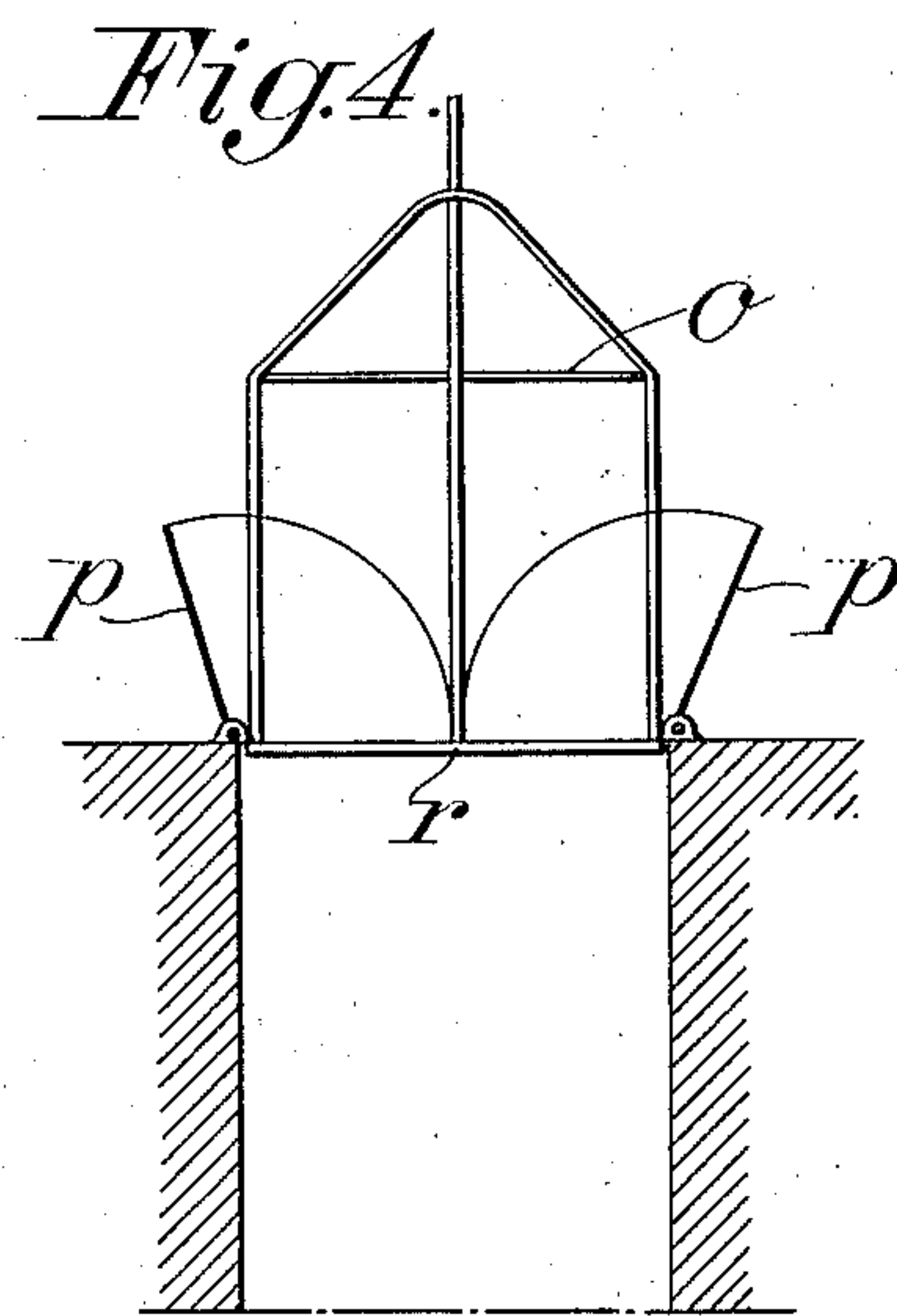
