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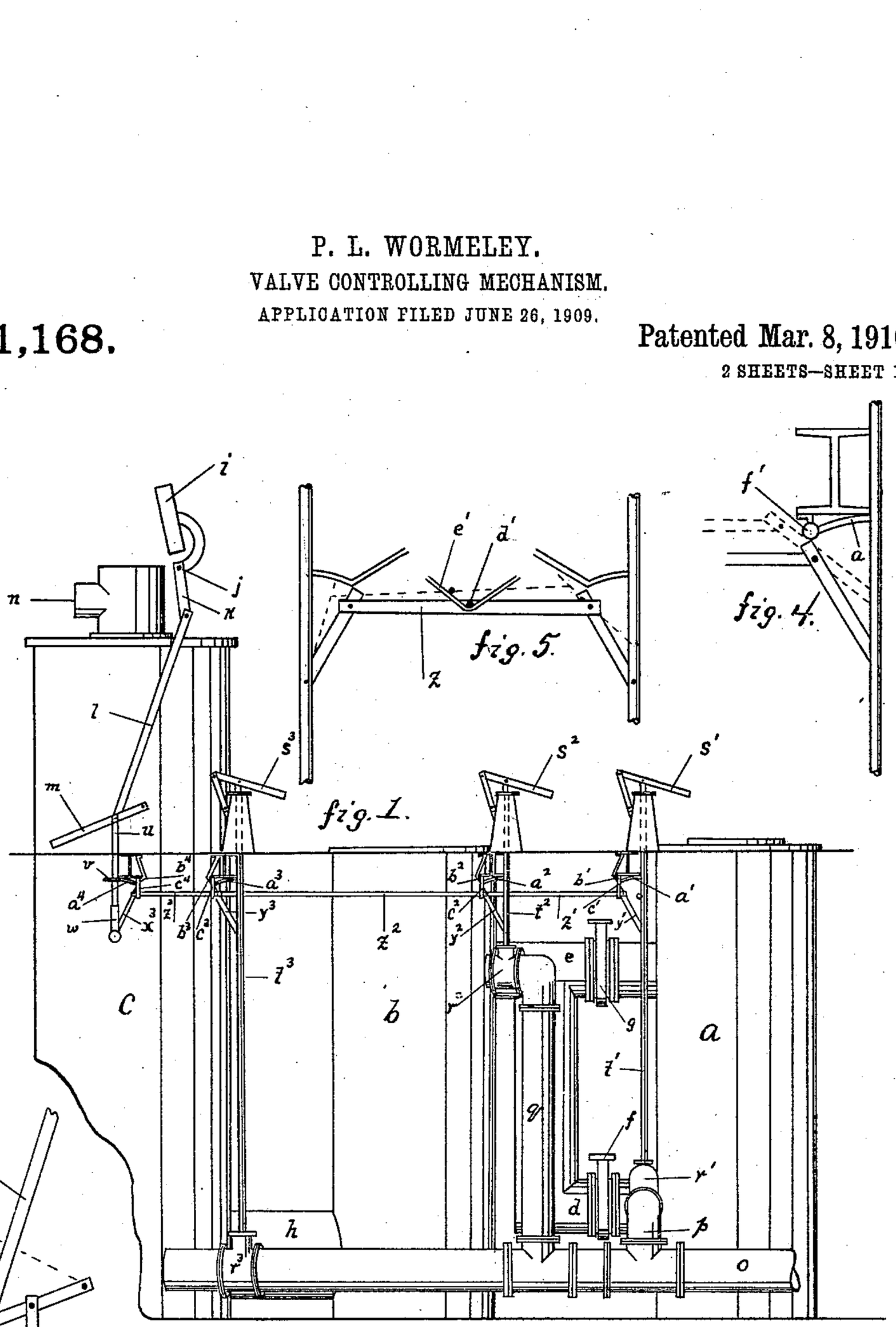
VALVE CONTROLLING MECHANISM.

