No. 731,826. PATENTED JUNE 23, 1903.

G. T. VOORHEES.

AUTOMATIC GAGE COCK.

APPLICATION FILED OCT. 10, 1901.

NO MODEL.

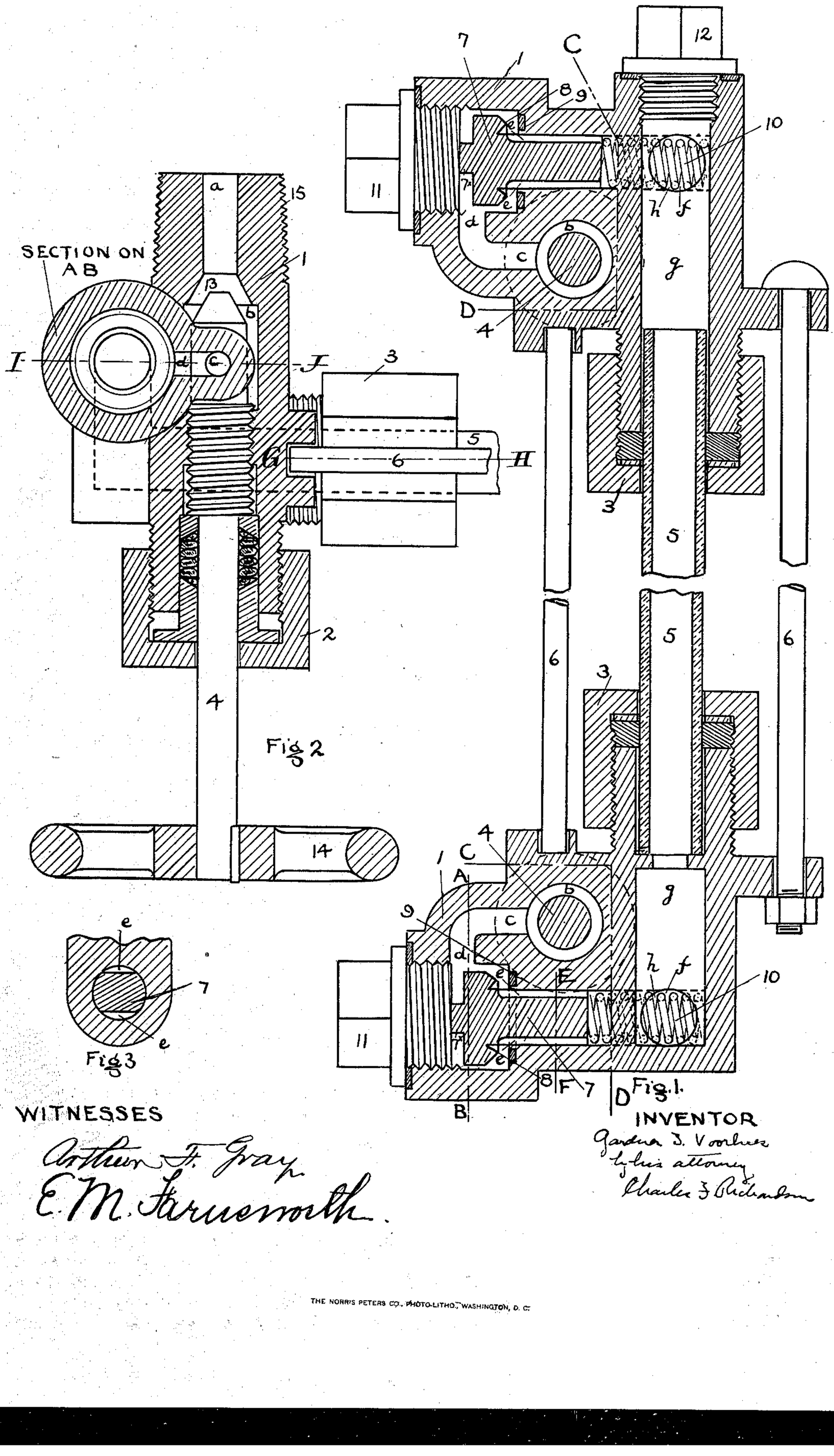

Fig 2

Fig 3

Fig. 1.

WITNESSES

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No. 731,826. Patented June 23, 1903.

UNITED STATES PATENT OFFICE.

GARDNER T. VOORHEES, OF BOSTON, MASSACHUSETTS.

AUTOMATIC GAGE-COCK.

SPECIFICATION forming part of Letters Patent No. 731,826, dated June 23, 1903.

Application filed October 10, 1901. Serial No. 78,178. (No model.)

To all whom it may concern:

Be it known that I, GARDNER T. VOORHEES, a citizen of the United States, residing at Boston, in the county of Suffolk and State of Massachusetts, have invented certain new and useful Improvements in Automatic Gage-Cocks, of which the following is a specification.