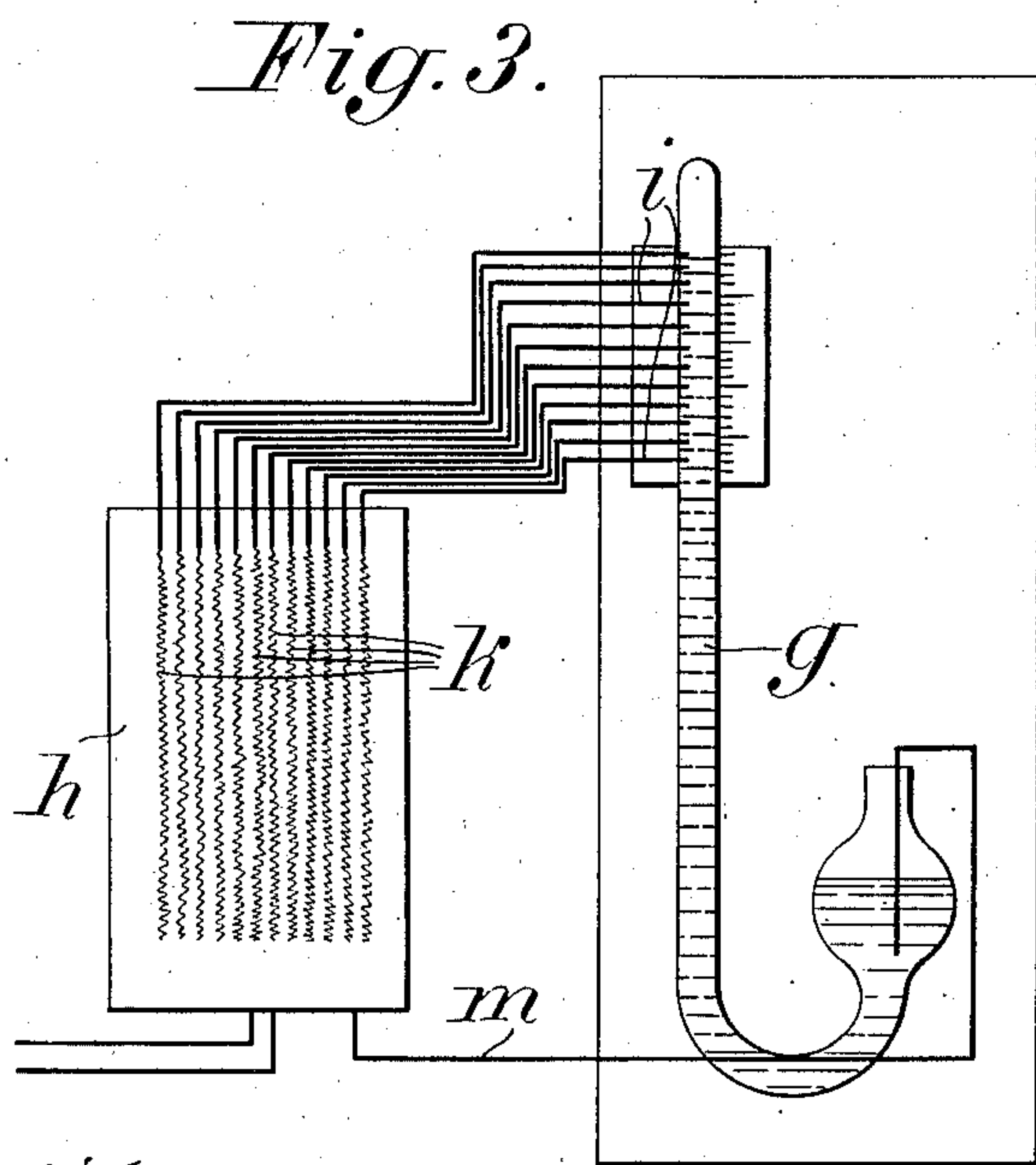