APPLICATION FILED JUNE 26, 1909.

951,168.

Patented Mar. 8, 1910.

2 SHEETS—SHEET 1.



Witnesses

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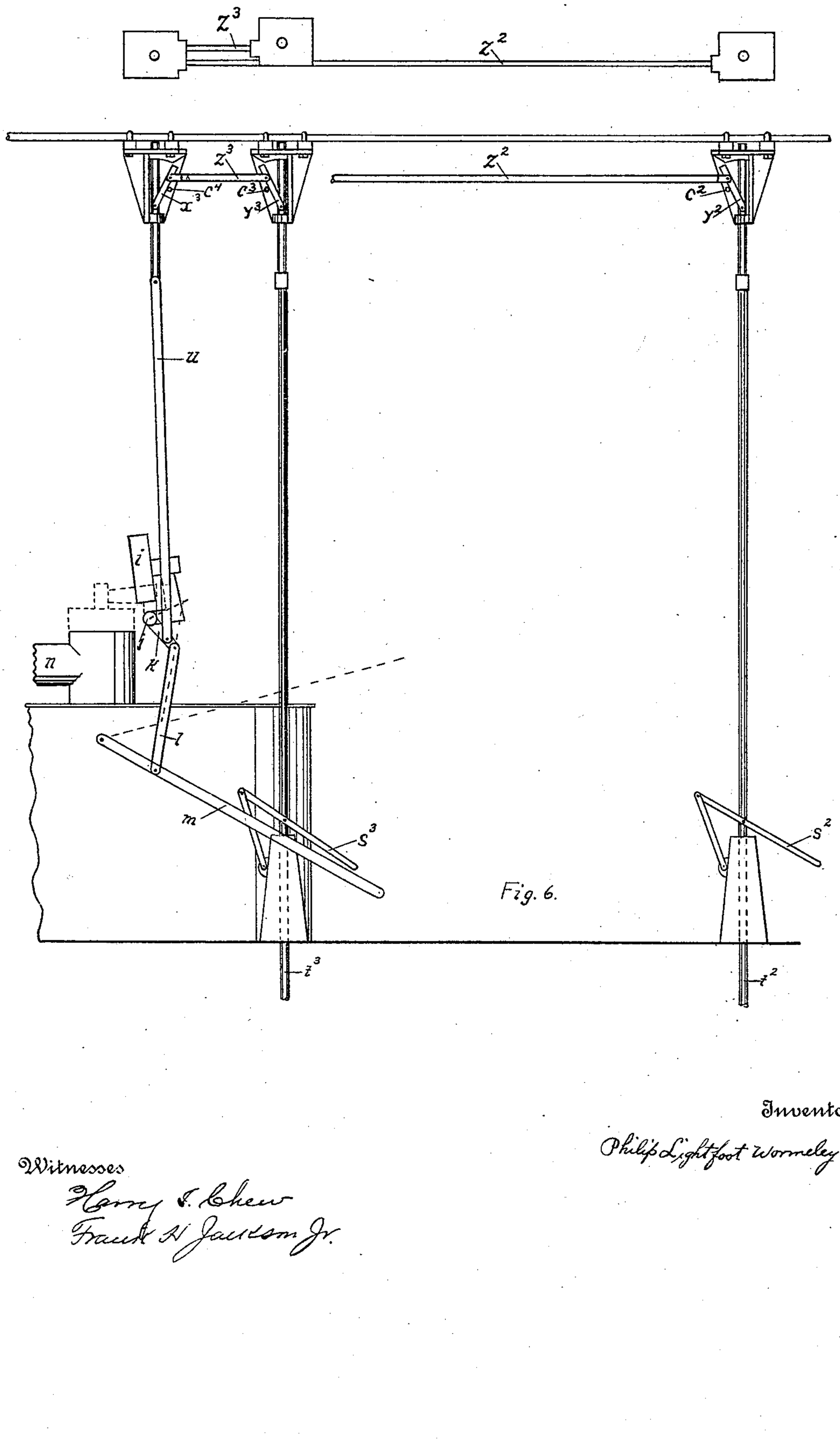

Fig. 6.

