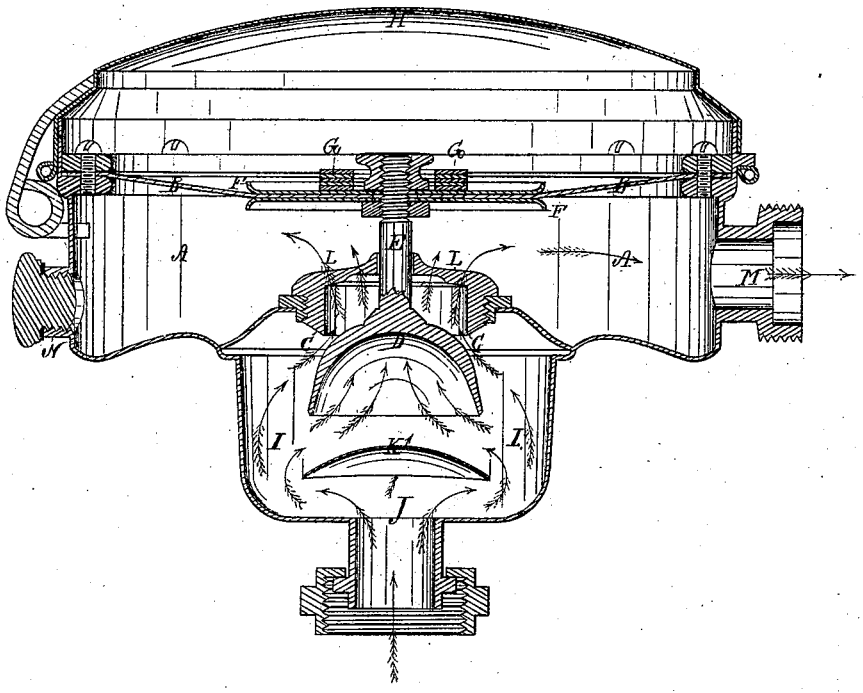
F. E. VAIL.
Gas-Regulator.

No. 207,832. Patented Sept. 10, 1878.



Witnesses.
L. A. Miller.
Herbert Wadsworth

Inventor
Frank E. Vail
by A. K. Stevens
his atty

UNITED STATES PATENT OFFICE.

FRANK E. VAIL, OF CHELSEA, MASSACHUSETTS.

IMPROVEMENT IN GAS-REGULATORS.

Specification forming part of Letters Patent No. **207,832**, dated September 10, 1878; application filed July 8, 1878.

To all whom it may concern:

Be it known that I, FRANK E. VAIL, of Chelsea, Suffolk county, Massachusetts, have invented certain Improvements in Gas-Regulators; and that the same are fully described in the following specification and illustrated in the accompanying drawing.

The object of my improvement is to equalize and regulate the pressure of coal or other gas as it is supplied to the burners, so as to prevent waste by an excessive pressure, and to cause a uniform, steady flame under all circumstances.

My invention consists in the combination of the gas-chamber, valve, valve-seat, and stem with a guide or bridge spanning the valve-seat, and insuring the proper closing of the valve thereon, and a deflecting-plate.

It also consists in the combination of the annular valve-seat with a valve supported by the diaphragm, and made concave or open on its under side, and a deflecting-plate, to receive the flow of gas.

It also consists in a deflecting-plate, placed between the inlet and valve, serving to check the direct flow of gas and prevent, to a great degree, the deposit of impurities on the valve and diaphragm.

The accompanying drawing represents, in vertical section, a gas-regulator embodying my improvements.

A is the gas-chamber, comprising that part of the instrument between the diaphragm B and the valve-seat C. D is the valve, suspended from the diaphragm by a stem, E, secured to the compression-plates F F above and below the diaphragm. Upon these plates the loading is placed, sufficient in amount to counterbalance the desired gas pressure, and applied, preferably, in the form of thin disks or flat rings of sheet metal, G, weighing, perhaps, half an ounce each, so that any desired weight may be used in such a manner as not to be easily shifted from a central position.

