

March 17, 1936.

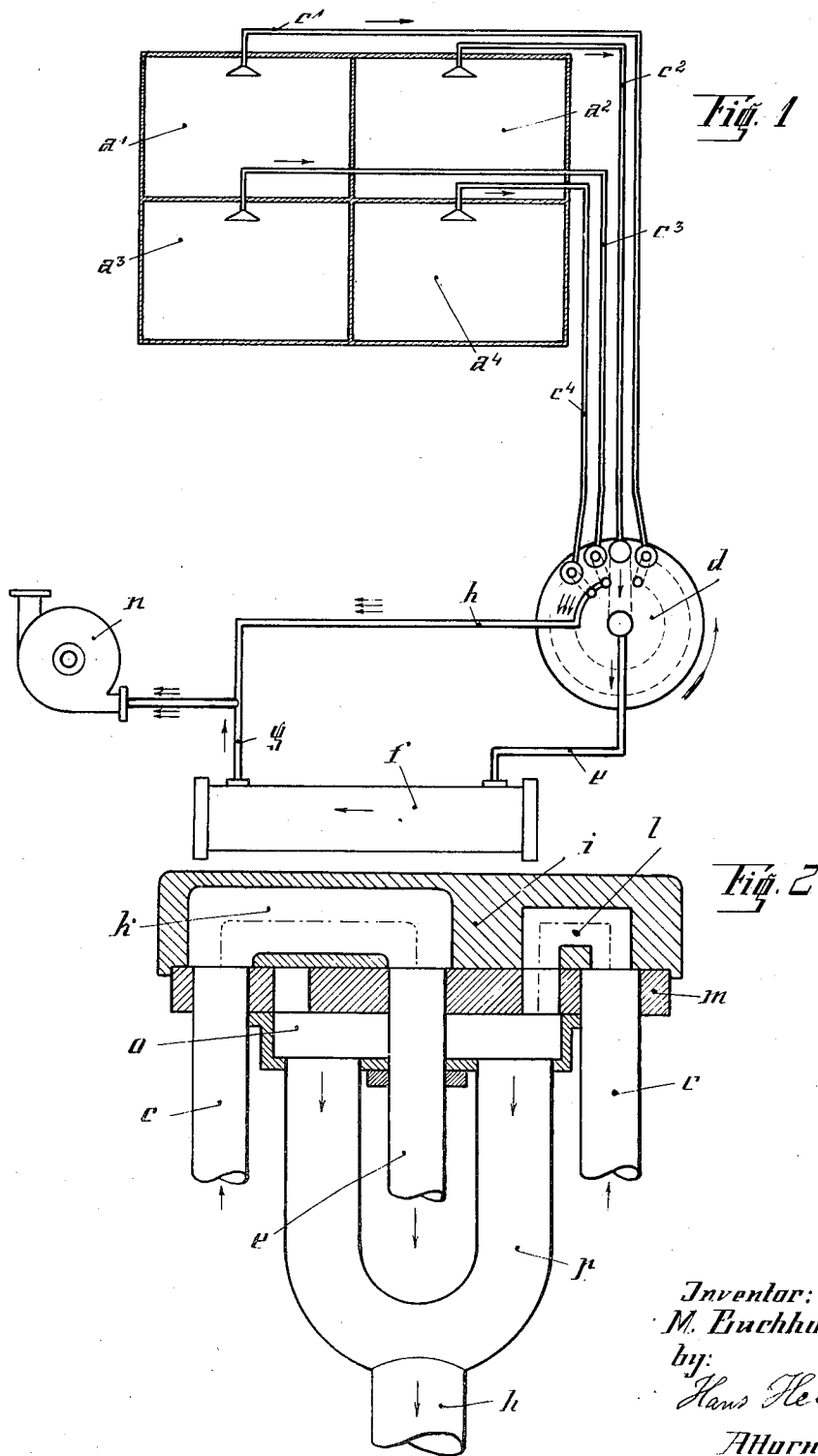
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INSTALLATION FOR THE DETECTION OF SUSPENDED MATTER IN FLUIDS