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VALVE-CONTROLLING MECHANISM.

951,168. Specification of Letters Patent. Patented Mar. 8, 1910.

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To all whom it may concern:

Be it known that I, PHILIP LIGHTFOOT WORMELEY, a citizen of the United States, residing at Washington, District of Columbia, have invented certain new and useful Improvements in Valve-Controlling Mechanisms, of which the following is a specification.

My invention relates to valve controlling mechanisms, and more particularly to interlocking devices whereby the opening or closing of one valve locks another valve against movement, and vice versa.

More particularly, the object of my invention is to provide an interlocking device which will prevent the possible formation of an explosive mixture of gas and air in the apparatus used in the manufacture of water-gas, and through which there is an alternate flow of gas and air.

In order to produce a suitable temperature in the apparatus, air is forced through the fuel in the generator and the products of combustion pass through the carbureter, superheater, and out through the stack valve. For the production of water-gas, the blast valves and stack valves are closed, steam is forced through the incandescent fuel in the generator, and the gas thus formed passes through the carbureter and superheater, and thence through the lateral opening just below the stack valve, to the condensers.

The object above referred to is accomplished by interlocking the stack valve with one or more of the blast valves in such a way that the opening of any one of the blast valves, locks and prevents the closing of the stack valves, so long as the said blast valve remains open or partially open; and the closing of the stack valve locks and prevents the opening of any one or more of the blast valves, so long as the stack valve remains closed or partially open.

With these objects in view, and such others as may hereinafter appear, my invention consists in the novel construction and combination of the various parts which will be pointed out and fully described in the appended claims.

In the drawings forming a part of this specification:—Figure 1 is an elevation showing a common form of water-gas apparatus, provided with an interlocking device embodying my invention. Fig. 2 is an enlarged view of a portion of the apparatus shown in Fig. 1, and Fig. 3 is a plan view of the device shown in Fig. 2, with the fork w revolved 90 degrees to the left. Fig. 4 is a modified form of abutment member, and Fig. 5 is a modified form of stirrup or guide. Fig. 6 shows the interlocking device bolted to roof truss and connecting the stack valve with carbureter and superheater blast valves.

a is a water-gas generator, connected to the carbureter b by the pipes d and e; f and g being valves in the pipes d and e by which either may be closed. The pipe h connects the carbureter b and superheater c. The stack valve i at the top of the superheater c, revolves about the horizontal shaft j, being operated by the actuating lever m in connection with the rods k and l. Water-gas passes through the side opening n when the stack-valve i is closed. The air-blast pipe o has branches p and q, and the blast valves r^1, r^2, and r^3 control the admission of air to the chambers a, b, and c respectively. The blast valves r^1, r^2 and r^3 are operated by the levers s^1, s^2 and s^3, which are connected to the valve stems or rods t^1, t^2 and t^3 respectively. The rod u has one end pivoted to the lever m (or to any other mechanism such as a hydraulic piston, used to actuate the stack valve i) and passes through a suitable bearing v, the construction being such that the rod u moves down or up, according as the stack valve i is being opened or closed by the actuating lever m. To the rod u are pivoted by means of the fork w, arms x^1, x^2 and x^3, and to the valve stems t^1, t^2 and t^3, are pivoted similar arms y^1, y^2 and y^3 respectively, these arms being pivotally connected to the ends of the rods z^1, z^2 and z^3 respectively, which latter are each pivotally connected to one of the arms x^1, x^2 and x^3. Just above the arms y^1, y^2 and y^3, and x^1 x^2 x^3, are abutment members having curved portions a^1, a^2, a^3 and a^4, the same being bent so as to form inclined surfaces b^1, b^2, b^3 and b^4, which act as guides or deflecting members for the ends of said arms, at which ends may be provided small wheels or rollers if desired. The members a^1, a^2 and a^3 are curved substantially in the arcs of circles whose radii are equal in length to the respective arms y^1, y^2 and y^3 plus necessary clearance; and the member a^4 is similarly curved with respect to the arms x^1, x^2 and x^3.

