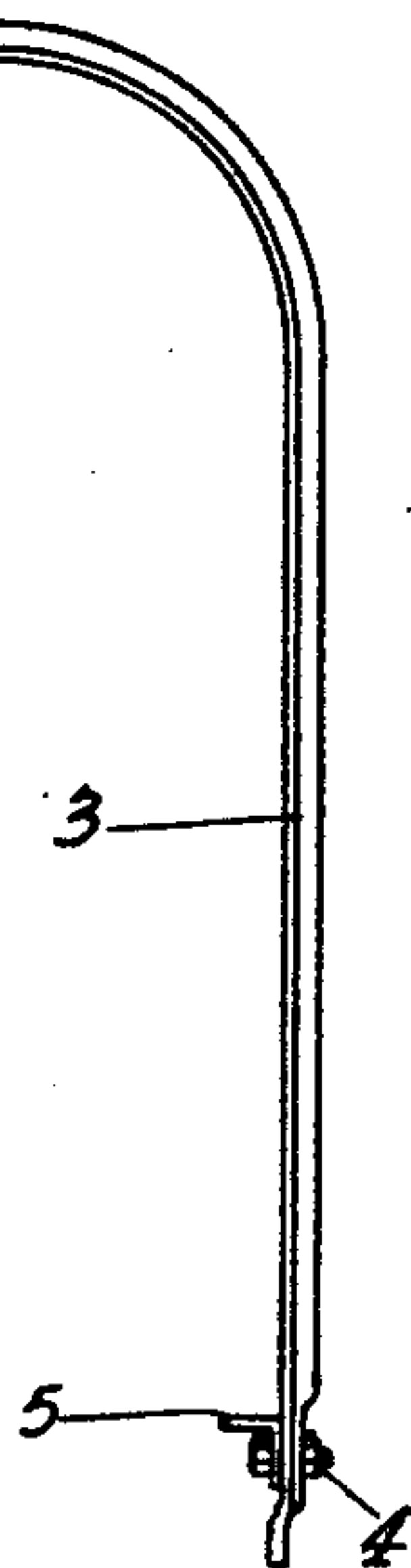
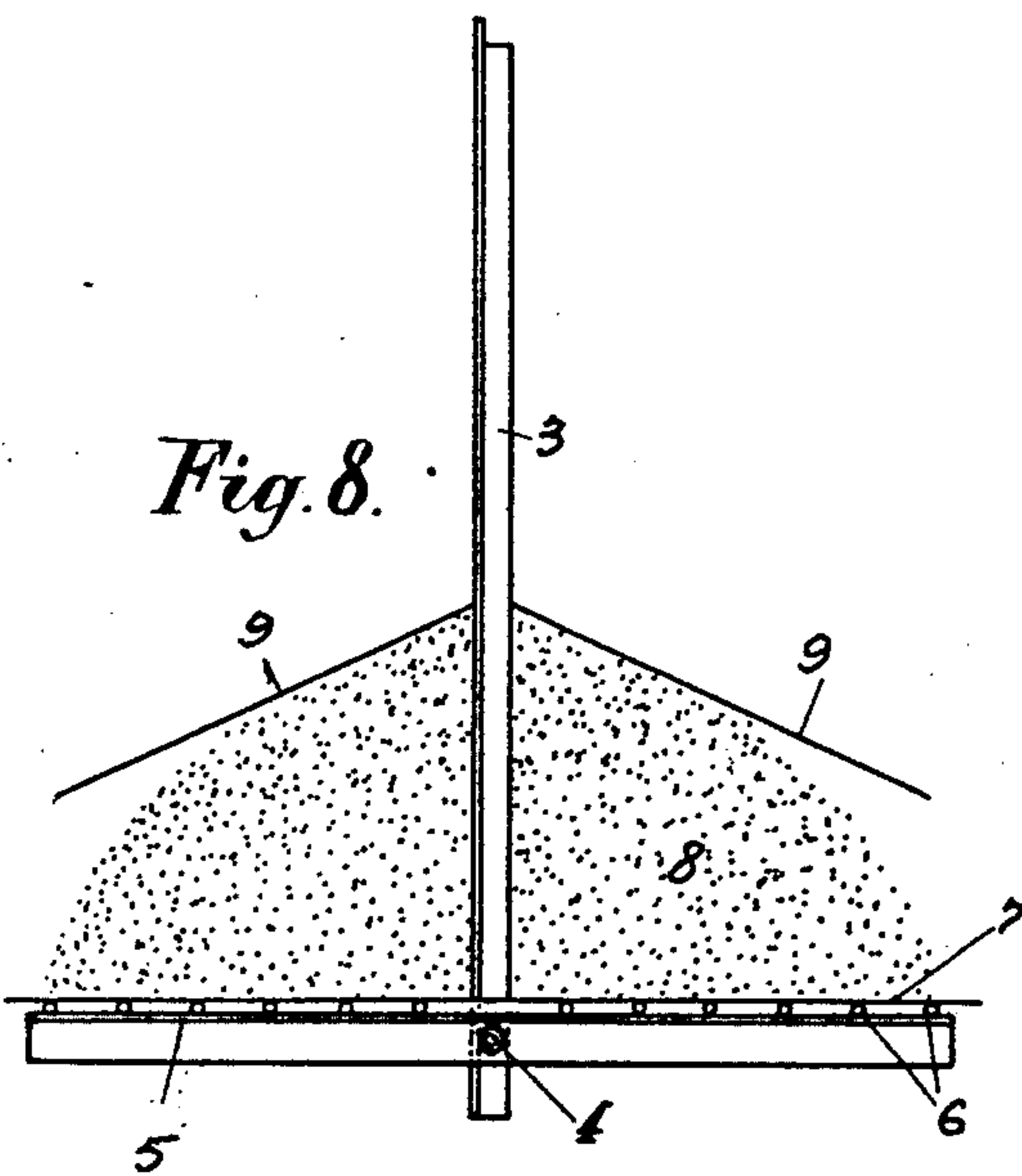