Filed Dec. 16, 1930

2 Sheets-Sheet 1



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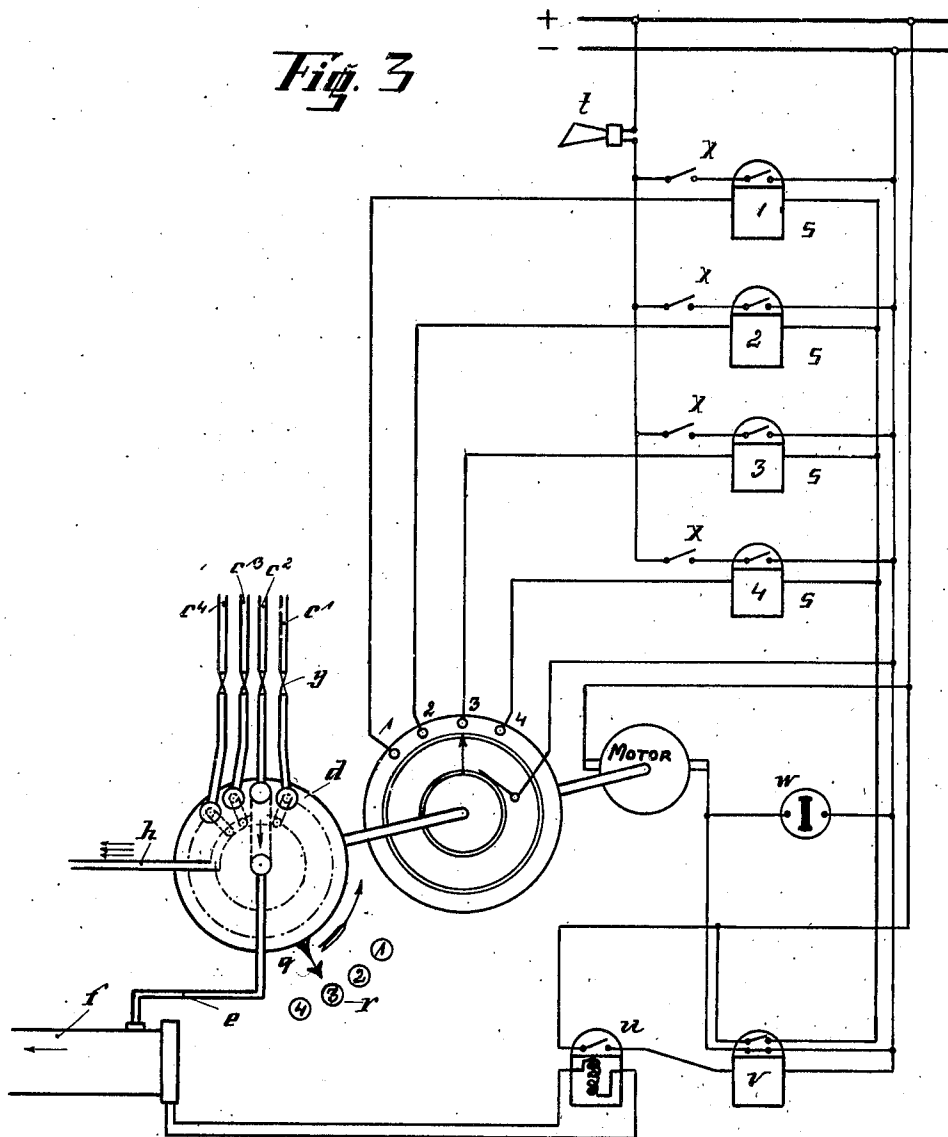
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UNITED STATES PATENT OFFICE

2,034,281

INSTALLATION FOR THE DETECTION OF
SUSPENDED MATTER IN FLUIDS

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It is known to ascertain the outbreak of a fire in rooms of vessels, storehouses, warehouses and the like with the aid of tubes connecting the individual rooms with a central watching or controlling room and being continuously subjected to sucking action so that they are always filled with such air, or, perhaps, mixture of air and smoke as is present in the respective rooms at the time being. Examining the contents of the individual tubes may be effected purely personally by the man in that central room without the aid of specially provided mechanical means, such as smoke-testing means, or also such means may be provided to assist that man; or the examination and announcing of the result may be effected mechanically, for instance by means of an automatic smoke density meter.