These abutment members are so placed that whenever one of the valves r^1, r^2 or r^3 is closed, its respective arm y^1, y^2 or y^3 is in position to swing into engagement with its abutment member a^1, a^2, or a^3, and as long as said arm and member are in engagement, the valve will be prevented from opening. Coöperating with the arms y^1, y^2 and y^3 are stirrups or guides c^1, c^2 and c^3, against which these arms rest when in the position shown in Fig. 2. These stirrups may be provided with roller bearings if desired. In this position said arms are clear of the locking portions of their respective abutments and the valves r^1, r^2 and r^3 are free to open. On the opening of any one of said valves by the upward movement of its valve stem, the arm slides along the deflecting member b^1, b^2 or b^3 which is inclined at an angle to the respective curved portion of the abutment, and is deflected outwardly from the valve stem with which it is connected. If now the valve is moved again to closed position, the arm engages with the adjacent stirrup or guide, and is thereby moved toward the valve rod and finally into position to be swung beneath the curved portion of its abutment. The members a^4 and b^4 and the stirrup or guide c^4 are similarly arranged with respect to the arms x^1, x^2 and x^3, except that in this case the arrangement is such that whenever the arms are in engagement with the member a^4, the stack valve i is locked in an open position, and whenever said arms are swung clear of said member, and into position for engagement with the member b^4, the valve i is free to close by an upward movement of the actuating lever m and the rod u. It will be noted further that the controlling mechanism for the valve i is reversely arranged with respect to that for the other three valves, and that the arms x^1, x^2 and x^3 are connected by rods z^1, z^2 and z^3 with the arms y^1, y^2 and y^3 respectively, in such a manner that when the arms x^1, x^2, x^3 are in engagement with the curved portion a^4 of the abutment, the arms y^1, y^2, y^3 are in engagement with the inclined portions b^1, b^2, b^3 of their respective abutments. Similarly when the arms x^1, x^2, x^3 are in engagement with the member b^4, the other arms are in engagement with the curved locking portions of their abutments. As a result of this arrangement, whenever the arms x^1, x^2, x^3 are deflected outwardly by the member b^4 on the closing of valve i, the arms y^1, y^2, y^3 are all deflected inwardly, their connected valves being locked in closed position. Similarly when any one of the arms y^1, y^2, y^3 is deflected outwardly on the opening of its valve, the respective arm x^1, x^2 or x^3 is deflected inwardly toward the rod u, and the valve i is locked in open position.

In the operation of the device, by raising the actuating lever m to close the stack valve i, the ends of arms x^1, x^2 and x^3 will immediately come in contact with and glide along the guide member b^4, thus throwing the ends of arms y^1, y^2 and y^3 under the abutment members a^1, a^2 and a^3 respectively. If now an attempt be made to open any one of the blast valves, say r^2, the end of arm y^2 will come in contact with the abutment member a^2, and make such movement impossible. If now the stack valve i is opened by lowering lever m, arms x^1, x^2 and x^3 will be guided to their original positions by the stirrup or guide c^4, and arm y^2 will assume its former position as indicated in full lines (Fig. 2). It is now possible to raise any one or all of the blast valves r^1, r^2 and r^3, but by raising any one of these valves, say r^1, the corresponding arm y^1 will immediately come in contact with and glide along the guide member b^1, thus throwing the end of arm x^1 under the abutment member a^4. Now if an attempt be made to close the stack valve i by raising lever m, the end of arm x^1 will come in contact with the abutment member a^4 and make such movement impossible.