Fig. 8.



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UNITED STATES PATENT OFFICE.

HERMANN KRUSKOPF, OF DORTMUND, GERMANY.

METHOD OF AND MEANS FOR EXTINGUISHING OR SMOTHERING EXPLOSIONS IN MINES.

Application filed December 15, 1920. Serial No. 431,056.

To all whom it may concern:

Be it known that I, HERMANN KRUSKOPF, a citizen of the German Republic, and resident of Dortmund, Germany, have invented certain new and useful Improvements in Methods of and Means for Extinguishing or Smothering Explosions in Mines, of which the following is a specification.

In the specification of my prior application Serial No. 394597, dated July 7th, 1920, I have described the use of pure natural quartz-dust as an extinguishing means against explosions in mines as well as tilting receptacles intended to contain quartz-dust for smothering explosions produced in mines. Devices of the kind described are particularly intended to prevent an explosion from being propagated or spread from one point to another in mines.

However said devices do not prevent—

(a) the explosion of fire-damp or coal-dust by the firing of a shot in layers of coal in mines.

The object of my present invention is to avoid these objections of the method and devices described in my prior application.

The object of the invention is to provide an improved method of and devices for arranging quartz-dust or any other incombustible stone-dust easily and readily before and into the blast-holes charged with powder, in order to avoid explosions of fire-damp or coal-dust by the setting off of shots. The invention has also for its object to increase the felling effects of such shots. Heretofore before setting a shot, the layer and surrounding parts of the blasting point were usually spread with water. Attempts have also been made to spread loose stone-dust around the blasting point and in front of the blast-hole to cause such dust to whirl around at the moment a shot is fired, thus preventing coal-dust and fire-damp from being ignited. It has also been proposed to drill holes in the coal to be blasted and impregnate the coal with water by special methods before the firing. These methods and devices are imperfect.

The subject matters of my invention are a method of and devices for wrapping stone-dust in a suitable easily destroyable container such as a bag made of any suitable

material (such as fabric, paper or the like) and attaching said packet of dust directly within and in front of the blast hole in a suitable way. Particularly convenient attaching means are formed of rods made of wood, which may be inserted into the blast-hole as shown in Fig. 1 of the accompanying drawing, the package of dust being split upon said rod as shown, or of wooden pegs (Fig. 3) wedged into the blast-holes and to which the packages of dust are attached. The wooden rod has preferably flattened sides so as to permit the ignition wires being easily lodged within the blast-hole.

Another essential feature of the protection against explosions by the firing of shots is the arrangement of stone-dust within the blast-hole in front of the blasting cartridge to serve as an inner tamping. This is shown in the accompanying drawing and forms a part of my invention. In the pit it is difficult to insert stone-dust into blast-holes in an easy and safe manner. For instance such dust would drop from blast-holes drilled vertically into the roof. It is likewise not easy to insert loose dust into blast holes uniformly and without forming air-pockets. In the rough work within the pit it is important to have simple, easily applicable and safe devices, unless the same are useless. Air-cushions are prejudicial to a good blasting effect in a blast-hole. The bad lighting, inconvenient transportation and other troublesome conditions are to be taken into consideration.

Now I have found it convenient for the present purpose to fill stone-dust into a suitable easily destroyable tube, whereby it may be easily inserted into a blast-hole. For instance such tubes may be made of paper and a diameter which is somewhat smaller than the diameter of the blast-hole. When rolled together in a flat state, said paper tubes may be easily transported without being injured. After being filled with dust without air-pockets, said tubes assume the round shape of the blast-hole and are sufficiently rigid to be easily inserted into the latter. By the arrangement of stone-dust directly before and within the blast-hole charged with powder I realize great advantages in the protection against explo-

sions in mines. At the moment the shot is fired the stone-dust will be thrown and finely divided into the passage of the drift by the force of the shot to fill said passage completely up.