All these known plants and devices suffer from severe drawbacks. Thus, for instance, the man in the watch room must distribute his attention onto very many tube ends, or correspondingly many smoke detectors or the like (one for every tube) must be provided. Endeavors have been made to overcome these drawbacks by letting all tubes terminate at a common central room and connecting them there with one another so that only one common discharge end or only one common smoke detecting apparatus need be watched, but this arrangement entails the other and likewise severe drawback that the smoke perhaps arising in one of the respective rooms is considerably diluted by the air sucked from the other rooms where there is no smoke, so that it is sometimes very difficult to detect the smoke and to determine, thus, the place where a fire has broken out.

The present invention relates to a considerably improved smoke detecting system in which, although all tubes terminate in a common central room in which there is only one watchman and only one control device, still every individual tube and, thus, every individual room can be controlled with absolute reliability. The characteristic feature of this system resides therein that there is provided in the central room a switching-over device at which all tubes terminate and from which a separate tube extends to a smoke detector which can be instantly connected with any of said tube ends so that it is possible to ascertain practically instantaneously from which tube smoke has been sucked, that is to say, in which room smoke exists at the time being and a fire has broken out or is just developing. That common switching-over device may establish a communication between the smoke detector and the several tubes either

in a certain definite succession or in any other way, that is to say, the communication may be established mechanically (automatically) or manually. In either case the smoke-laden air arriving from any one of the rooms connected with the central room is not diluted by air of the other rooms but arrives in the smoke detector in undiluted state and the smoke can, therefore, be detected at once, and furthermore, the room from which that smoke has come can at once be ascertained.

My invention is illustrated diagrammatically and by way of example on the accompanying drawings on which Figure 1 is a general view of a smoke detecting system designed according to this invention and intended for four rooms, Figure 2 is an axial section through the switching-over device, this figure being drawn to a greatly enlarged scale relatively to Fig. 1, and Figure 3 shows the members illustrated in the lower half of Figure 1 combined with indicating means, blocking means, and shut-off means, all as fully described hereinafter. The four rooms to be controlled are denoted $a^1a^2a^3a^4$, and $c^1c^2c^3c^4$ are tubes connecting said rooms with the switching-over device d which is arranged in the central room (not specially indicated in the drawings) at which all connecting tubes end. From the switching-over device d extends a tube h to an exhaustor n and a tube e to a smoke detector f . This tube extends from the centre of the casing of the device d and is continually connected therewith, as may be seen from Fig. 2. The front of the device d consists of a rotatory disk i provided with a passage k and three passages l , of which k serves for establishing a communication between the common tube e and any of the tubes $c^1c^2c^3c^4$, according to the position of the disk i , whereas the passages l serve for establishing communications between the common tube h and all other of the tubes $c^1c^2c^3c^4$, that is to say, those tubes which are, at the time being, not connected with the passage k . The passages l terminate all into a common chamber o which is, in the example shown, connected with the tube h by means of a U-shaped intermediate tube p .

It will be seen that, irrespective of the position of the disk i , all tubes are continuously connected with the exhaustor n so that air is continually sucked through them, and they are, thus, continually filled with air from the respective rooms. But there is always one of the rooms connected with the smoke detector f , in dependency of the position of the disk i , and if smoke is detected in the detector it will at once be evident from the

position of the disk *i* from which room that smoke has come.

As long as there is no smoke in any of the rooms, only practically pure air, that is to say, smokeless air, is flowing through the detector *f*, but when smoke appears in this device the watchman will detect it at once, ascertain the respective room and cause the requisite measures.

I wish it to be understood that instead of the exhaustor *n* any other suitable sucking device may be used, for instance a water-jet pump or a rotary pump or the like, and that the movable member of the switching-over device *d* may be longitudinally movable instead of turnable, which does not constitute a departure from the present invention and does not affect the proper operation and effect of the plant. But in every case the switching-over device must be inserted between all tubes *c*¹ *c*² *c*³ *c*⁴ etc. and the tubes *e* and *h*, and always one of said first-mentioned tubes must be connected with the smoke detector *f* whereas all other tubes are directly connected with the exhaustor *n* or its equivalent. The exhaustor etc. operates uninterruptedly and the entire plant, including all rooms connected with the switching-over device *d*, is, therefore, uninterruptedly subjected to the sucking action thereof. The number of the rooms controlled may be, of course, smaller or larger than four, or even by far larger, as the case may be, and the switching-over device will in every case be designed correspondingly.

