G. BAEHR.

SAFETY DEVICE FOR GAS MAINS AND HOLDERS.

APPLICATION FILED OCT. 20, 1909.

1,015,930.

Patented Jan. 30, 1912.

2 SHEETS—SHEET 1.

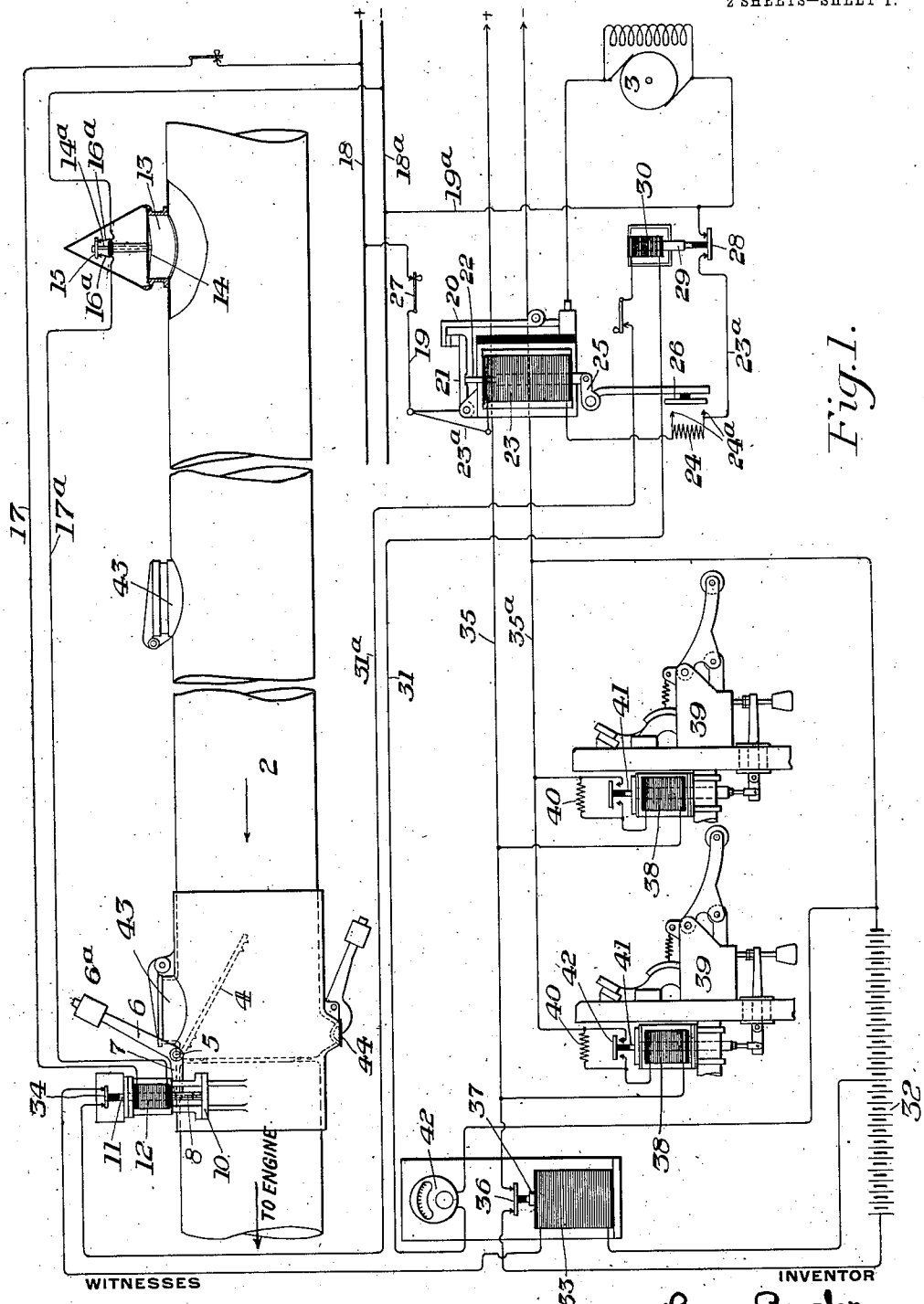

Fig. 1.

