No. 646,608. Patented Apr. 3, 1900.

W. W. RANDOLPH & A. G. GLASGOW.

SAFETY DEVICE FOR GAS PRODUCERS.

(Application filed May 11, 1898.)

(No Model.) 3 Sheets—Sheet 1.

FIG. 4.

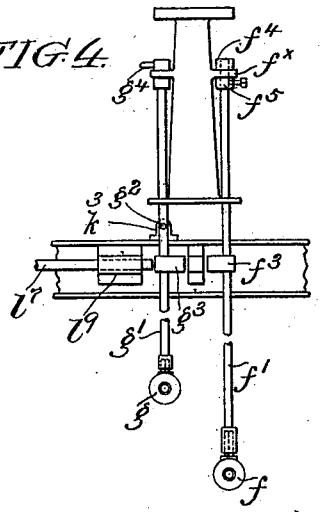

FIG. 1.

FIG. 5.

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(No Model.) 3 Sheets—Sheet 2.

FIG. 1a.

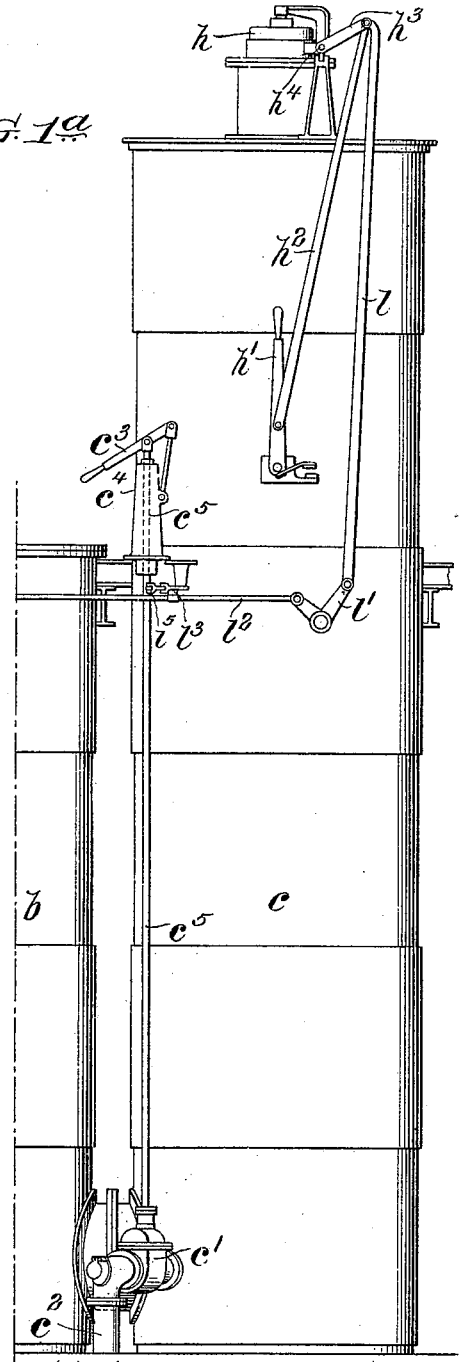
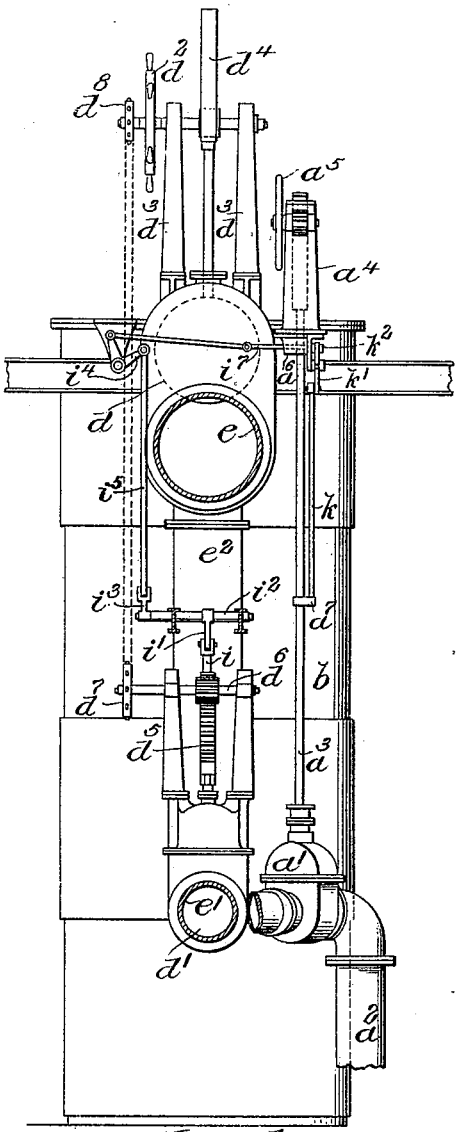