The movable member of the switching-over device, i. e. the rotary disk *i* or its equivalent, for instance a slidable member, may be moved, continuously or intermittently, viz. step-by-step wise. The means for moving said member in the one or the other manner may be of any desired description.

Thus, for instance, the shaft of the exhaustor may be used for driving the said movable member of the switching-over device by the intermediary of a suitable gearing, or an electromagnet controlled by clock-work or any other driving device directly or indirectly connected with the said movable member may be used.

If the smoke detector is visually watched and if smoke is discovered therein, the room from which that smoke has come may be ascertained by the position of the disk *i* or its equivalent. It is suited to the purpose to provide the switching-over device with means for facilitating the ascertainment of the respective room. Such means may consist, for instance, in providing the disk or its equivalent with a pointer *q*, Fig. 3, cooperating with a stationary shield bearing names or numerals *r*, Fig. 3, designating the various rooms, or such a shield may be provided on the movable part of the switching-over device and may be located behind a stationary plate having merely an aperture in which the respective name or numeral appears. But also optical means (for instance electric lamps of different colors) or any other means suitable for the purpose in view may be provided.

If the control is effected automatically, for instance in this way that a smoke density meter is equipped with electric contacts closed automatically when smoke appears in the device *f*, and switching on, for instance, an alarm bell, the arrangement may be completed in this way that also a selector and an annunciator or indicator board *s*, Fig. 3, or the like are provided, the arrangement being then such that there are, for instance, as many drop indicators as there are

rooms to be watched or controlled, that is to say, as there are possible positions of the switching-over disk or slide of the device *d*, and that any one thereof pertains to any one of the rooms, there being, of course, also the corresponding circuits provided, of which any one can be closed by the contacts in the smoke density meter. The drop indicators are designed as relays and the indication remains visible also after the switching-over member has been further moved so that also then the room from which the smoke has come can be securely ascertained. Preferably also an alarm bell *t*, Fig. 3, is switched on simultaneously with the switching on of the respective indicator relay. It is, however, also possible to design the device in this way that the movable member of the switching-over device *d* is instantly blocked by means of the contact of the relay *v*, Fig. 3, when the contacts *u* of the smoke density metering arrangement are closed so that the room concerned can be ascertained directly at said device by the position of the movable member thereof, especially if either this member or the casing bears a pointer *q* or an aperture and the other members bear names or numerals *r* indicating the various rooms, the pointer or aperture and the names or numerals co-operating in the manner already dealt with in a preceding part of this specification.

When the smoke-filled room has been ascertained the blocking may be released by shutting the breaker *w*, Fig. 3, so that the device then continues to operate in the same manner as before. Means, for instance breakers *x*, Fig. 3, may be provided to break the circuit pertaining to the smoke-filled room so that this is not a second time called attention to. Such means may be provided also in cases in which the rooms or spaces to be controlled as to smoke or as to particularly much or dense smoke or dust are for certain periods of time filled with a certain amount of smoke or dust, as is the case, for instance, with coal bunkers in vessels, while they are freshly filled.

It is in such a case desirable to disconnect the smoke detecting device from the coal bunker or whatever other place it may be by means of valves or the like *y*, Fig. 3.

I wish it to be understood that my invention is by no means limited to the constructional form shown in the drawing merely by way of example but many departures are possible in the details, as well as, for instance, in this way that the connecting tubes are subjected not to suction but to pressure, viz. to a pressure existing in the rooms or spaces to be watched or controlled, and it is in certain cases likewise possible to make use of suction and of pressure.

I claim:

1. A device for detecting suspended matter in fluids comprising a plurality of fluid sources, means responsive to the presence of suspended opaque matter in fluids, a rotatable member to effect connection of the responsive means with the sources successively, means to direct a fluid flow from the sources substantially continuously, means to rotate the member, and indicating means rotatable with the member to indicate the connection established between the responsive means and the sources.

2. A device for detecting suspended matter in fluids comprising a plurality of fluid sources, means responsive to the presence of suspended opaque matter in fluids, a rotatable member to effect connection of the responsive means with

the sources successively, means to direct a fluid flow from the sources substantially continuously, means to rotate the member, and means actuated by the responsive means to render the last named means inoperative upon passage of suspended matter through the responsive means.