Figure 1 shows a cross-sectional elevation of my invention in two planes, that portion of the elevation to the right of line C D being in a plane G H of Fig. 2 through the longitudinal axis of the gage-glass 5 and the portion to the left of said line C D being in a plane I J of Fig. 2 through the longitudinal axis of the auxiliary valve 7. Fig. 2 shows a longitudinal sectional elevation of my invention in two planes through the main body portion 1 of the gage-cock, one plane passing through the longitudinal axis of the main valve 4 and the other indicated by line A B shown in Fig. 1, the auxiliary valve 7 being omitted for the sake of clearness; and Fig. 3 is a cross-section on line E F of Fig. 1 through the main body 1 and the piston part of the auxiliary valve 7.

In the process of artificial refrigeration a gage-glass is the only sure means for ascertaining the level of ammonia or other refrigerant liquid in a refrigerating apparatus, but its liability to breakage and the consequent escape of ammonia render its use dangerous. Numerous gage-cocks have been constructed for the purpose of automatically shutting off communication between the device to be gaged and the gage-glass when the gage-glass breaks; but their operation is defective in that they do not always close instantly and with certainty, because they are dependent simply upon the rush of the surrounding refrigerant liquid to carry the automatic valve to its seat, the pressure of the refrigerant liquid on all sides of the automatic valve remaining substantially the same until said valve is seated.

Now the principal feature of my invention resides in an auxiliary valve which when the gage-glass breaks has a certain and instantaneous closing movement that depends not upon a movement of the escaping refrigerant liquid, but upon a positive pressure acting on the auxiliary valve and being substantially equal to the difference between the pressure of the liquid on one side of the valve and that of the atmosphere on the opposite or seat side thereof. I obtain said closing movement by so designing said auxiliary valve that when the gage-glass breaks the pressure on the escape side of the valve immediately drops from that of the liquid to that of the atmosphere, and the excessive liquid-pressure on the opposite side of the valve instantly and quickly closes the valve. Another objection to valves previously constructed lies in the fact that their seats are ground seats, and if perchance a small particle of grit gets between a valve and its seat the former will be held open sufficiently to cause a bad leakage of any liquid or gas. I overcome this objection by a second feature of my invention. It consists in providing a valve with a continuous knife-edge and a valve-seat therefor of softer material—such, for instance, as lead. This construction insures an absolute closing of the valve.

A third feature of my invention comprises means whereby for the purpose of cleaning and the like an auxiliary valve can be removed from its gage-cock during the full operation of the device to be gaged—as, for example, a refrigerating apparatus.

In the drawings illustrating the principle of my invention and the best mode now known to me of embodying that principle, 1 is the main body portion of each of two gage-cocks, said portion being preferably a casting. It is provided with a packing device 2 and a stuffing device 3 for a main shut-off valve 4 and a gage-glass 5, respectively. Said main body portion of each gage-cock (see Figs. 1 and 2) has a passage *a* leading from without and opening into a main-valve chamber *b*. A second passage *c*, which extends outwardly therefrom, communicates with an auxiliary-valve chamber *d*. *g* is an outlet or a gage-glass chamber and is in communication with the auxiliary-valve chamber *d* through a passage *f* and a piston and spring chamber *h*. This chamber *h* is circular in cross-section and has mounted therein a spiral spring 10 and the piston of an auxiliary valve 7. The spring 10 abuts the rear wall of the spring-

chamber and also the adjacent face of the piston, while a small projection $7^{\times}$ on the face of the opposite end of the auxiliary valve is held in contact with a threaded plug 11 by the spiral spring 10, said face being at right angles to the axis of the piston and said spring being strong enough to overcome the friction between the piston and the walls of its chamber and hold the auxiliary valve away from its seat.

In order that there may be communication between the valve-chamber *d* and the gage-glass chamber *g* when the auxiliary valve is open, as shown in Fig. 1, the piston portion of the valve is cut away longitudinally. (See Figs. 1 and 3.) The channels so formed thereby are only large enough to permit the passage of the refrigerant to the gage-glass 5, all designed to allow the latter to perform its functions. The auxiliary-valve chamber *d* has a continuous soft-metal seat 9. To contact therewith is a continuous knife-edge 8, mounted on the auxiliary valve. The threaded plug 11 and the opening therefor in the gage-cock are provided for the purpose of gaining access to the auxiliary valve 7 and to remove and clean the same without removing the gage-cock from the device to be gaged. The axis of said plug is the same as that of the piston of the auxiliary valve, and its diameter is larger than that of said valve. These two gage-cocks are the same in construction and operation, except that one is adapted to be above the other and has an additional threaded plug 12 and an opening therefor, through which the gage-glass 5 may be inserted or removed. The gage-glass 5 opens into the two gage-glass chambers *g*, and the gage-cocks are provided with the usual guard-rods 6 and threaded portions 15. (See Fig. 2.) These rods 6 pass through holes in the flanges of the body portion 1 of the gage-cocks and are secured therein in any well-known manner, as by nuts and upset heads on the opposite ends of the rods, outside the flanges, for the purpose of protecting the gage-glass from injury by a blow from any source.