FIG. 2.



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SAFETY DEVICE FOR GAS PRODUCERS.

(Application filed May 11, 1898.)

(No Model.) 3 Sheets—Sheet 3.

FIG. 3.

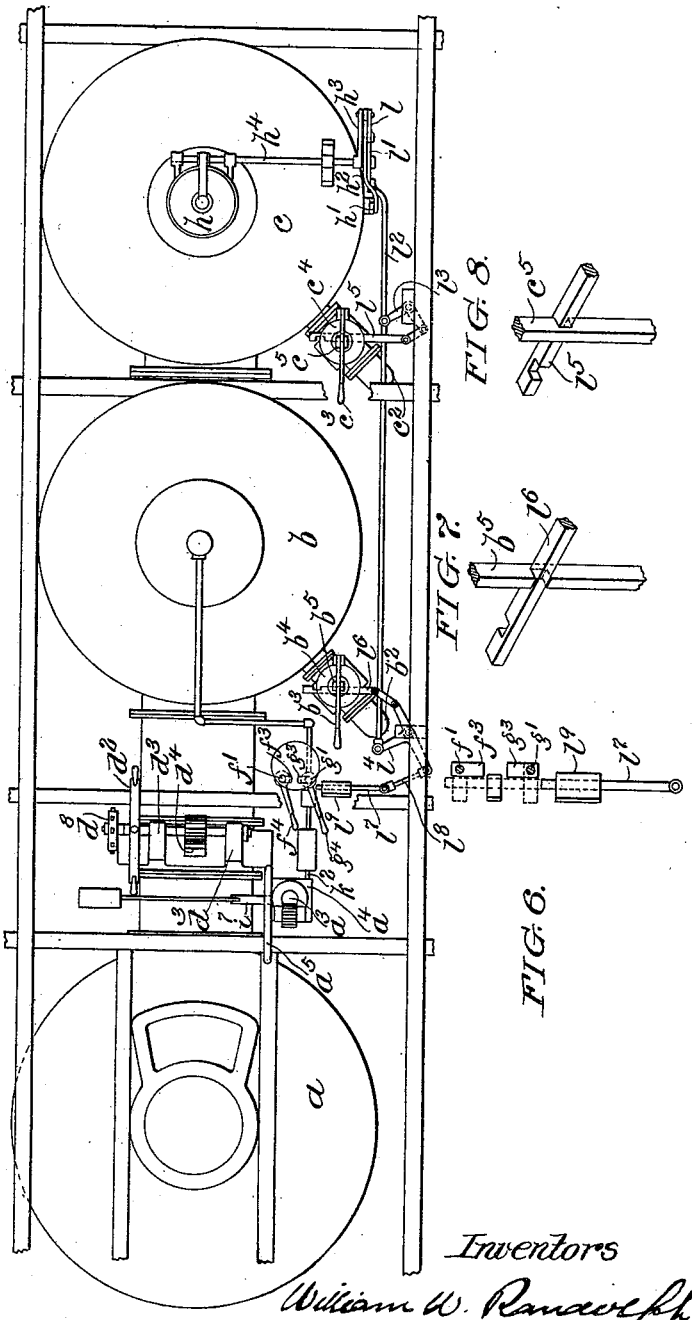

FIG. 8.

FIG. 7.

FIG. 6.

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UNITED STATES PATENT OFFICE.