A tight-fitting cover, H, adapted to be secured in position by a padlock or otherwise, protects the diaphragm from injury, and prevents tampering with the loading by unauthorized parties. An air-space is also formed thereby beneath the cover, which gives increased elasticity to the diaphragm.

I represents the valve-chamber, to which the gas is admitted through an inlet, J, provided with suitable couplings to adapt the regulator for use upon meters of various sizes. Near the base of this chamber I place a broad deflecting-plate, K, turned downwardly at the edges, to intercept the incoming current of gas and break its force. By thus directing the flow downwardly and against the walls I, impurities in the gas will, to a great extent, be deposited on said walls and plate K rather than upon the valve or diaphragm. Such impurities may be withdrawn from time to time by removing the plug N when the gas is shut off. M indicates the exit-port for the gas in the ordinary use of the machine.

The diaphragm, the valve, the valve-seat, and a guide for its stem require a more extended description, since each is the subject of my present improvements.

The diaphragm B is composed of a thin and highly flexible vegetable membrane, which I term "vulcanized fiber," which is absolutely impervious to gas or the vapors of petroleum, naphtha, &c., and does not become either hardened or weakened by exposure to the pressure or the impurities of gas; but its flexibility and softness increase with use, owing to the lubricating action of the mineral oil in the gas upon the vegetable membrane of which the diaphragm is composed.

It consists of a sheet formed of vegetable fiber reduced to a pulp and subjected to powerful chemical treatment in a bath of the chlorides of zinc, tin, calcium, or magnesium, to liberate the resinous or gummy matter, and subsequently treated with a solution of glycerine, to give pliability and softness to the sheet, and vulcanized. By this process the fibrous portion only of the original stock remains, and these fibers are compacted, so as to form an impervious sheet, and softened by the glycerine treatment, so as to be perfectly adapted to my purpose.

I prefer to employ two thicknesses of this material, and I clamp them firmly together at the center between the plates F F, and at the circumference between flanges F′ F′, secured in position by screws.

I expressly disclaim the use of sheets of rubber, leather, parchment, paper, or pliable

ble metal, which have been heretofore used for a like purpose.

The valve D is formed of sheet metal or other suitable material, concave or bell-shaped, and open on its under side, to receive the gas as it passes the deflector, so that the impulse of the current shall tend, automatically, to lift the valve into contact with its seat, and thus render its action more sensitive to changes of pressure than would be possible with the ordinary globe or solid valve. Its upper surface is circular in cross-section and finished perfectly smooth, so as to fit its seat accurately. To retain this fine finish and avoid the injurious effects of corrosion, I nickle-plate the valve, thereby adding greatly to the durability and efficiency of the apparatus.

The valve-seat C is an annulus, sharpened around its lower edge, to present the most limited surface possible, so that contact with the valve shall not be prevented by any particles of matter deposited thereon, nor shall the two adhere because of the presence of any impurities. The upper part of the valve-seat is spanned by a bridge or guide-piece, L, perforated at its exact center to receive, and serve as a guide for, the stem E as it rises and falls with the varying pressure of the gas. The advantage of this location of the guide is, that being formed integral with or firmly secured to the valve-seat, their centers coincide perfectly, and the valve, guided by the bridge L, will invariably close accurately and be held so as not to vibrate. The bridge also serves as a handle or thumb-piece by which the annular valve-seat may be screwed into or out of its place. Without such an attachment this work is attended with considerable difficulty.

With a guide secured to any other part each guide must be separately fitted to the machine in which it is to be used to bring its center into coincidence with that of the valve-seat.

I claim as my invention—

1. The combination of the case, the diaphragm, and the valve with a guide, L, for the valve-stem, secured to the valve-seat, and a deflecting-plate, substantially as set forth.

2. The combination of the case and diaphragm with a valve having an open or concave under surface and a deflecting-plate to receive the flow of gas, substantially as and for the purpose set forth.

3. The deflecting-plate K, having its edges turned downwardly, in combination with the valve and diaphragm of a gas-regulator, substantially as set forth.

FRANK E. VAIL.

Witnesses:
A. H. SPENCER,
E. A. PHELPS.