In the operation of my invention the liquid from the device to be gaged enters the lower gage-cock by passage *a*, (see Fig. 2,) passes main-valve seat 13 into chamber *b* and through passage *c* to auxiliary-valve chamber *d*. From here it passes along the channels *e e*, found between walls of the piston-chamber and the cut-away portions of the piston of the auxiliary valve 7, (see Figs. 1 and 3,) and into the spring-chamber *h* and then out through passage *f* into the gage-glass chamber *g*, from which it goes up through the gage-glass 5 and then in the reverse order through the upper gage-cock and back into the device to be gaged. The pressure exerted by the refrigerant liquid within the device to be gaged, the gage-cocks, and gage-glass is the same throughout thereof; but it exceeds that of the atmosphere. The moment the gage-glass for any reason breaks the pressure in the gage-glass chamber and spring-chamber of each gage-cock instantly drops to atmospheric pressure. The pressure against the face of the auxiliary piston, exposed in the spring-chamber, consequently falls and becomes that of the atmosphere. The liquid-pressure in the auxiliary-valve chamber remaining the same as before the breakage is greatly in excess of atmospheric pressure and acting in an opposite direction thereto on the face of the auxiliary valve instantly compresses the weak spiral spring 10 or its equivalent and snaps the auxiliary valve against its seat and firmly holds it there. Should there happen to be any grit in the path of the valve to its seat, the knife-edge 8 would instantly push it to one side, cut in two or force it into the soft seat 9 sufficiently to insure a tight joint.

To remove the broken gage-glass and reset the apparatus in operative position, shut the main shut-off valve 4 in each gage-cock. Remove the threaded plugs 11. This removal relieves the pressures within the auxiliary-valve chambers *d* and allows the spiral springs 10 to throw open the auxiliary valves 7. It also permits the removal of the auxiliary valves, &c. Next remove the plug 12. Substitute a new gage-glass for the broken one. Replace the plug 12 and also the plugs 11, and then open the main shut-off valve 4. Communication is thus reëstablished throughout the gage-cocks, gage-glass, and device to be gaged, and the apparatus is ready to repeat the above cycle of operations.

It will be plain to those skilled in the art to which my invention appertains that it can be embodied in many different forms without departing from the spirit thereof, and I desire to be understood as claiming my invention in the broadest manner legally possible.

What I claim is—

1. Two gage-cocks; a gage-glass opening into and operatively communicating with said gage-cocks; each of said gage-cocks comprising an auxiliary-valve chamber; an inlet to said chamber; a soft-metal valve-seat therein; an outlet-chamber; means of communication between said chambers; a piston-chamber opening into each of said chambers; an auxiliary valve provided with a continuous knife-edge to engage said soft-metal valve-seat; said auxiliary valve controlling communication between said outlet-chamber and said auxiliary-valve chamber.

2. Two gage-cocks; a gage-glass opening into and operatively communicating with said gage-cocks; each of said gage-cocks comprising an auxiliary-valve chamber; an inlet to said chamber, a soft-metal valve-seat therein; an outlet-chamber; means of communication between said chambers; a piston-chamber opening into each of said chambers; an auxiliary valve provided with a continuous knife-edge to engage said soft-metal valve-

seat, and also provided with a piston movably mounted in said piston-chamber; the free end of said piston always forming a portion of the wall of the outlet-chamber, and the auxiliary valve controlling communication between said outlet-chamber and said auxiliary-valve chamber.

3. Two gage-cocks; a gage-glass opening into and operatively communicating with said gage-cocks; each of said gage-cocks comprising an auxiliary-valve chamber; an inlet to said chamber and controlled by a main shut-off valve; a soft-metal valve-seat therein; an outlet-chamber; means of communication between said chambers; a piston-chamber opening into each of said two chambers; an auxiliary valve provided with a continuous knife-edge to engage said soft-metal valve-seat, and also provided with a piston movably mounted in said piston-chamber; the free end of said piston always forming a portion of the wall of the outlet-chamber; and said auxiliary valve controlling communication between said outlet-chamber and said auxiliary-valve chamber.

4. Two gage-cocks; a gage-glass opening into and operatively communicating with said gage-cocks; each of said gage-cocks comprising an auxiliary-valve chamber; an inlet to said chamber; an outlet-chamber; means of communication between said chambers; a piston-chamber opening into each of said chambers; an auxiliary valve; said auxiliary valve controlling communication between said outlet-chamber and said auxiliary-valve chamber; and means whereby upon a closing of said auxiliary valve there is a knife-edge contact between said auxiliary valve and its seat.

In testimony whereof I affix my signature in presence of two witnesses.

GARDNER T. VOORHEES.

Witnesses:

ARTHUR F. GRAY,

E. M. FARNSWORTH.