J. F. BARKER.

Air-Forcing Apparatus.

No. 221,385. Patented Nov. 11, 1879.

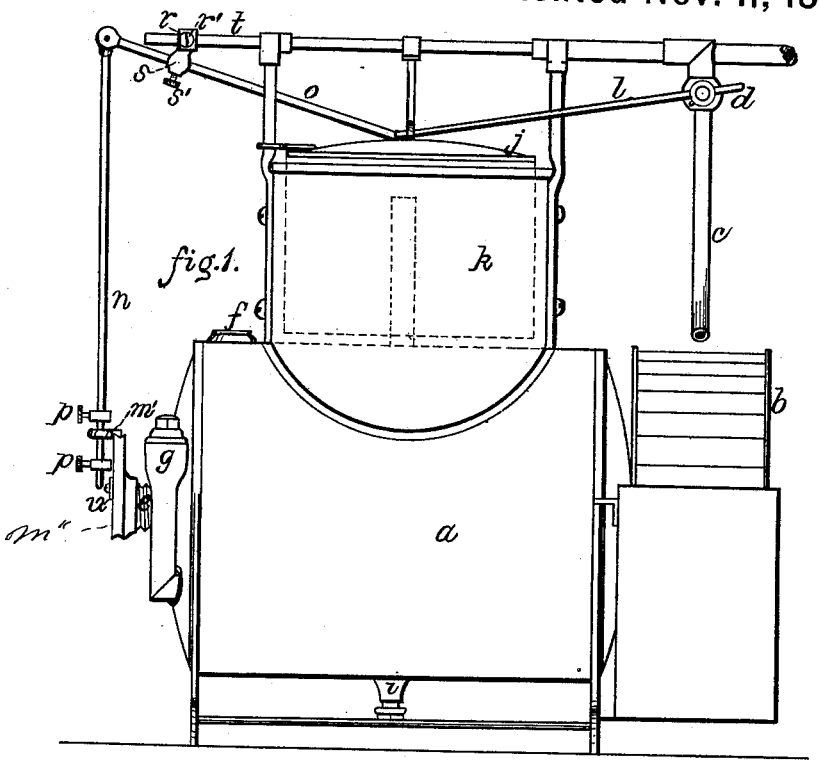

fig. 1.

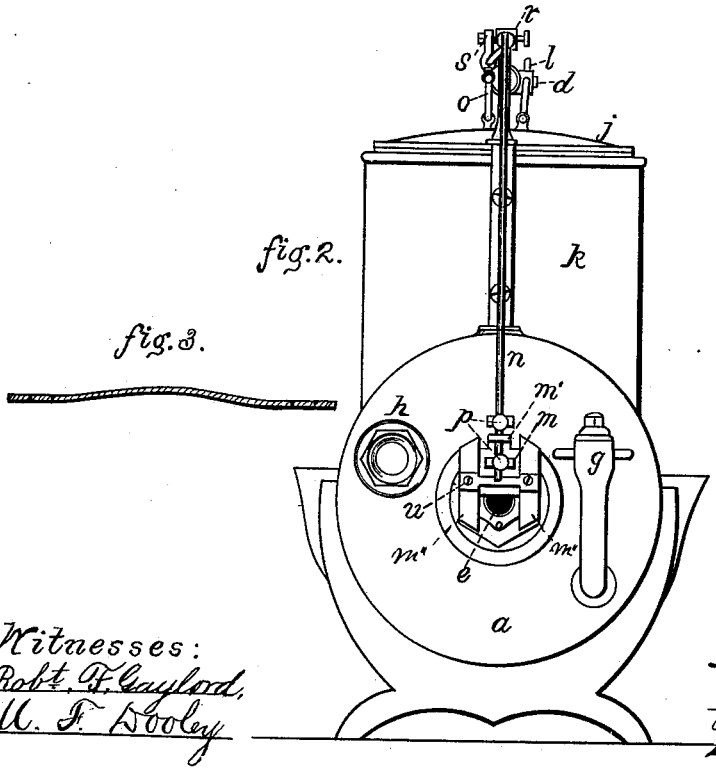

fig. 2.

fig. 3.

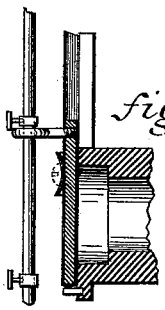

fig. 5.

fig. 4.

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UNITED STATES PATENT OFFICE

JOHN F. BARKER, OF SPRINGFIELD, MASSACHUSETTS.

IMPROVEMENT IN AIR-FORCING APPARATUS.