In the modified form of abutment shown in Fig. 4, the angular deflecting member shown in the other figures is replaced by the roller f^1. This roller is pivoted at a point adjacent to the end of the locking member a, and it will readily be seen that when the arm disengages the locking portion of the abutment and the valve is moved, said arm will engage the roller and be deflected in substantially the same manner as in the form shown by the other figures. It will be understood that in this form the roller constitutes the deflecting member.

In the modified form of stirrup or guide shown in Fig. 5, the V shaped member e^1 is adapted to receive the pin or lug d^1 which is attached to the horizontal rod z. It is evident from the figure that the member e^1 coöperating with the pin or lug d^1, performs substantially the same functions as the stirrups shown in Fig. 2.

While I have described my invention as applied to the manufacture of water-gas, I do not limit myself to such application, nor to the precise details of construction set forth herein. The device is capable of use in various relations for controlling valves that are used for different purposes, and I do not limit myself solely to its use in connection with gas generators. It is also to be understood that the device is applicable to valves and valve stems arranged in any relative positions, and is not limited to an arrangement where the valve stems are parallel as shown. The exact form of the interlocking mechanism is evidently susceptible of wide variation within the scope of my invention, and the desired motion may be taken either directly from the valves, or from parts of the apparatus actuating, or

actuated by the said valves. Such variations are found necessary to meet the varying conditions of different installations.

What I claim is:—

1. In an interlocking valve mechanism, the combination with valves and a rod connected with each valve, of an arm pivotally connected with each of said rods, a cross-rod pivotally connected with said arms, and abutment members located adjacent to said arms and coöperating therewith to lock one valve in open position while the other is being moved to open or closed position, substantially as described.

2. In an interlocking valve mechanism the combination with valves and a rod connected with each valve, of an arm pivotally connected with each of said rods, a cross-rod pivotally connected with said arms, and abutment members located adjacent to said arms and coöperating therewith to lock one valve in closed position while the other is being moved to closed or open position, substantially as described.

3. In an interlocking valve mechanism, the combination with valves and a rod connected with each valve, of an abutment member located adjacent to each of said rods, an arm pivotally connected with each of said rods and adapted in one position of the rod to swing into position to engage a portion of its respective abutment member and lock its valve against movement, and a cross-rod pivotally connected with said arms and of such length that when either one of said arms is in position to engage the locking portion of its abutment the other arm is disengaged from its respective locking member and its valve is free to move, substantially as described.

4. In an interlocking valve mechanism, the combination with valves and a rod connected with each valve, of an abutment member located adjacent to each of said rods and constructed with a curved locking portion, an arm pivotally connected with each of said rods and adapted in one position of the rod to swing into position to engage the curved portion of its respective abutment member and lock its valve against movement, and a cross-rod pivotally connected with said arms and of such length that when either one of said arms is in position to engage the locking portion of its abutment the other arm is disengaged from its respective locking member and its valve is free to move, substantially as described.

5. In an interlocking valve mechanism, the combination with valves and a rod connected with each valve, of an arm pivotally connected with each of said rods, an abutment member adjacent to each of said rods and constructed with a locking portion curved substantially in the arc of a circle whose radius is approximately equal in length to the adjacent arm, said arm being adapted in one position of the rod to swing into position to engage said curved portion and lock its respective valve against movement; and a cross-rod pivotally connected with said arms and of such length that when either one of said arms is in engagement with the locking portion of its abutment the other arm is disengaged from its respective locking member and its valve is free to move, move, substantially as described.

6. In an interlocking valve mechanism the combination with valves and a rod connected with each valve, of an abutment member located adjacent to each of said rods, each of said abutment members being constructed with a curved locking portion and a deflecting member arranged at an angle to said locking portion, an arm pivotally connected with each of said rods and adapted in one position of the rod to swing into position to engage the locking portion of its respective abutment and lock its valve against movement, and a cross-rod pivotally connected with said arms and of such length that when one arm is in engagement with the locking portion of its abutment the other arm is in position to engage the deflecting member on its respective abutment and its valve is free to move, substantially as described.

