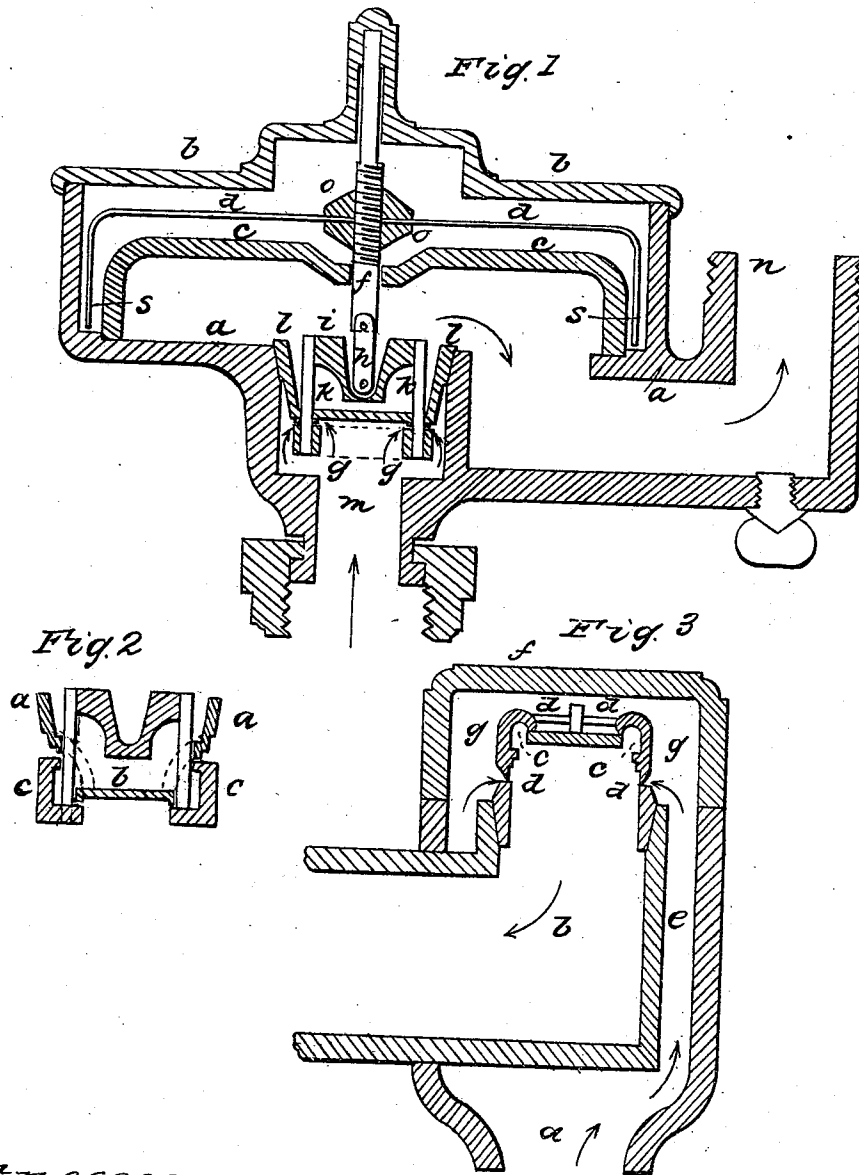


H. WATERMAN.

Gas Regulator.

No. 14,893.

Patented May 13, 1856.



witnesses
 Henry J. Prins
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UNITED STATES PATENT OFFICE.

HENRY WATERMAN, OF HUDSON, NEW YORK.

GAS-REGULATOR.

Specification of Letters Patent No. 14,893, dated May 23, 1856.

To all whom it may concern:

Be it known that I, HENRY WATERMAN, of the city of Hudson, county of Columbia, State of New York, have invented a new and useful Improvement in the Method of Regulating and Governing the Pressure of Gas in the Branch or House Pipes; and I do hereby declare that the following is a full and exact description of the same, reference being had to the accompanying drawings and to the letters of reference marked thereon.