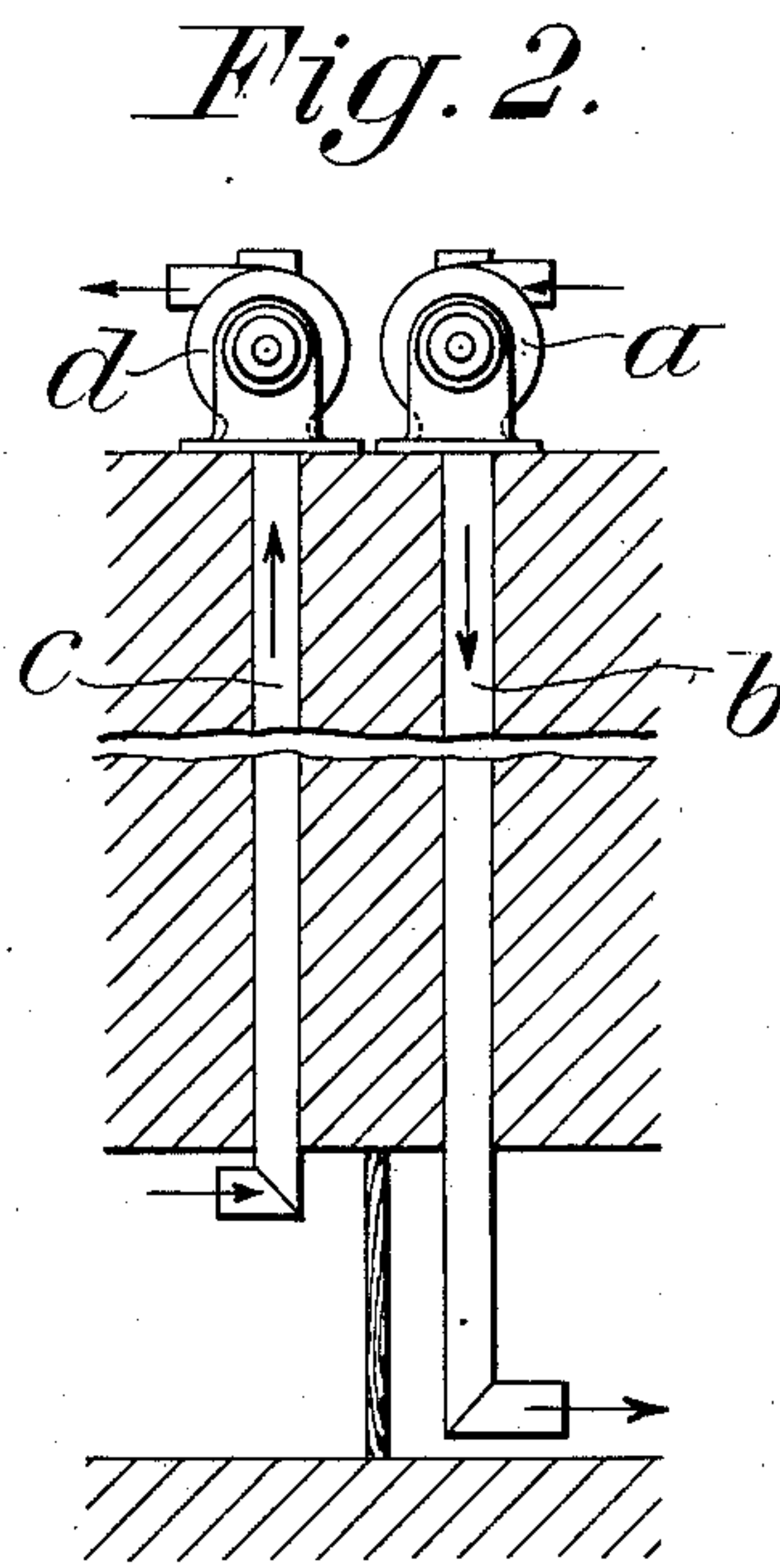