7. In an interlocking valve mechanism, the combination with valves and a rod connected with each valve, of an abutment member located adjacent to each of said rods, each of said abutment members being constructed with a curved locking portion and a deflecting member, an arm pivotally connected with each of said rods and adapted in one position of the rod to swing into position to engage the locking portion of its respective abutment and lock its valve against movement; a cross-rod pivotally connected with said arms and of such length that when one valve is moved from its locked position its connected arm engages the deflecting member and forces the other arm into locked position, and means for guiding said first arm to its original position on a reverse movement of the valve, substantially as described.

8. In an interlocking valve mechanism, the combination with valves and a rod connected with each valve, of an abutment member located adjacent to each of said rods, each of said abutment members being constructed with a curved locking portion and a deflecting member, an arm pivotally connected with each of said rods, and adapted in one position of the rod to swing into position to engage the locking portion of its respective abutment and lock its valve against movement, a cross-rod pivotally connected with said arms and of such length that when one valve is moved from its locked position

its connected arm engages the deflecting member and forces the other arm into locked position, and a stirrup coöperating with said first arm to guide the same to its original position on a reverse movement of the valve, substantially as described.

9. In a gas generator the combination with the stack valve for taking off the products of combustion and an air valve for admitting air to the apparatus of a rod connected with each valve, an abutment member adjacent to each of said rods, an arm pivotally connected with said stack valve rod and adapted in one position of the rod to swing into position to engage a portion of its respective abutment member and lock said valve in open position, an arm pivotally connected with said air valve rod and adapted in one position of said rod to swing into position to engage a portion of its respective abutment member and lock its valve in closed position, and a cross-rod pivotally connected with said arms and of such length that when either of said arms is in position to engage the locking portion of its respective abutment, the other arm is out of position to engage its respective locking member, and its valve is free to move; whereby the stack valve is locked in open position at all times except when said air valve is closed and said air valve is locked in closed position at all times except when said stack valve is open, substantially as described.

10. In a gas generator, the combination with the stack valve for taking off the products of combustion and a plurality of air valves for admitting air to the apparatus, of a rod connected with each of said valves, an abutment member adjacent to each of said rods, a plurality of arms pivotally connected with said stack valve rod and each adapted in one position of the rod to swing into position to engage a portion of the respective abutment member and lock said valve in open position, said arms being equal in number to the number of air valves, an arm pivotally connected with each of said air valve rods and adapted in one position of the respective rod to swing into position to engage a portion of its respective abutment member and lock its valve in closed position, and a plurality of cross-rods respectively connecting each of said air valve arms with one of the arms on the stack valve rod, said cross-rods being of such length that when either of the connected arms of a pair is in position to engage the locking portion of its respective abutment the other arm is out of position to engage its respective locking member, whereby the stack valve is locked in open position at all times except when all of said air valves are closed, and all of said air valves are locked in closed position at all times except when said stack valve is open, substantially as described.

11. In an interlocking valve mechanism, the combination with valves and a rod connected with each valve, of a plurality of arms pivotally connected with one of said rods, an arm pivotally connected with each of said other rods, cross-rods pivotally connected with the arms on said first named rod and with said other arms, abutment members located adjacent to said arms and coöperating therewith to lock the valve connected with said plurality of arms, in open position while any of the other valves is in other than closed position, substantially as described.

12. In an interlocking valve mechanism, the combination with valves and a rod connected with each valve, of a plurality of arms pivotally connected with one of said rods, an arm pivotally connected with each of said other rods, cross-rods pivotally connected with the arms on said first named rod and with said other arms, abutment members located adjacent to said arms and coöperating therewith to lock the valves connected with said last named arms in closed position at all times except when the other valve is open.

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Witnesses:
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