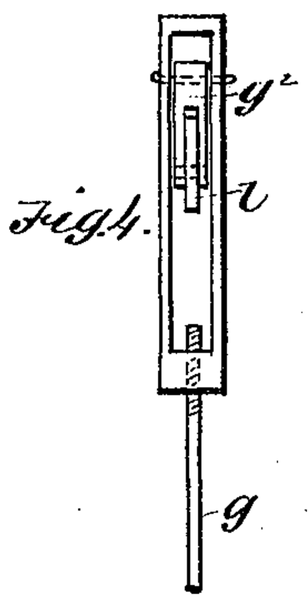
P. NOYES.

Gas Pressure Regulator.

No. 234,421. Patented Nov. 16, 1880.

Fig. 4.



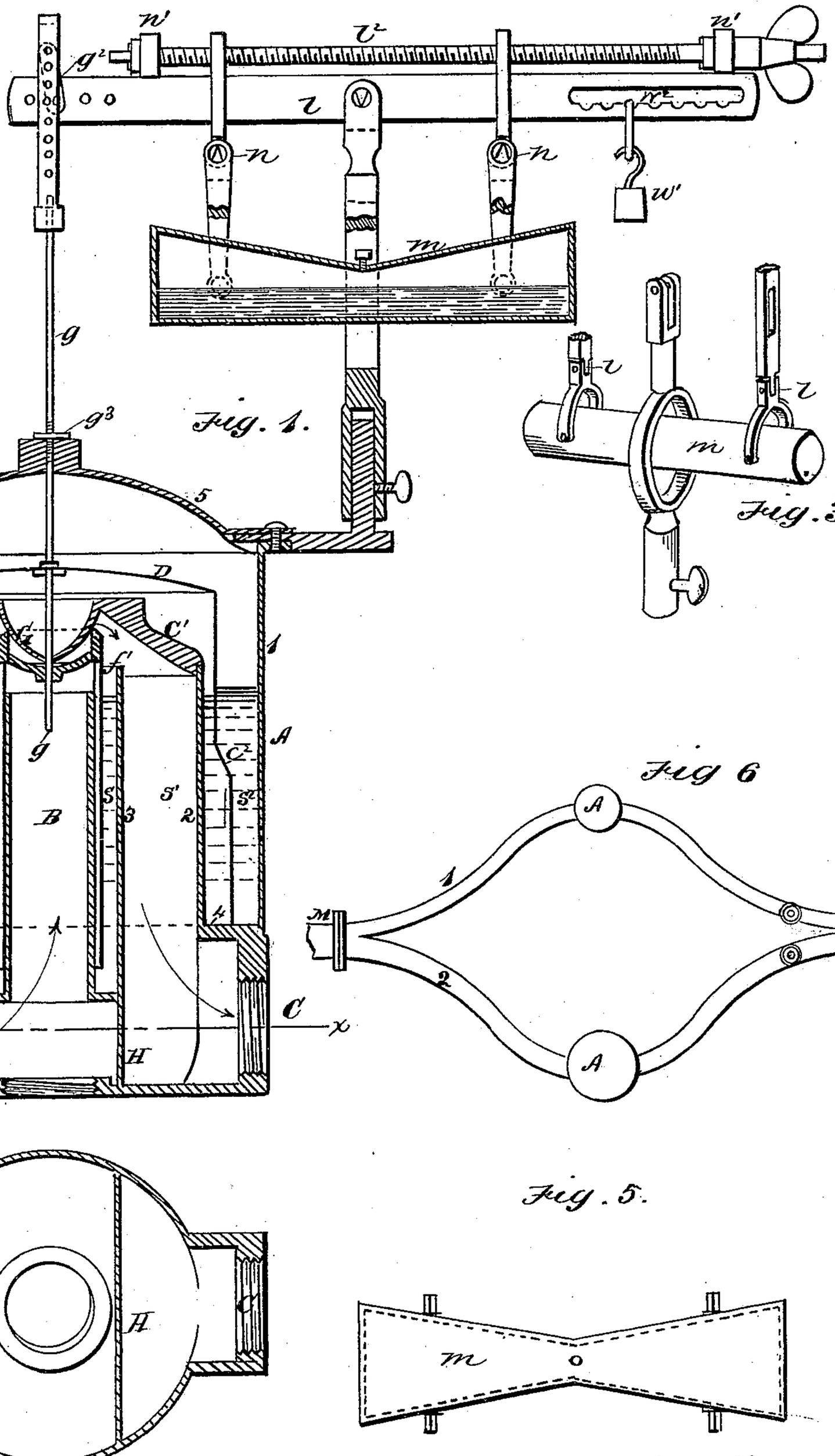


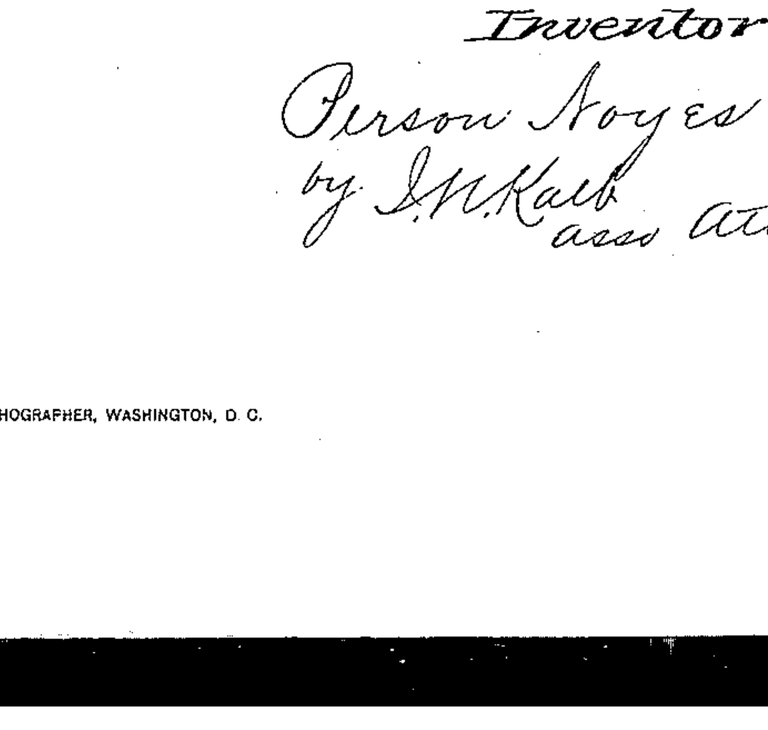
Fig. 1.

Fig. 3.

Fig. 2.

Fig 6

Fig. 5.



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UNITED STATES PATENT OFFICE.

PERSON NOYES, OF LOWELL, MASSACHUSETTS.

GAS-PRESSURE REGULATOR.

SPECIFICATION forming part of Letters Patent No. 234,421, dated November 16, 1880.

Application filed March 19, 1879.

To all whom it may concern:

Be it known that I, PERSON NOYES, of Lowell, in the county of Middlesex and State of Massachusetts, have invented certain Improvements in Gas-Pressure Regulators, of which the following is a specification.

This invention relates to gas-pressure regulators for street-mains and other large pipes or conduits for gas in which the regulator is composed of a casing through which the gas passes, having a rigid valve-seat, a floating inverted cup or holder adapted to be raised or supported by the pressure of the gas in the pipes intervening between the regulator and the burners, and a valve supported by and floating with the holder, and adapted to close upwardly against the valve-seat to shut off the flow of gas through the regulator. In this class of regulators it is desirable that the floating holder should exert a pressure upon the gas in the pipes between the regulator and the burners, and such pressure should increase as the quantity of gas passing increases, and vice versa, so as to compensate for the obstruction to the flow of gas resulting from the friction of the gas on the pipes, the friction increasing with the quantity passing.

My invention has for its object, particularly, to provide improved means for automatically varying the pressure of the floating holder upon the gas; and it consists, mainly, in an adjustable automatic regulating device and in certain details of construction, all of which I will now proceed to describe and claim.

Of the accompanying drawings, forming a part of this specification, Figure 1 represents a sectional view of a gas-pressure regulator embodying my invention. Fig. 2 represents a section on line *x x*, Fig. 1. Fig. 3 represents a perspective view of a portion of the compensating device. Fig. 4 represents an elevation of a modification of the same. Fig. 5 represents a plan view of the suspended tube. Fig. 6 is a plan view of a gas-main with the pressure-regulators in position.

Similar letters of reference indicate like parts in all the figures.

In the drawings, A represents the casing of a gas-regulator, the same being composed preferably of an outer wall, 1, two inner walls, 2 3, (one within the other,) a bottom, 4, cast with the walls, and a closely-fitting cover, 5, applied to the outer wall. The walls 1, 2, and 3 are concentric with each other; but the inner walls, 2 3, are lower than the outer wall, and the wall 2 is provided at its upper end with a dome, *c'*, in which are small perforations for the passage of gas.