3. A device for detecting suspended matter in fluids comprising a plurality of fluid sources, means to maintain a flow of fluid streams from the sources substantially continuously, means responsive to the presence of opaque suspended matter in fluids, means to periodically connect the responsive means successively to the sources and to direct one of the fluid streams thereto from a respective source, said last named means being substantially adjacent said responsive means, indicating means to indicate from which source suspended matter is directed to the responsive means, an alarm, means whereby the alarm is actuated by the responsive means, and manually releasable means to maintain the alarm in an actuated condition.

4. A device for detecting suspended matter in fluids comprising a plurality of fluid sources, means responsive to the presence of opaque suspended matter in fluids, means to connect the responsive means successively to the sources to shunt the fluid flow from the sources successively through the respective means, the responsive means being relatively near the last named connecting means, means to maintain a fluid flow from the sources substantially continuously, means to actuate the connecting means, means actuated by the responsive means to render the actuating means continuously inoperative, and manual means to render the actuating device operative.

5. A device for detecting suspended matter in fluids comprising a plurality of fluid sources terminating in openings arranged in a circular path, means responsive to the presence of opaque suspended matter in fluids, a rotatable member formed with a conduit adapted to communicate with said openings to connect the responsive means with the sources successively, means to direct a fluid flow from the sources substantially continuously, means to rotate the member, and means actuated by the responsive means to render the last named means inoperative upon passage of suspended matter through the responsive means.

6. A device for detecting suspended matter in fluids comprising a plurality of fluid sources terminating in openings arranged in a circular path, means responsive to the presence of opaque suspended matter in fluids, a rotatable member formed with a conduit adapted to communicate with said openings to connect the responsive means with the sources successively, means to direct a fluid flow from the sources substantially continuously, means to rotate the member, and indicating means rotatable with the member to indicate the connection established between the responsive means and the sources upon passage of suspended matter through the responsive means.

7. An installation for the detection of suspended matter in fluids, comprising a plurality of tubes leading from fluid sources; means to

create a fluid flow through said tubes; a selector valve device having a plurality of inlet passages and two outlet passages, a like plurality of said tubes leading to said inlet passages, and one of said outlet passages communicating with all but one of said inlet passages and the other outlet passage communicating with the inlet passage not served by the first-mentioned outlet; means responsive to the presence of opaque suspended matter in fluids connected to said other outlet passage, and means for operating the valve whereby the responsive means is successively connected with the respective tubes and whereby the fluid flow through the remaining tubes is preserved through the first-mentioned outlet passage.

8. An installation for the detection of suspended matter in fluids, comprising a plurality of tubes leading from fluid sources; means to create a fluid flow through said tubes; a selector valve device comprising a stationary member and a movable member, said stationary member having a plurality of inlet passages and two outlet passages, a like plurality of said tubes leading to said inlet passages, one of said outlet passages of said stationary member communicating with all but one of the said inlet passages through said movable member of the selector valve device, whereas the other outlet passage of the said stationary member communicates with the inlet passage not served by the first-mentioned outlet passage through the same movable member; means responsive to the presence of opaque suspended matter in fluids connected to said other outlet passage, and means for operating the valve whereby the responsive means is successively connected with the respective tubes and whereby the fluid flow through the remaining tubes is preserved through the first-mentioned outlet passage.

9. An installation for the detection of suspended matter in fluids, comprising a plurality of tubes leading from fluid sources; means to create a fluid flow through said tubes; a selector valve device comprising a stationary member and a movable member, said stationary member having a plurality of inlet passages and two outlet passages, a like plurality of said tubes leading to said inlet passages, one of said outlet passages of said stationary member communicating with all but one of the said inlet passages through said movable member of the selector valve device, whereas the other outlet passage of the said stationary member communicates with the inlet passage not served by the first-mentioned outlet passage through the same movable member; a fan connected at its suction branch with the first-mentioned outlet passages of the selector valve device; means responsive to the presence of opaque suspended matter in fluids inserted between the valve device and said suction branch of said fan through said other outlet passage, and means for actuating the said movable valve member whereby the responsive means is successively connected with the respective tubes and whereby the fluid flow through the remaining tubes is preserved through the first-mentioned outlet passage.

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