Specification forming part of Letters Patent No. **221,385**, dated November 11, 1879; application filed June 11, 1878.

To all whom it may concern:

Be it known that I, JOHN F. BARKER, of Springfield, in the county of Hampden and State of Massachusetts, have invented certain new and useful Improvements Pertaining to Air-Forcing Apparatus, of which the following is a specification, reference being had to the accompanying drawings, where—

Figure 1 is a front elevation. Fig. 2 is an end elevation. Figs. 3 and 4 are longitudinal and cross sections of the spring bearing on the air-valve. These figures are made to a much larger scale than that of Figs. 1 and 2. Fig. 5 is a view of the inlet and inlet-valve, in central vertical section, the section being one which, extended, would cut the whole apparatus in central vertical longitudinal section.

My invention is an improvement useful in connection with and applicable to that class of rotary meter-wheel air-forcing apparatus commonly called "pumps," used for feeding air into the generators of apparatus for producing an illuminating-gas from light hydrocarbon oils, commonly called "gasoline."

The principle of my improvement is not confined in its application to meter-wheel air-pumps simply, nor to apparatus for generating illuminating-gas in the manner mentioned; but I shall describe the application of the principle, and also the mechanism for applying the principle, in that connection, using a water-wheel as a motor for the meter-wheel pump.

The letter *a* denotes the cylinder containing the rotary meter-wheel, and *b* denotes the small water-wheel on the same shaft with the meter-wheel. The water for driving the water-wheel finds access to the wheel through the tube *c*, in which is a cock, *d*, to control or shut off the flow of water. The letter *e* denotes the air-supply orifice, *f* the pipe through which air is fed to the generator, *g* a pipe for introducing the requisite amount of water into the cylinder *a*, and *h* a glazed peep-hole for observing the height of the water in the cylinder. The letter *i* denotes a pipe for drawing out water from the pump-cylinder.

On the top of the cylinder *a* there is arranged a pressure-indicator, *j*, similar in construction and operation to an ordinary gasometer or gas-holder. It is a cylinder with the upper end closed, the lower end open and dipping into water contained in the tank *k*. A pipe coming from the top of the cylinder *a* runs up through the water contained in the tank *k*, and opens into the chamber or open space inside the cylinder *j*. The effect of this arrangement is, that the cylinder *j* rises as the air-pressure in the pump-cylinder increases, and falls as it decreases. This pressure-indicator connects with the water-cock *d* by means of the arm *l*, and the parts are so combined and arranged that when the indicator is down—that is, at the lowest limit of its movement—the cock *d* is open and water flows freely upon the water-wheel. As the indicator rises the cock is gradually and finally wholly closed, the closing taking place at the point when a suitable and desired pressure of air is exceeded, and the moment that pressure becomes less the indicator commences to fall and the cock to open farther and farther.

So far I have described an apparatus already known and in use. I will point out some of its practical limitations.

The speed of rotation of the water-wheel is, in the nature of things, limited; hence its production of power is limited, and that power has, in a properly-working apparatus, to maintain a certain and constant relation to the pressure-indicator.

Gas-pressures are commonly denoted in inches. An inch-pressure is a pressure which, applied to the surface of the water in one leg of a reversed siphon, will raise the water in the other leg an inch above its normal height. A two-inch pressure is one which will thus raise the water two inches, and so on for higher pressures.

Difference in number of burners, or in height to which the gas must be forced, require corresponding differences in the gas-pressure. Given a case where a two-inch pressure is required, the pressure-indicator must be weighted and adapted to remain at a certain point when the pump exerts a two-inch pressure, and at this point it must hold the cock which supplies water to the water-wheel open just so far as will permit the passage of the proper amount of water, and the wheel must be adapted in size and rotation to produce a two-inch pressure. Such an adaptation of the water-wheel not only requires that the power exerted should be sufficient to raise the pressure-indicator to the "certain point" last mentioned, but the

wheel must exert a small excess of power to overcome the balance which would otherwise exist between the wheel and the indicator, and permit the wheel to rotate while maintaining the requisite pressure. This excess of power I denominate the "margin of power," and it is practically arrived at by giving the wheel a certain number of buckets more than is requisite to get just the desired pressure.

Now, if, with this apparatus adjusted to produce a two-inch pressure, a case arises where a three-inch or four-inch pressure is required, clearly the apparatus thus adjusted is not adequate to the task. To make it adequate the water-wheel must be replaced by one of greater power, and, having attained such a wheel, the pressure-indicator must be weighted and adapted to the power of the new wheel and the desired increased pressure.