The methods used heretofore are imperfect. For instance the method of spreading stone-dust before the setting of a shot upon the floor, walls and timber-work of the drift, other advantages of the present method and devices are found in the easy, safe, simple and economical manipulation thereof. Practical shooting experiments proved that the use of my present method enables one to shoot even in fire-damp by means of dynamite without causing fire-damp to be ignited. It is a new method of filling stone-dust into bags made of suitable easily destroyable material and attaching said bags directly before the blast-holes to pegs made of suitable material inserted and wedged into said blast-holes. The method of filling stone-dust into suitable easily destroyable tubes and inserting the latter into blast-holes directly in front of the blasting cartridges is also new. It is also a new feature to give these tubes a flat shape as described.

Moreover practical experiments proved the novel fact that in contradistinction to the clay tamping heretofore used in blast-holes, the use of a dust-tamping produces better blasting effects. The increase of these effects are a saving of 30 to 50% of blasting powder.

It may be supposed that such better blasting effect is produced by the new method of making comparatively long uniform tamping cartridges, adapted to fill up the full length of the blast-hole. The fine nonbaking grain of natural quartz-dust permits of making cartridges without air-pockets. Such air-pockets in the tamping act at the firing like an air-brake producing a checking and force absorbing effect. Heretofore shots are tamped in general by smooth clay-plugs which fill up only a short length of the blast-hole. By the firing of the shot the smooth clay plug will be forced through the blast hole like a projectile through the barrel of a cannon, whereby a part of the blasting power will be lost.

On the contrary a long cartridge filled with fine grains of quartz-dust without air-pockets will be immediately packed or stowed within the blast hole like the well known wet tamping, whereby the blasting power is allowed to produce its full effect.

Figs. 1, 2 and 3 of the accompanying drawings show embodiments of this part of my invention.

Referring to Fig. 1, *f* designates a horizontal blast-hole in a layer of coal, into which is inserted a pointed wooden rod *b* preferably provided with flat sides. The paper-bag *a* filled with stone-dust and closed

is spit upon said rod. Arranged adjacent the wooden rod *b* are conducting wires *c* extending to the blasting cartridge. The latter as well as the tamping are not shown.

Fig. 2 shows a flat shaped tube *c*¹ which is filled with stone-dust and inserted into the blast-hole so as to fill the same completely up and serve as a safety tamping for the blasting cartridge.

Fig. 3 shows the blasting cartridge *d*, the tube *c*¹ filled with stone-dust, a wooden wedge *b*¹ forced into the blast-hole and to which a bag *a* filled with stone-dust is attached by means of a wire.

Having now fully described my said invention, what I claim and desire to secure by Letters Patent, is:

1. An improved method of avoiding explosions in mines by firing shots in layers of coals, which consists in introducing natural quartz-dust into suitable easily destroyable tubes, inserting said tubes into the blast-holes and securing other containers filled with dust centrally in front of said blast-holes, substantially as set forth.

2. An improved method of avoiding explosions in mines by firing shots in layers of coals, which consists in inserting flexible paper tubes filled with stone-dust into the blast-holes as a tamping for the charge, and securing paper-bags filled with stone-dust to an element wedged in the blast-hole centrally in front of said blast-hole, substantially as set forth.

3. An improved method of avoiding explosions in mines by firing shots in layers of coals, which consists in inserting suitable rods into the blast-holes, so that the same project outwardly from the holes, and suitably attaching paper-bags filled with stone-dust to said rods in front of the blast-holes, substantially as set forth.

4. Means for preventing explosions in mines, comprising a frangible container filled with a non-combustible dust, an element inserted in a blast hole and held therein by engagement with the walls of the blast hole, and means for attaching the container to the element, whereby the explosion of a charge in the blast hole will destroy the container and distribute the dust over the adjacent portion of the drift in the mine.

5. Means for preventing explosions in mines, comprising a frangible container filled with a fire extinguishing element and of a form adapted for insertion into a blast hole in the mine over the blasting charge for forming the tamping for said charge, a second frangible container containing a fire extinguishing element, and means for securing said container over the open end of the blast hole, whereby the force of the explosion of the blasting charge will destroy the first-mentioned container and pack the dust

in the hole, which will increase the effect of the explosion in the portions of the mine being blasted, and also destroy the second-mentioned container and cause the extinguishing element therein to be scattered over the adjacent portion of the drift of the mine for preventing fire therein.

In testimony whereof I have hereunto set my hand in presence of two witnesses.

HERMANN KRUSKOPF.

Witnesses:

M. QUELLENBERG,
A. GERTRING.