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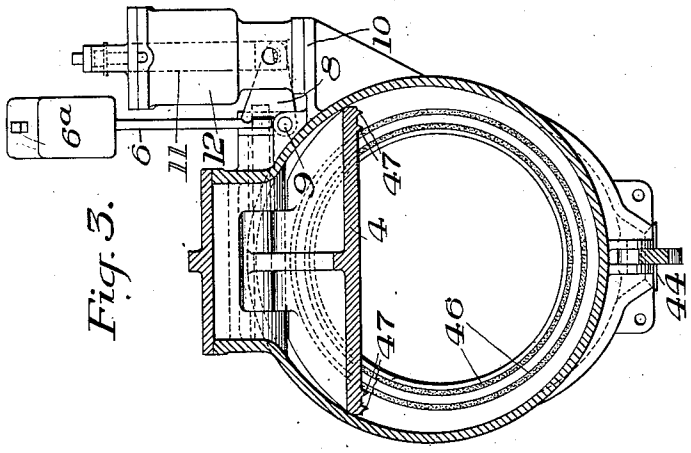

Fig. 3.

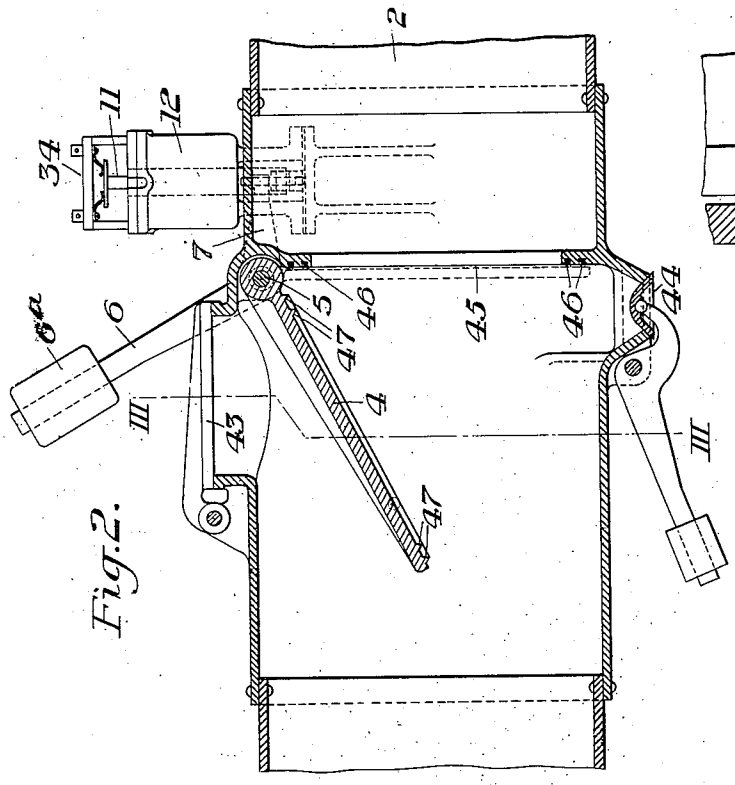

Fig. 2.

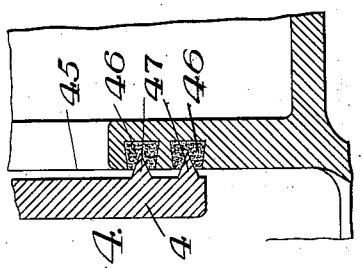

Fig. 4.

WITNESSES

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UNITED STATES PATENT OFFICE.

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SAFETY DEVICE FOR GAS MAINS AND HOLDERS.

1,015,930. Specification of Letters Patent. Patented Jan. 30, 1912.

Application filed October 20, 1909. Serial No. 523,709.