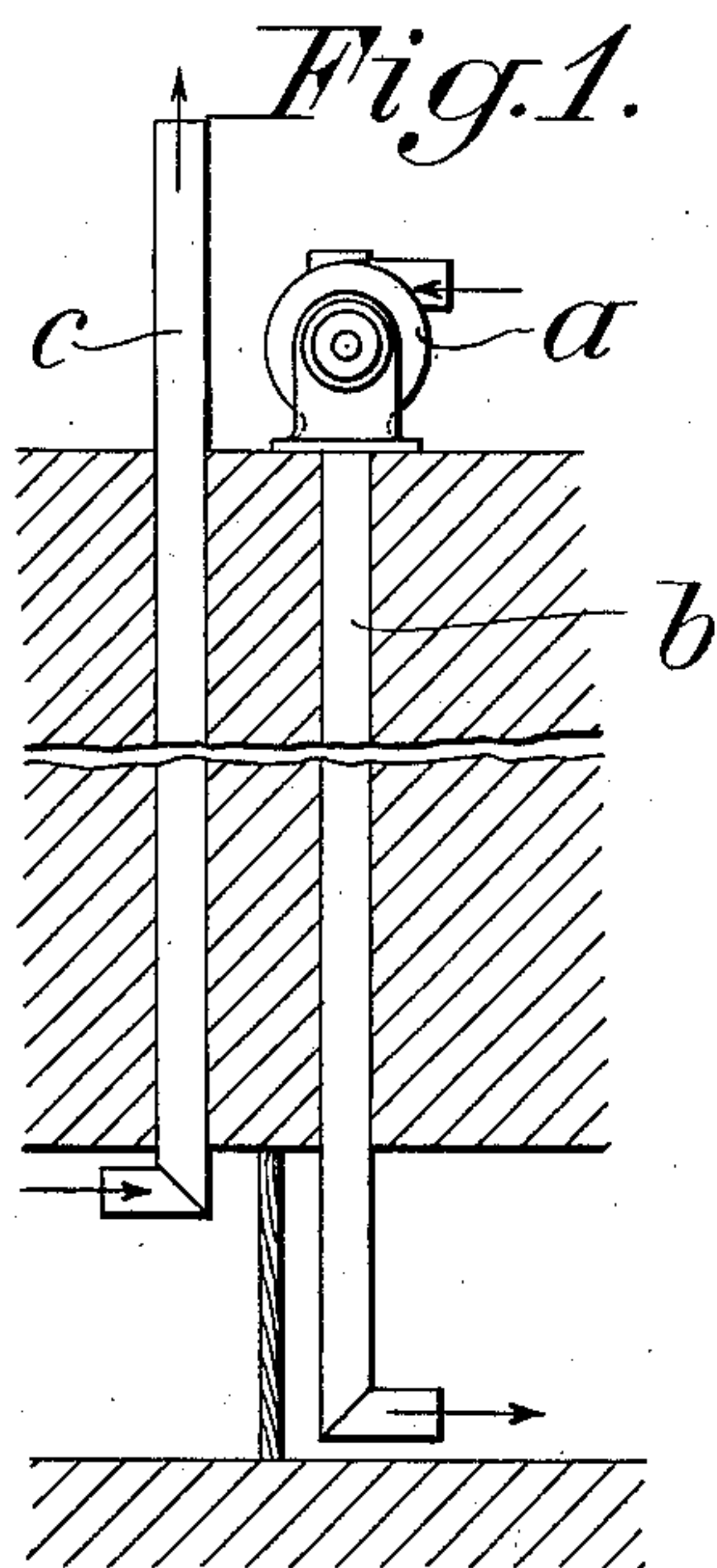