It is, among others, these limitations and these difficulties that my present invention is designed to obviate and overcome. My present invention renders it practicable to use a water-wheel of a certain power—say, a power adequate to the production of a four-inch pressure, and at will make the apparatus to which it is attached produce the maximum pressure, or any pressure less than that. It makes one wheel and one apparatus produce a wide range of pressures at will.

The vital principle of my present invention is the controlling of the inlet of air to the pump by the pressure produced by the pump operating through suitable mechanical means. The principle is not limited to any particular kind of pump, nor to any particular motive power for operating the pump.

It will be readily understood that if all ingress of air be stopped the pump must be stopped, for it will not work while tending to produce a vacuum. It follows that if the ingress of air be partially stopped the working of the pump will be proportionately retarded. Now, if an excess of pressure be made to work to or toward the closing of the air-inlet, and vice versa, the principle of my present invention is developed.

The letter *m* denotes a gate or valve to the air-inlet *n*, a rod connecting the valve with the outer arm of the pivoted lever *o*, the inner arm of which is jointed to the top of the pressure indicator. This arrangement necessitates that when the pressure-indicator rises above the certain point at which it should be for the maintenance of the desired pressure, the air-valve *m* will commence to close, and, by shutting off air, act as a drag or brake on the meter-wheel and on the motive power, and vice versa.

By means of the nuts *p p* on the rod *n* the valve *m* can be set at any desired point with reference to the air-inlet. By moving the fulcrum-block or pivot-block *r* on the rod *t* the relative lengths of the arms of the lever *o* can be varied at pleasure, and a quicker or slower movement be thereby given to the air-valve. The pivot-block *r* is provided with a set-screw, *r'*, for this purpose. From the pivot-block depends a pivoted rocker-arm, *s*, through which the lever *o* runs, it being adjustable therein and held to place, when adjusted, by the set-screw *s'*. Such adjustment in the rocker-arm is essential when the pivot-block is adjusted on the rod *t*.

The air-valve is pressed upon gently, that it shall not move accidentally or by its own gravity, by the spring *u* peculiarly shaped, in that it is formed into a convexity, where it touches the valve.

It will be observed that this spring is not used to give the reciprocating movement of the valve in either direction, but that it is stationarily attached by its ends to the ways *m''*, and holds the reciprocating valve against the valve-face; and that for this purpose the convexity has a peculiar advantage in that it touches the valve at but a slight point, or by a small bearing-surface, and that a rounded surface, so as to attain but a minimum of friction or resistance to the reciprocating motion of the valve, consistently with the exertion of a pressure sufficient to hold the valve to its seat, and prevent its accidental movement.

There is a feature in my newly-invented part of this mechanism of peculiar utility when a water-wheel is used as the motive power, and the supply of water thereto is controlled and governed by the pressure-indicator.

It will be observed that in the drawings the nuts *p p* do not closely embrace the projection *m'* from the air-valve, and that the rod *n* has thereby what is commonly called "lost motion." This has a direct reference to the cock *d*. These nuts are so adjusted that the air-valve cannot wholly close until the port through the plug of the cock *d* has a trifle more than closed. Then, when the pressure-indicator falls, as it will by its own gravity, and the depletion of the air within it, the water-cock will be slightly opened before the air-valve commences to open. This insures that the water-wheel shall start gradually and immediately as the air-valve commences to open.

Although I have in the foregoing description designated the cylinder which contains the meter-wheel by the letter *a*, I shall in the following claim mean the letter *a* to stand for the pump as a whole—that is, for the cylinder and the contained pump.

I claim as my invention—

1. The arrangement, upon the inlet of a meter-wheel air-pump, of a valve operated by the pressure of air in the pump acting directly and constantly against the pressure-indicator *j*, and thence transmitted by suitable mechanism to the valve, substantially as shown and described.

2. In combination, the pump *a*, pressure-indicator *j*, lever *o*, rod *n*, adjusting-nuts *p p*, and air-valve *m*, all arranged to operate substantially as described.

3. In combination, the pump *a*, pressure-

indicator *j*, lever *o*, adjustable pivot-block and rocker-arm *r s*, rod *n*, and air-valve *m*, all arranged to operate substantially as described.

4. The stationary convex spring *u*, combined with the reciprocating and sliding valve *m*, substantially as described.

5. In combination, the pump *a*, pressure-indicator *j*, arm *l*, cock *d*, water-pipe *c*, water-wheel *b*, lever *o*, rod *n*, adjusting-nuts *p p*, and air-valve *m*, all arranged to operate substantially as described, and for the purposes set forth.

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Witnesses:
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