To all whom it may concern:

Be it known that I, GEORGE BAEHR, of Ampere, county of Essex, and State of New Jersey, have invented a new and useful Safety Device for Gas Mains and Holders, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a partly diagrammatic side elevation showing a gas main leading from a gasometer or gas-holder, or other source of supply to the engine cylinders of a gas engine plant or a power station having generators driven by gas engines. Fig. 2 is a detailed sectional elevation on a larger scale of the gas main showing the fire door, and its operating mechanism forming part of my invention. Fig. 3 is a transverse section of the same on the line III—III of Fig. 2. Fig. 4 is a detail sectional elevation showing the means employed in sealing the fire door when seated in its closed position.

My invention relates to the handling and controlling of manufactured or combustible gases, the gas engines employing such gases as fuel and the mechanism operated by such gas engines and it more particularly relates to the handling of blast furnace gases in cleaning, storing and conducting such gases to the place of use and to the controlling of apparatus using such gases in generating power. In the handling of such gases, they are conducted from the blast furnace, gas producer, or other source of supply in suitable gas mains to a gas washing or scrubbing plant where they are freed from impurities and cleaned so as to be adapted for the use for which they are intended. The cleaned gases are then conducted to the gas engines or other point of use where they are used in producing power. A gasometer or gas holder is usually installed at a suitable point in the length of the gas-main between the source of supply and the place of use to store up the gases as made and deliver them as required, although in some cases the gas-holder is dispensed with, the gas mains acting as the place of storage.

In operating gas engines, particularly the large units used in driving electric generators with blast furnace gases as fuel, the gases have frequently become ignited by a "back fire" from such gas engine cylinders. When such back firing occurs and enough air has been admitted into the gas mains to form an explosive mixture, explosions have occurred causing great damage to the gas-main; gas holder, gas engines and surrounding property.

The object of my invention is to provide improved means by which such explosions are rendered impossible and the liability of damage to the apparatus used in connection with such gases is overcome and prevented.

Another object of the invention is to provide improved means for controlling the operation of gas engines using such gases and the electric generators, when such are driven by such gas engines, and for controlling the operation of the gas washing apparatus employed in cleaning such gases.

In the drawings, 2 represents a gas-main in which the gases flow (in the opposite direction to that indicated by the arrow in Fig. 1) to the gas engines from a gasometer or gas-holder, or, when the gas holder is not employed, flow direct from the blast furnaces, gas producer, or other source of supply.

A rotary gas washer forming part of the gas washing plant is usually employed in cleaning the gases and is preferably located between the source of gas supply and the gas engines. Such rotary washers, which are practically pressure blowers, as they are adapted to increase the pressure of the gases on the discharge side above that on the inlet side of the washer are generally driven by an electric motor, which is indicated in the drawings by the numeral 3.

At a suitable location on the gas-main, preferably near the point where the gases are conducted through branch pipes leading from the gas-main 2 to the cylinders of the gas engines is a pivoted fire door 4 (shown dotted in its open position in Fig. 1 of the drawings). The door 4 is keyed or other-

wise secured to the shaft 5 so as to rotate or oscillate with the shaft, which is mounted in suitable bearings on the gas main. The shaft 5 is provided, on its end extending to the outside of the gas main, with a bell-crank having one arm 6 which is provided with a counter-weight 6[a] and a second arm 7. The end of the arm 7 is held in the position shown in the drawings by the pivoted trigger or latch 8, which is secured by a pin or shaft 9 to the bracket 10 on the side of the gas main 2. The latch 8 is adapted to hold the counterweighted bell crank and maintain the fire door 4 in its open position so as to permit the gases to flow through the gas main beyond the fire-door toward the gas engine cylinders or other place of use. The latch 8 is connected at one end to the solenoid core 11, the coil 12 of which is mounted on the bracket 10 on the side of the gas main. Also mounted on the gas main 2 and preferably at some distance from the fire door 4 (in one instance this distance being about 600 ft.) is a branch opening or hat pipe 13, which is closed by a flexible diaphragm 14. This diaphragm is adapted to be actuated by changes in the pressure of gases in the main and is arranged to hold the bridge piece 15 on the upper end of its stem 14[a] in engagement with the terminals 16[a], so as to complete and maintain a circuit through the wires 17, 17[a] which lead from the main wires 18, 18[a] and supply current to energize the solenoid coil 12 upon the bracket 10.