A. VON GRÖLING.
METHOD OF PREVENTING THE LIBERATION OF FIRE DAMP.
APPLICATION FILED MAR. 16, 1908.

906,872.

Patented Dec. 15, 1908.



Witnesses:

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UNITED STATES PATENT OFFICE.

ALBRECHT VON GRÖLING, OF VIENNA, AUSTRIA-HUNGARY.

METHOD OF PREVENTING THE LIBERATION OF FIRE-DAMP.

No. 906,872.

Specification of Letters Patent.

Patented Dec. 15, 1908.

Application filed March 16, 1908. Serial No. 421,533.

To all whom it may concern:

Be it known that I, ALBRECHT VON GRÖLING, subject of the Emperor of Austria-Hungary, residing at Vienna, Austria-Hungary, have invented certain new and useful Improvements in Methods of Preventing the Liberation of Fire-Damp, of which the following is a specification.

It is a well known fact that fire damp (mine gas, fulminating damp) in being liberated at a low atmospheric pressure and flowing from several places combines to produce catastrophic disasters.

The present invention relates to a method having for its object to obviate the said drawback and to attain a relatively satisfactory security in the working of mines. For this purpose according to the present invention the atmospheric pressure in the mines is always maintained on the same height notwithstanding the variations of the exterior atmospheric pressure, the mines being closed from the outer air by means of suitable pit closures of known construction and the actually existing ventilating means (ventilators, air feeding shafts and ventilating drifts) being retained. The said maintenance of the stationary air pressure in the mines is effected in such a manner that the relation between the quantity of air admitted into the mine in a unit of time by means of one ventilator to the quantity of air exhausted from the mine in the same unit of time by means of a second ventilator is regulated according to the barometric height. In this manner the gas pressure in the mine can be controlled within the barometric limits or even beyond the same by the differences in the number of revolutions of the ventilators.

The working of the ventilators can be actuated by means of a motor of any desired kind and the controlling of the performed work can be effected either by hand according to the observed barometric heights or automatically by the variations of the atmospheric pressure.

In order to prevent the escape of fire damp at low barometric height it has already been proposed to feed fresh air into the mine by means of a blast ventilator so that the fire damp is being retained in the mine independently from the alterations of the pressure of the exterior atmosphere. Now according to the present invention the action of

the blast ventilator is supported by means of a suction ventilator, this arrangement presenting the advantage that by differentiating the working of the two ventilators the facility is afforded to produce in the interior of the mine quite independently from the condition of the exterior atmosphere pressure of any desired height and consequently depressions; this method could absolutely not be produced by means of one single blast ventilator. Moreover the employment of two ventilating devices of equal output of which each is sufficiently large and powerful to perform by itself if necessary the ventilation of the mine presents the important advantage of affording a mutual reserve of absolute safety. This is of particular importance in consideration of the fact that in the event of explosion occurring in the interior of the mine blast ventilators are as a rule damaged and put out of work so that precisely in the cases of similar incidents the mine remains without ventilation. Furthermore in the above named known system the tight closure of the air admission pit (that is to say in the present instance the pneumatically closed working pit) may become damaged for some reason or other. If in such case only one single blast ventilator is employed the ventilation of the mine may be either damaged or entirely stopped. A similar occurrence must of course be avoided under all circumstances and in such cases the suction ventilator will automatically perform as a complete reserve organ the ventilation of the mine.

A suitable regulation of the number of revolutions of the ventilator affords the possibility to variate at will the air pressure in the mine so that the above mentioned arrangement of blowing ventilators and suction ventilators can also be employed for the purpose of producing an underpressure within the mine and to suck up by means of this underpressure the fire damp from the rock as also from the old filled up works and to exhaust the same by the admission of fresh air, said operation being preferably carried out on non working days. The fire damp escaping above ground can be constantly submitted to analysis in order to determine the nature of the ventilation of the mines.

The process of closing or reducing the admission opening of the pits for fresh air in order to exhaust the gases of the mine rock by means of a suction ventilator is already

known but this method afforded until now the possibility to obtain only most insignificant depressions particularly in the case of extensive sets of a mine. On the other hand

5 this method cannot under any circumstances afford the possibility of increasing the pressure as compared with the exterior atmospheric pressure whenever this may be needed.

As showing a conventional means whereby a method in accordance with this invention can be carried out, reference is had to the accompanying drawings wherein—

Figures 1 and 2 represent diagrams of the arrangement of one ventilator or of two ventilators respectively at the mouth of air shafts. Fig. 3 represents an arrangement for the automatic controlling of the output of a similar ventilator and Fig. 4 shows a form of execution of the device employed for closing the pit.