WILLIAM W. RANDOLPH, OF NEW YORK, N. Y., AND ARTHUR G. GLASGOW, OF LONDON, ENGLAND, ASSIGNORS TO THE UNITED GAS IMPROVEMENT COMPANY, OF PHILADELPHIA, PENNSYLVANIA.

SAFETY DEVICE FOR GAS-PRODUCERS.

SPECIFICATION forming part of Letters Patent No. 646,608, dated April 3, 1900.

Application filed May 11, 1898. Serial No. 680,362. (No model.)

To all whom it may concern:

Be it known that we, WILLIAM W. RANDOLPH, residing in the city, county, and State of New York, and ARTHUR G. GLASGOW, residing in Westminster, London, in the county of Middlesex, England, both citizens of the United States of America, have invented certain new and useful Improvements in Safety Devices for Gas-Producers, of which the following is a true and exact description, reference being had to the accompanying drawings, which form a part thereof.

Our invention relates to improvements in safety devices for gas-producers of the kind referred to in the specification of our former British Letters Patent No. 23,904, dated the 27th of October, 1896, wherein there is an alternate production of water-gas and fuel-gas. As explained in the said former specification, there is danger of forming an explosive mixture in the apparatus by the air-blast mixing with the water-gas, and certain means are described for obviating this danger by interlocking the blast-valves, which control the admission of air to the various parts of the apparatus, with the valve through which the products of combustion are led away from the apparatus, usually termed the "take-off" or "stack" valve, owing to its being situated at the entrance of the stack. Now in some cases we find it advantageous to be able to operate the generator blast-valve independently of the stack-valve, and the object of our present invention is to provide means whereby this can be done, while at the same time we avoid liability to explosions by interlocking the said generator blast-valve with the oil-supply valve and with the gas-valves controlling the direction of make in the generator. We allow the stack-valve to remain interlocked with the other blast-valves of the apparatus, and we may also interlock the stack-valve with the steam or oil supply valves, or both. The steam-valve in such case may be arranged in such a manner that it can, if desired, be disengaged and operated by hand in the manner subsequently described, such disengagement, however, requiring the performance of a series of deliberate operations which preclude any possibility of its being effected inadvertently.

In order that our invention may be clearly understood and readily carried into effect, we will proceed to describe the same fully by aid of the accompanying drawings, in which—

Figures 1 and 1^a make up a side elevation of a gas-producer of the kind referred to, having our improved safety arrangements applied thereto. Fig. 2 is a sectional elevation on the line 2 2, Fig. 1. Fig. 3 is a plan of the gas-producer with certain parts omitted, showing a portion of the floor or staging usually erected above such a producer. Fig. 4 is a detached side elevation of the interlocking apparatus connected with the steam and oil valves. Figs. 5 to 8 are detail views, hereinafter referred to.

a, b, and c are respectively the generator, carbureter, and superheater of a carbureted water-gas plant.

a', b', and c' are the blast-valves which control the admission of air from the blast-pipes a^2, b^2, and c^2 to the parts a, b, and c. The first of these valves—namely, a'—is operated in the manner hereinafter described. The other two are operated, respectively, by means of levers b^3 c^3, mounted on pillars b^4 and c^4 and connected with their valves by rods b^5 and c^5.

d d' are the gas-valves by which the exit of gas from the generator a to the carbureter b, passing through the pipes e' e^2, is controlled. These valves are arranged to slide transversely of their pipes e or e', and the upper valve d is operated by a hand-wheel d^2, the spindle of which is mounted on pillars d^3 and carries a pinion engaging a rack d^4, connected to the valve d. The lower valve d' is operated by a rack d^5, which is engaged by a pinion on the shaft d^6 of a chain-wheel d^7, driven from a corresponding chain-wheel d^8 on the spindle of the hand-wheel d^2. It will be observed, Fig. 2, that the upper rack d^4 is in front of its pinion, while the lower rack d^5 is behind its pinion, and consequently the valves d d' move simultaneously in opposite directions, one opening while the other closes, in correspondence with a three-way cock, (not shown,) directing the admission of steam to the top or bottom of the generator, the arrangement of the gas-valves and the three-way steam-cock being similar to that de-

scribed in the specification of former British Letters Patent No. 19,753 of 1892.

f is a stop-valve controlling the admission of steam to the generator for the production of water-gas and is worked by a rotary movement of a rod f'.

g is a valve controlling the admission of oil to the carbureter for enriching the gas. This valve is operated by turning a rod g'. (See Figs. 1 and 4.)

h is the stack-valve by which the products of combustion are allowed to escape to the stack, (not shown,) this valve being operated by a lever h' through the medium of a rod h^2, connected to an arm h^3 on the pivot or axle h^4, which carries the valve.