The nature of my invention consists in providing a machine that is worked by the united forces of the house and street pressure at the same time, and to accomplish this I use the common floating disk, sealed with quick silver (or other fluids) and attach to it a valve of peculiar construction. that is assisted in its operations by; and receives the full force on its lower surface of the varying pressure of gas in the street mains or pipes, while at the same instant the floating disk or gasometer is elevated or depressed by the increased or diminished pressure of the gas in the branch or house pipes. By this process I open and close the valve of my machine so as to admit only a required amount of pressure in the house or branch pipes and produce a uniform escape at the burners.

To enable others skilled in the art to make and use my invention I will proceed to describe its construction and operation.

Figure 1, is a vertical section of the most common form of my improvement. Fig. 2, is a modification of the valve used when greater orifice is required between the faces. Fig. 3, is another modification of the valve used when there is a liability to stoppage from deposits of tar oil, &c.

Letters *a, a*, of Fig. 1, represent the lower exterior part which is made of cast iron; *b, b*, the upper exterior or cap also made of cast iron; *c, c*, represents an inner partition made of the same material as *a, a*, and *b, b*, and is used for the double purpose of forming the quicksilver well between its outer side and the inner surface of *a, a*; and to separate the chamber in which the floating or

disk *d, d*, operates from the space or passage below through which the gas passes to the house. Letter *f* represents the spindle which connects the valve and floating disk or gasometer; the disk *d, d*, is attached near the upper end at the points *o, o*, to the spindle *f*; and the valve *g, g*, is connected at the extreme lower end by means of the link *h*, and the parts *i*, and *k*; so that when the gasometer *d, d*, is moved upward or downward the valve *g, g*, has a corresponding motion. The lower edge of the gasometer *d, d*, is immersed in quicksilver contained in the well or space *s, s*. Letters *l, l*, represent the shell of the valve seat on the lower face of which there is an annular or ring shaped opening usually about one tenth of an inch in the clear through which the pins *k, k*, pass and connect to the valve *g, g*. This valve is also made in a ring or annular shape, and in its motion upward closes the opening or orifice in *l, l*, so as to regulate or govern the quantity of gas flowing from the street mains to the house or branch pipes; *m*, is the inlet and *n*, the outlet through which the gas passes in the direction indicated by the arrows or darts.

Letters *a, a*, Fig. 2, represent the shell of another modification of a valve which I make when I require greater capacity than the annular or ring valve is capable of; I do this without changing the relative diameters of the inner and outer valve faces, by lowering or separating vertically the part *b*, from the part *a*, to which it is attached; *c, c*, represents the valve and is made to conform to the faces or beat of the shell *a*, and is connected to the gasometer or disk in the same manner as represented in Fig. 1.

Fig. 3, represents a vertical section of the valve used when there is a liability to stoppage by deposits of tar oil, &c. *a*, shows the inlet and the arrows indicate the direction in which the gas passes upward between the passage *b*, and the outer casing *e*—thence through the valve *c, c*, at the point *d, d*, and downward through the passage *b*, to the house or branch pipes. The cap *f* is made to cover the chamber *g, g*, and is constructed with particular regard to facility in

removing it, so that the valve *c, c,* can be adjusted, cleaned, &c., without disturbing or disconnecting the regulator.