The main feed wires 18, 18[a] supply current through wires 19, 19[a] to the motor 3 which drives the rotary gas washer and connected in the circuit formed by these wires is a magnetic switch having a stationary contact 20 and movable contact 21. The movable contact 21 is arranged to be held in engagement with the contact 20 by the solenoid core 22 when the coil 23 forming part of this switch is energized.

The coil 23 is energized by current supplied through a shunt circuit formed by the wires 23[a], 23[a] leading from the wires 19, 19[a] and resistance 24 is introduced in the circuit formed by these wires to prevent overheating of the coil 23, this coil being energized during the time the motor 3 is in operation. The lower end of the solenoid core 22 is connected to a bell crank or lever 25 having a bridge piece 26 on its lower end which is arranged to engage with terminals 24[a] and cut out the resistance 24 when the core 22 is being moved into position in bringing the contacts 20 and 21 of the magnetic switch into engagement after such engagement has been broken to stop the operation of the motor. A switch 27 is provided to cut out the solenoid 23 and the motor 3 from the feed wires 18, 18[a] when desired.

The circuit through the solenoid core 23 is completed by means of a bridge piece 28 on the lower end of the core 29 for the solenoid coil 30. The bridge piece 28 engaging with terminals provided on the wires form a shunt circuit from the motor circuit to the coil 23. The coil 30 is connected by wires 30 and 31[a] with a battery 32 through the solenoid coil 33 and the bridge piece 34 on the upper end of the core 11 for the solenoid coil 12.

The ignition circuit for the gas engines formed by the wires 35 and 35[a] is completed by a bridge piece 36 on the end of the core 37 of the solenoid having the coil 33 and the circuit breakers 39, through which the current generated in driving the gas engine is transmitted to the bus bars are provided with solenoid coils 38 connected in parallel to the ignition circuit formed by the wires 35—35[a] of the power station. The coils 38 are provided with resistance 40 to prevent heating and the cores 41 on the solenoids formed by the coils 38 are provided on their upper ends with bridge pieces 42 by which the resistance 40 is cut out in actuating the solenoid core 30 after the circuit breakers have been tripped to cut out the generators with which they are connected to the bus bars.

A suitable ammeter 42 is provided in the circuit formed by the wires 31, 31[a] to show variations in the current supplied for actuating the solenoids connected with this circuit and to indicate variations from the normal current.

The gas main 2 is provided with explosion doors 43, cleaning doors, etc., at suitable points in its length and a cleaning door having a bell 44 is provided on the gas main below the fire door 4 to facilitate cleaning of the gas main at this point.

The seat 45 for the fire door 4 is provided with one or more annular grooves 46 in which asbestos or similar material is packed to form a gasket or seat for the door when in its closed position. The inner surface of the door 4 is provided with annular projections 47 which are adapted to register with the grooves 46 and be jammed into the asbestos in those grooves when the door is moved into its closed position and in this way maintain a tight joint to prevent passage of the gases past the door when the door is closed.

In the operation of my improved apparatus, when "back firing" occurs in the gas engine cylinders and there should be sufficient air mixed with the gases in the main to form a combustible or explosive mixture, the gases will be ignited and an internal explosion take place in the gas main 2. When this occurs, the pressure in the gas main is instantly increased and the diaphragm 14 will be actuated to break contact between the bridge piece 15 and the terminals on the wires 17, 17[a] and break the circuit leading to the solenoid coil 12. The

increased pressure in the gas main will act on the diaphragm 14 before reaching the fire door 4. When the circuit is broken to the solenoid coil 11, its core 12 drops and, through the latch 8 secured to its lower end releases the arm 7 of the bell crank on the pivoted shaft 5. The counterweight 6ª then swings the fire door 4 into its closed position before the effect of the explosion has reached this point in the gas main. When the door is closed, the effect of the explosion in the gas main passing this point is prevented and liability of the ignition of the large quantity of gas usually behind the fire door is overcome. The increase in pressure in the mains is relieved by opening of the explosion doors on the gas main.