The interlocking of the blast-valve a' and the gas-valves d d' is effected in the following manner: The valve a' is connected to a rod a^3, which extends upward into a pillar a^4 and is operated by a hand-wheel a^5 through the medium of a rack-and-pinion arrangement similar to that by which the valve d is operated from the wheel d^2, the rack, however being situated inside the pillar a^4. The rack d^5 of the lower valve d' is connected by a rod or link i to an arm i', fixed on a rocking shaft i^2 and from another arm i^3, Fig. 2, on this shaft to a bell-crank i^4 by means of a rod i^5. This bell-crank has secured to it a sliding locking-rod i^7, which projects into a block a^6, attached rigidly to the pillar a^4. The rod a^3 of the valve a' passes through this same block approximately at right angles to the rod i^7. Interlocking gaps or notches $i^\times$ $a^\times$, formed in the rods i^7 and a^3, respectively, as in Fig. 5, allow the valve a' to be operated by up-and-down movements of the rod a^3 so long as the lower gas-valve d' is closed and the upper gas-valve d consequently open, and these valves cannot be reversed until the rod a^3 has been pushed down to allow the rod i^7, connected with said valves, to move endwise through $a^\times$, at which time obviously the rod a^3 is prevented from moving and the blast-valve cannot be opened. This same arrangement of slotted rods can be applied in the interlocking of blast-valves with stack-valve, as subsequently described.

In the interlocking of the generator blast-valve with the oil-valve a lug a on the rod a^3 is connected by a rod k to a bell-crank k', which in turn is connected to the sliding rod k^2, working in a guide k^3 and adapted to enter a hole or eye g^2 in the rod g' when the valve a' is opened, thus preventing the turning of the rod g' and the opening of the oil-valve g. In the position shown in Fig. 1 the oil-valve g is open, and the rod k^2 cannot enter the hole g^2. Hence the opening of the generator blast-valve a' is prevented. In Fig. 4, however, the oil-valve has been closed, and the rod k^2 can therefore enter the hole g^2, thus allowing the blast-valve a' to be opened, locking the said oil-valve.

The interlocking of the blast-valves b' and c' with the stack-valve h is effected through the medium of a rod l, connected with the arm h^3 on the stack-valve axle. This rod l is connected to a bell-crank l', to which is coupled a rod or bar l^2, connected with a bell-crank lever l^3 and a three-crank lever l^4, as seen more clearly in Fig. 3. A pair of rods l^5 l^6, connected, respectively, with the levers l^3 and l^4, are brought into the position shown in Fig. 3 when the stack-valve h is closed. In this position (see Figs. 8 and 7) they enter notches, catches, or openings in the valve-rods b^5 c^5, thus preventing the latter rods being moved to open the valves b' c' as long as the valve h is closed. The rods l^5 l^6 are also provided with notches, as shown, which when these rods are moved by the opening of the valve h come opposite the rods b^5 c^5 and permit the latter to be raised to open the valves b' c', in which raised position they prevent endwise movement of the rods l^5 and l^6 and prevent closing of the valve h as long as either of the valves b' or c' is open.