The importance and utility of regulating or governing the varying pressure of gas as it flows from the street mains to the house or branch pipes so as to produce a uniform flow at the burners is well known and various methods have been devised and used to effect that purpose. "The Clegg regulator" or "governor" is among the first and best of these inventions and is similar in its principle and construction to the one described in Fig. 1, of this specification; with the important difference, that the valve *g, g,* of Fig. 1 is an annular or ring form having great circumferential capacity in proportion to its area; while in the "Clegg regulator" it is a simple disk or puppet valve connected with the gasometer, and is acted upon by the varying pressure of the mains causing the following difficulty, viz.—the action of the gas in the main upon the lower side of the valve assists to close it; and it was usually found that as the pressure of the main increased, the pressure of branch diminished; this was caused by too great a pressure upon the lower side of the valve; this difficulty was sought to be remedied by increasing the relative size of the gasometer, and perfection was nearly attained thereby. Now it is an essential element of my theory that this form or principle is capable of the most perfect approximation to equable action when a proper proportion between the area of disks of gasometer and valve is used than any other that has ever been devised. When this proportion was attained in the "Clegg regulator" it was found to have such a diameter of gasometer as to be expensive and cumbersome. The recent inventions of Walter Kidder and Dixwell and Dorr are designed to remedy this difficulty of using a large gasometer, by substituting for the common "puppet valve," a "balanced valve;" these are ingenious and important improvements; but for the following reasons I do not consider them perfect in their action.

If the valve is moved by the action of the gasometer alone and the pressure of the gas in the main is say one half inch above the required pressure in the branch and there are a large number of burners lighted—say (100) one hundred, the valve may require to be open—say (2.05) two and five one hundredths of an inch to pass the requisite quantity of gas; now if the pressure in the main should be increased to (2½) two and one half inches above the required house pressure it is evident that the valve will close to a point (.05) five one hundredths of an inch to pass the same amount of gas. If

the valve is balanced it is evident there must be an increased pressure in the branch to raise the gasometer sufficiently. Now if the varying pressure of gas in the main is used as it is in "Clegg's regulator" and in my invention to assist the disturbance of gasometer and valve just in its proper proportion then I conceive the nearest approach of equable pressure in the branch may be attained.

It is the principal feature of my invention to use the moderately small gasometer and to connect it as heretofore described to an annular or ring valve that shall have a small area yet of proper proportion to the area of disk of the gasometer, so that the valve may have great circumferential capacity or discharge by the least motion or disturbance.

The parts *g, g, i* and *h,* which form what I call the valve, I make in such manner as to proportions of weight that the point of connection with the link *h* shall be as near as possible the center of gravity of the valve, so that when the level of the apparatus is disturbed by change of position of meter to which it is usually attached it will not require increased force from the floating and consequent increased pressure in the branch (which I am by every means seeking to avoid) to raise the valve against the seat.

I have found by repeated experiments with a gasometer and valve combined, acting as herein described that when the area of the disk of the gasometer to the area of the valve is as (82 to 1) eighty two to one an approximation of equable pressure is attained that does not shown in practice an appreciable difference or deviation under the varying changes of pressure in the mains. In accordance with this I make the gasometers of my large machines (7.5) seven and five tenths inches in diameter; the annular opening in the valve (1.75) one and seventy five hundredths of an inch in diameter—area (.68) sixty eight one hundredths. Now if the area I use in my annular valve were placed in a simple disk or puppet valve its diameter would be only (.98) ninety eight hundredths. This limited circumferential capacity would require (3.7) three and seven tenths times greater motion to open a given orifice; and at the same time require a much greater disturbance of gasometer and branch pressure: Thus my improvement will be readily seen.

As I before stated I sometimes remove that portion of the valve shell which has upon it the inner valve face out of same plane in a vertical direction to a distance corresponding to about one fifth the diameter of valve; this allows greater capacity of passage in the annular valve when required, without changing in the least the actuating

principle I have heretofore described. I also use in connection with this annular valve an elastic disk or disks of leather, cloth, &c., in place of the heretofore described floating gasometer.

What I claim is—

The construction of the valve of the gas regulator in the annular or ring form with two faces or teats of different diameter one
10 at the outer and one at the inner periphery

or edge so as to produce greater circumferential capacity or opening for discharge of gas with a limited area of valve relatively, working in a manner and for the purpose herein set forth.

HENRY WATERMAN.

Witnesses:

HENRY D. TOWNSEND,
SALMON SKINNER.