When the core 12 is dropped by deenergizing the coil 11, the bridge piece 34 on its upper end is moved to break the circuit through the wires 31, 31ª so as to deënergize the coil 30 and the coil 33. When these coils become deënergized the core 29 is dropped to break the circuit leading to the motor 3 and the core 38 is dropped so as to break the ignition circuit formed by the wires 35 and 35ª which lead to the gas engine cylinders. The breaking of the circuit through the wires 35, 35ª also deënergize the coils 38 on the circuit breakers 39 and by the dropping of their cores 41 trip the circuit breakers and cut out the gas engine driven generators from the bus bars. When the circuit leading to the motor 3 is broken the core 20 connected into this circuit is deënergized and its core 22 drops so as to actuate the magnetic switch and break connection between the contacts 20 and 21 until such time as the coil 20 is again energized. After the effects of such an explosion have disappeared, the explosion doors 43 on the gas main are closed and the fire door is lifted (by hand) so as to be again held in its open position by the latch or trigger 8. The diaphragm moves back into position to again complete the circuit through the bridge piece 15 and wires 17, 17ª when the pressure of gases in the main is reduced to normal and the completion of this circuit again energizes the coil 12 and causes it to lift its core 11 and bring the bridge piece 34 on the upper end of this core in position to complete the circuit through the wires 31, 31ª. When this circuit is completed, the coil 33 and the coil 30 are again energized and caused to move their cores into position to complete, through the bridge piece 36, the ignition circuit leading to the engines and through the bridge piece 28 the shunt circuit leading to the electric motor 3. When the shunt circuit leading to the motor 3 is completed by raising the core 29 and bridge piece 28, the coil 20 becomes again energized and lifts its core 22 so as to move the movable contact 21 of the magnetic switch engagement with the stationary contact 20 and again supply current to the motor 3, causing the gas washer or washers to again begin operations.

The advantages of my invention will be apparent to those skilled in the art. The apparatus is simple and is easily kept in repair. By its use the possibility of explosions caused by back firing from the gas engine cylinders reaching to the gasometers or gas holder or beyond the fire door in the gas main is prevented and liability of damage to the apparatus is overcome. The occurrence of such explosions cause the generators driven by the gas engines to be instantly cut out from the bus bars and in this way damage to the generators is prevented. Such explosions also cause the ignition circuit to the gas engines to be broken and the engines to be stopped until the gases have been again restored to their normal pressure.

Modifications in the construction and arrangement of the parts may be made without departing from my invention.

I claim:

1. In apparatus of the character described, a gas main for conducting gases to a gas engine, a circuit breaker adapted to operatively complete the circuit leading from a generator connected to said gas engine, a fire door on the gas main arranged to close and prevent flow of gases therethrough, means actuated by a change in pressure in the gas main for closing said door and means adapted to trip said circuit breaker when the fire door is being closed.

2. In apparatus of the character described, a gas main for conducting gases to a gas engine, a circuit breaker adapted to operate to break the ignition circuit leading to said gas engine, a fire door on the gas main arranged to close and prevent flow of gases therethrough, means actuated by a change in pressure in the gas main for closing said door and means adapted to actuate said circuit breaker to break the ignition circuit to the gas engine when the fire door is being closed.

3. In apparatus of the character described, a gas main for conducting gases to a gas engine, a circuit breaker adapted to break the ignition circuit leading to said engine, a fire door on the gas main adapted to close and prevent passage of gases therethrough, means actuated by a change in pressure in the said gas main for closing said door, means arranged to break the ignition circuit of the gas engine connected to said gas main and means adapted to stop the rotary washer when said fire door is being closed.

4. In apparatus of the character described, a gas main for conducting gases to

a gas engine having a rotary gas washer therein, a fire door on the gas main arranged to close and prevent passage of gases therethrough, means operated by a change in pressure in the gas main for closing said door, and means arranged to stop the gas washer when said fire door is being closed.

In testimony whereof, I have hereunto set my hand.

GEO. BAEHR.

Witnesses:
JOHN FOX,
CHAS. J. BOYD.