In the arrangement according to Fig. 1 air is forced into the air shaft *b* by means of a forcing ventilator *a* while a second air shaft *c* serves for the escape of waste air. The exhaust opening of the latter is made of such dimensions as to allow of the flowing off of only such quantity of air that corresponds to the quantity of air admitted at *b* when the ventilator is working with normal velocity. This takes place at a favorable exterior atmospheric pressure which in this case will coincide with the air pressure in the mine. Whenever the exterior air pressure diminishes the ventilator is made to work more rapidly with greater velocity, whenever the air pressure in the mine is comparatively increased, that is to say it remains the same as before.

In the arrangement according to Fig. 2 air is admitted into the pit *b* also by means of a pressure ventilator *a* while the waste air is exhausted from the pit *c* by means of a second ventilator *d*. In order to maintain constantly in the mine the same degree of pressure and to avoid almost completely any variations of pressure the suction ventilator can be made to work slower to a suitable extent and the forcing ventilator correspondingly quicker when the barometer is falling. This controlling of the air pressure in the mines can be effected according to the observed barometric heights by suitably regulating the corresponding driving machines (electromotors, steam engines etc.) either by hand or by means of an automatic regulating device actuated by the falling or rising of the exterior air pressure itself.

One form of regulating device is illustrated by way of example in Fig. 3. In the tube of a mercury barometer *g* with open cistern are melted in the ends of a number of metallic wires *i* within the limits of the possible variations of the mercury level in the barometer tube; these wires are arranged in juxtaposed pairs superposed one pair above the

other so that the mercury as soon as it has reached a certain level will come in contact with the corresponding pair of wire ends and will establish the metallic contact between the same. The metallic wires are connected to an electromagnetic apparatus which comes into action as soon as the circuit is closed; the said apparatus has for its object for instance to turn a lever by means of which a resistance inserted in the leads of a dynamo that drives the ventilator is put in circuit or out of circuit. When the barometer is rising the superposed pairs of metallic wires *i* are successively brought into electrical connection and consequently the corresponding resistances *k* of a rheostat *h* are put into circuit or as the case may be out of circuit. When the barometer shows the position that is most favorable for the mine that is to say as a rule its highest position all metallic wire ends are electrically connected with each other. When the mercury column in the barometer tube is falling the connection of the successive wire pairs will be gradually interrupted so that the corresponding resistances will be successively put into or as the case may be out of circuit. The electrical contact may however be established for good and all by connecting the mercury to a return lead *m*. The maintenance of a uniform air pressure in the mine always presupposes that the connection of the interior of the mine with the exterior air can be interrupted by means of a closing device. This is effected by means of pit closures such as are already known. Fig. 4 shows by way of example a similar closing device. The top of the pit is closed by flap doors *p* which are raised by the ascending drawing cage *o* and while the latter is in its uppermost position the said flap doors *p* are replaced by the bottom *r* of the cage so that in this manner the closure of the pit mouth is not interrupted for a single moment. When the cage is being lowered the aperture is again closed in consequence of the weight of the flap doors *p* or by some other mechanical means producing the closure of the flap doors. The small apertures and slits that remain open in similar closing devices are but of secondary importance for the purpose aimed at.

The admission or exhaust of air by means of ventilators as above described can be performed according to the particular local circumstances not only through the ventilator pits and the working pits but if required also through the pumping shafts.

What I claim is:—

1. A method of preventing the liberation of fire damp in mines consisting in maintaining an invariable air pressure of a predetermined degree in the mine irrespective of barometric variations in the air exterior of the mine by regulating the quantity of air ad-

mitted into the mine in a unit of time relatively to the quantity of air exhausted from the mine in the same unit of time.

2. A method of preventing the liberation
5 of fire damp in mines consisting in maintaining
a stationary air pressure of a predetermined
degree by regulating the quantity of air admitted into the mine in a unit of time relatively to the quantity of air exhausted from
10 the mine in the same unit of time irrespec-

tive of the barometric variations of the air exterior of the mine.

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

ALBRECHT VON GRÖLING.

Witnesses:

JOSEF RUBURCH,

ROBERT W. HEINGARTNER.