B represents the pipe for the introduction of gas into the casing. This pipe enters the bottom of the casing, and extends to about the same height as the walls 2 3. Between the pipe B and the inner wall, 3, is a space, *s*, for sealing-liquid. Between the walls 2 3 is a space, *s'*, for gas, and between the walls 2 1 is another space, s^2, for sealing-liquid, the spaces *s* s^2 being suitably connected, so that the liquid will flow from one to the other.

C represents the gas-outlet leading from space *s'*.

D represents the floating gas-holder, which is an inverted cup of metal, arranged to float in the liquid in the space s^2, and covering the dome *c* and walls 2 3. This holder is preferably provided with a conoidal band or portion, C^2, as shown, and for the purpose described, in the patent to M. W. Kidder, October 29, 1878.

F represents the valve, which consists of a sheet-metal tube, open at both ends, and terminating at its upper end in a horizontal ring, *f*, which has a Λ-shaped or knife edge, *f'*. The ring *f* is provided with a cross-bar, to which is attached the rod *g*, that connects the valve with the floating holder, said rod passing through and sliding in an orifice in the dome C'. The rod *g* is preferably threaded and provided with a nut, g^3, which may be screwed down against the cover of the casing, so as to hold the valve up against its seat whenever it is desired to shut off the gas from the casing. The lower ends of the holder D and valve F project down into glycerine or other suitable liquid packing material, which is placed in the spaces *s* s^2.

G represents the valve-seat, which is located on the under side of the dome C', and is preferably of a hemispheroidal shape.

Of the parts thus far described none constitute my invention excepting the nut g^3 and the threaded portion of the rod *g*, on which it works.

The operation of the regulator thus constructed is as follows: The inlet B is connected to the outlet of a gas-meter, and the outlet C to a pipe leading to the burners, or the connections may be with sections of a street-main. The lower edges of the valve F and holder D are sealed by the packing in which they are immersed, so that no gas can pass below them, and the packing extends above the conoidal band c^2 when the holder is depressed. The gas entering through the pipe B strikes against the dome C′, and a portion passes through the perforations of the dome into the holder D.

It will be seen that the floating holder is supported mainly by the gas in the pipe or pipes between the regulator and the burners, where the gas that passes through the regulator is consumed. When the consumption of gas is reduced to the minimum the pressure of gas in the pipes increases and the friction of the gas is reduced. The pressure acting on the floating holder raises the same and causes the valve to partially close the opening for the passage of gas through the regulator, and thus reduce the pressure of the gas in the pipes between the burners and the regulator. When the consumption of gas is increased the pressure is reduced by the consumption at the burners, and the floating holder and valve fall, so that more gas can pass through the regulator. As the flow of gas increases its friction on the pipes also increases, so that its passage through the pipes would be retarded were it not for the fact that means are employed for loading the holder or increasing its downward pressure on the gas in proportion to the friction. In the Kidder patent above referred to the conoidal band on the floating holder is employed for this purpose. The present invention consists mainly in an adjustable automatic device connected to the floating holder and used for the same purpose as the conoidal band, and with or without the latter. This device consists preferably of a lever, *l*, having an adjustable automatically-shifting weight, *m*. This lever is pivoted to a standard on the top of the casing and is connected at its inner end by a link, g^2, to the rod *g* of the valve, which rod is extended through the cover of the casing.

The weight *m* consists of a close receptacle or tube partly filled with mercury, and is suspended from the lever by two links, *n n*, pivoted to slotted blocks or pieces *n′ n′*, which are adapted to slide on the lever. The tube is preferably flat on its under side and wider at its ends than at its center, as shown in Figs. 1 and 5. The weight may be suspended from any part of the lever by moving the links, which is preferably accomplished by a threaded bolt, l^2, turning in bearings on the lever and passing through tapped orifices in the blocks *n′ n′*, as shown.