When it is desired to interlock the steam and oil valve with the stack-valve, this may be effected through the medium of the three-armed horizontal lever l^4, Fig. 3, to which a locking-rod l^7 is connected by a link l^8. This locking-rod l^7 works in guides l^9, Figs. 3 and 4, and is adapted to pass or be blocked by projecting pieces or stops f^3 g^3, secured to the valve-rods, as indicated more clearly in Figs. 4 and 6. When the rod is pushed upward into the position indicated in dotted lines in Fig. 6, it prevents the stops assuming the position shown in dotted lines, and consequently prevents the valve-rods f' g' being turned by their handles f^4 g^4. In case, however, for any special reason it might be desired to open the steam-valve at this time without disturbing the other parts of the apparatus we arrange the valve-rod f' so that it can be raised sufficiently to allow its stop f^3 to clear the rod l^7. For this purpose the upper end of the rod f' is provided with a collar f^5, Fig. 4, secured to it by means of a set-screw in such a position that the said collar abuts against the lower side of a bracket $f^\times$ when the stop is level with the locking-rod l^7. As long, therefore, as the collar is in this position it is impossible to raise the valve-rod f' in the manner referred to. When, however, the collar is loosened by disengaging its set-screw, the valve-rod f' can be raised without difficulty until the stop f^3 is above, and rests upon the rod l^7 as the rod f' is turned to open the steam-valve. When the steam-valve is closed or the rod l^7 withdrawn, the rod f' drops automatically to its original level, and the two become again interlocked. Obviously when the stop f^3 is in the position shown in dotted lines it will prevent the movement of the rod l^7 to the right, and consequently the stack-valve cannot be opened, also, the sliding rod l^7 may be shortened, so as to omit the steam-valve and interlock only with the rod g' of the oil-valve.

The various parts of the apparatus not spe-

cifically described form no part of the present invention and are common to gas-producing plants of the kind referred to.

What we claim is—

1. In a gas-producer the combination of a generator blast-valve, a stack-valve, an oil-valve and a steam-valve with connections operating with the stack-valve, the oil-valve and the steam-valves respectively and adapted to interlock, as described to prevent the opening of the stack-valve when the oil or steam valves are open and to prevent the opening of the steam and oil valves when the stack-valve is open and connections operating with the blast and oil valves respectively and adapted to interlock as described to prevent the opening of either of said valves when the other is open.

2. In a gas-producer the combination of a stack-valve, a steam-valve, an oil-valve, means for interlocking said valves and means for disengaging said steam-valve while the other valves are interlocked, substantially as described.

3. In a gas-producer the combination of a blast-valve, a steam-valve, an oil-valve, means for interlocking said valves and means for disengaging said steam-valve while the other valves are interlocked, substantially as described.

4. In a gas-producer the combination of a generator, gas-outlet pipes leading from the top and bottom of said generator, gas-valves situated in said pipes, a blast-valve controlling the air-supply to said generator and means for interlocking said gas and blast valves substantially as described, and whereby the blast-valve is free to open only in one position of the gas-valves.

5. In a gas-producer the combination of a generator blast-valve, a valve-rod connected therewith, upper and lower gas-valves, means for operating these gas-valves simultaneously, a locking-rod adapted to engage said valve-rod and means for causing said locking-rod to be operated by said gas-valves.

6. In a gas-producer the combination of a stack-valve, a sliding rod, means for actuating said rod from the stack-valve, crank-levers connected with said rod, locking-rods connected with said levers, valve-rods connected with the air, oil and steam valves, and means for causing said locking-rods and valve-rods to interlock with one another.

7. In a gas-producer the combination of a gas-valve, an air-blast valve, a valve-rod for operating said blast-valve, a rod for locking said valve-rod, a rocking shaft, and means for transmitting motion from said gas-valve to said shaft and from said shaft to said locking-rod, substantially as described.

8. In a gas-producer the combination of a blast-valve, a blast-valve rod, a gas-valve, a steam-valve, a steam-valve rod, locking-rods one for each valve-rod, a rocking shaft and means for causing the gas-valve to operate the shaft and for causing the shaft to operate the locking-rods substantially as described.

In testimony whereof I, the said WILLIAM W. RANDOLPH, have hereunto set my hand this 5th day of May, 1898.

WM. W. RANDOLPH.

Witnesses:
W. H. MACOMBER,
IRVINE J. KIDNEY.

In testimony whereof I, the said ARTHUR G. GLASGOW, have hereunto set my hand this 14th day of April, 1898.

ARTHUR G. GLASGOW.

Witnesses:
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HERBERT D. JAMESON.