The lever and its weight are so arranged that when the valve F is raised to its seat to shut off the gas, as shown in Fig. 1, said lever and weight will be about horizontal, so that it will exert the minimun downward pressure on the floating holder; but when the holder is lowered by the decrease of pressure of the gas the lever and weight are inclined, and the latter, swinging on its links, assumes an altered position with relation to the fulcrum of the lever. The inclination of the weight causes the mercury therein to move to the lower end, and thus change its position with relation to the fulcrum of the lever. The enlargement of the weight at its ends enables the mercury to accumulate in a compact form at the extreme end, where it will have the greatest effect when the receptacle is inclined. It will be seen, therefore, that as the lever is inclined by the falling of the holder, its weight is shifted or moved toward the inner end of the lever and caused to load or increase the downward pressure of the holder, said loading or increase of pressure being directly proportioned to the downward movement of the holder and to the increase of friction of the gas in the pipes, so that the flow of gas from the burners is rendered steady and uniform regardless of the friction.

The means provided for moving the blocks *n′ n′* on the lever enables the weight *m* to be adjusted so that it will exert any desired degree of pressure on the holder D. Hence the automatic regulator can be adjusted to the degree of friction to be overcome, such degree increasing with the length of the pipe or pipes between the regulator and the burners. This is a marked advantage over the conoidal band and other automatic means heretofore used for the same purpose, none of which, so far as I am aware, have been adjustable. This adjustability practically enables the weight applied to the floating holder to be increased or diminished according to the pressure or friction to be overcome.

A modification of the adjustable compensating device is shown in Fig. 4. In this form two hollow balls are employed, one located on the rod *g* and the other on a standard on the casing. These balls are adjustable vertically, being supported by set-screws at any desired points, and are connected by a telescopic or a flexible tube. One of the balls contains a suitable quantity of mercury. The ball *k* is arranged at a lower point than the ball *k′* when the gas-holder is depressed, so that the mercury will be contained in the ball *k* and give its weight to the holder. When the holder is raised the ball *k* rises above *k′*, and the mercury flows into the latter, thus lightening the holder.

I prefer to place an auxiliary counterbalancing-weight, *w′*, upon the outer end of the lever *l*. This weight is preferably suspended by a hook from a notched slot, w^2, in the lever, and counterbalances the weight of the holder D, valve F, and rod *g*, so that the suspended tube or weight *m* can be entirely devoted to the au-

tomatic action described without being required to counterbalance the holder and its attachments.

In Figs. 1 and 2 I have shown an adaptation of the casing of the regulator to two sections of a street-main on the same level. In this the inlet B is provided with a horizontal branch, X, on the same level as the outlet C, both being horizontal and provided with end flanges or threads, whereby they may be secured to the sections of a street-main.

H represents a vertical wall, which separates the inlet B and outlet C below the main bottom of the casing A. This construction obviates the employment of an elbow to connect the regulator to the main, and is a very convenient arrangement, as it enables the regulator to be applied in a compact space and with little labor, and enables the outlet and inlet to be made in line with each other.

In Fig. 6 I have shown a street-main, M, divided into two parts, 1 2, the combined area of which is equal to the area of the undivided portion. The parts 1 2 have regulators of the construction described, each suited to the capacity of the branch to which it is attached. Each regulator is much smaller than a regulator of the required size for the entire main, and therefore takes up less vertical space. The branches are provided with valves adapted to shut them off from the main, so that one or both can be used at a time.

A pressure-regulator constructed on the general principles herein described may be used for water or other liquid without other changes than those which would naturally occur to a mechanic in adapting it to the nature of the liquid.

I claim—

1. The combination of the hollow adjustable weight m, enlarged at its ends and suspended from the threaded bolt l^2 by means of the links n n, with the lever l, link g^2, rod g, holder D, and valve F, as shown, and for the purpose set forth.

2. The lever l, fulcrumed at its center and attached to the rod g by means of the link g^2, and provided with the slot w^2, in which is swung the auxiliary weight w', and the threaded bolt l^2, in combination with the hollow adjustable weight m, the above-named rod g, holder D, and valve F, substantially as described.

3. In a gas-pressure regulator, the combination, with the holder D and valve F, of a pivoted lever, l, provided with the screw l^2, from which is suspended the liquid weight m, and with the auxiliary weight w', substantially as set forth.

4. The rod g, threaded at its passage through the dome 5, and provided with the nut g^3, in combination with the holder D, valve F, lever l, and weight m, substantially as shown and described.

5. The combination of the hollow weight m, links n n, lever l, and threaded bolt l^2, substantially as shown and described.

6. The hollow weight m, enlarged at its ends, in combination with the links n n, lever l, threaded bolt l^2, and auxiliary weight w', as and for the purpose set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

PERSON NOYES.

Witnesses:

WILLIAM ROSSNEY,

GEO. W. PIERCE.