# N. W. WHEELER.

## METHOD OF DELIVERING LIQUID GASES.

No. 52,477. Patented Feb. 6, 1866.

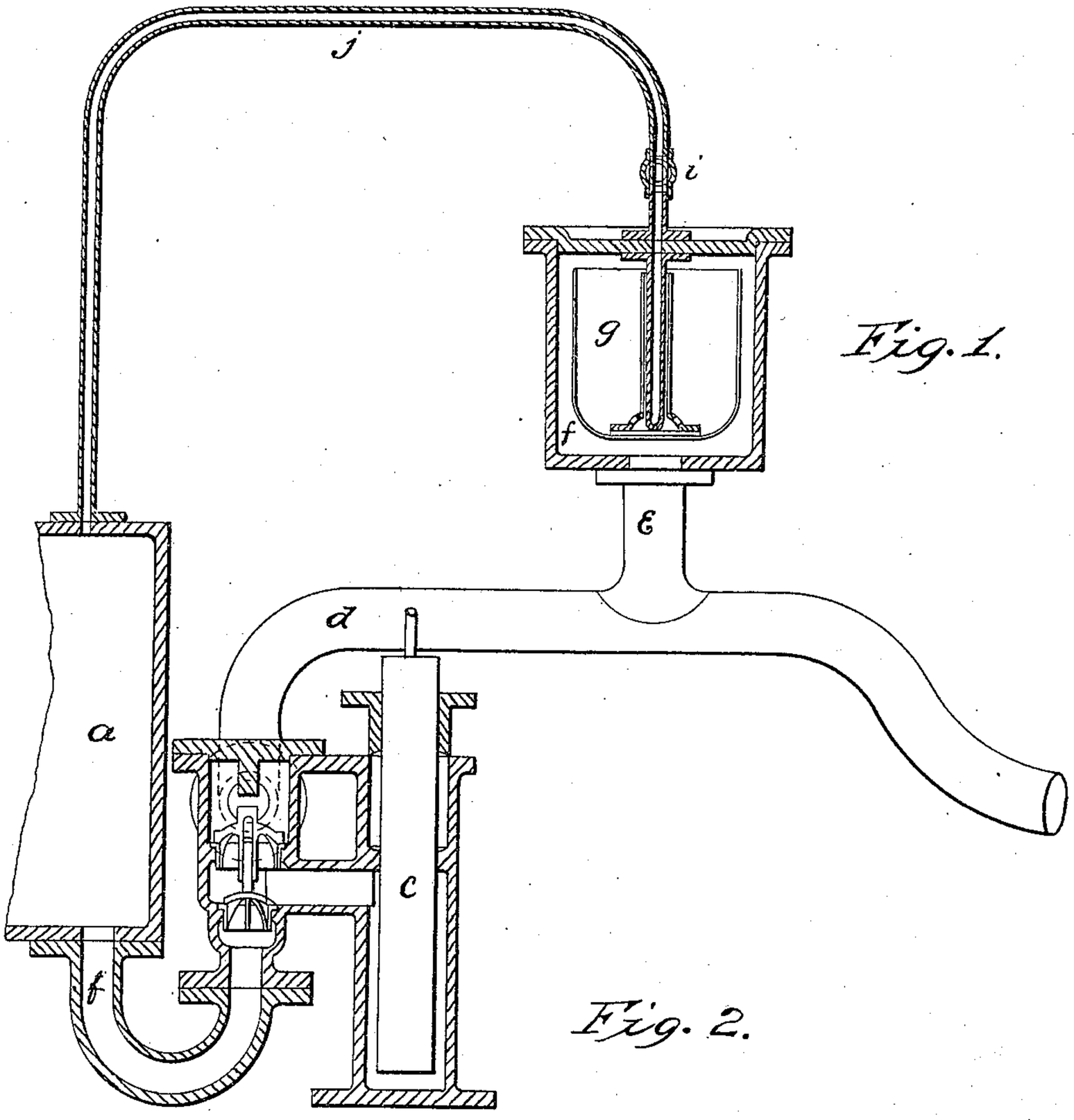
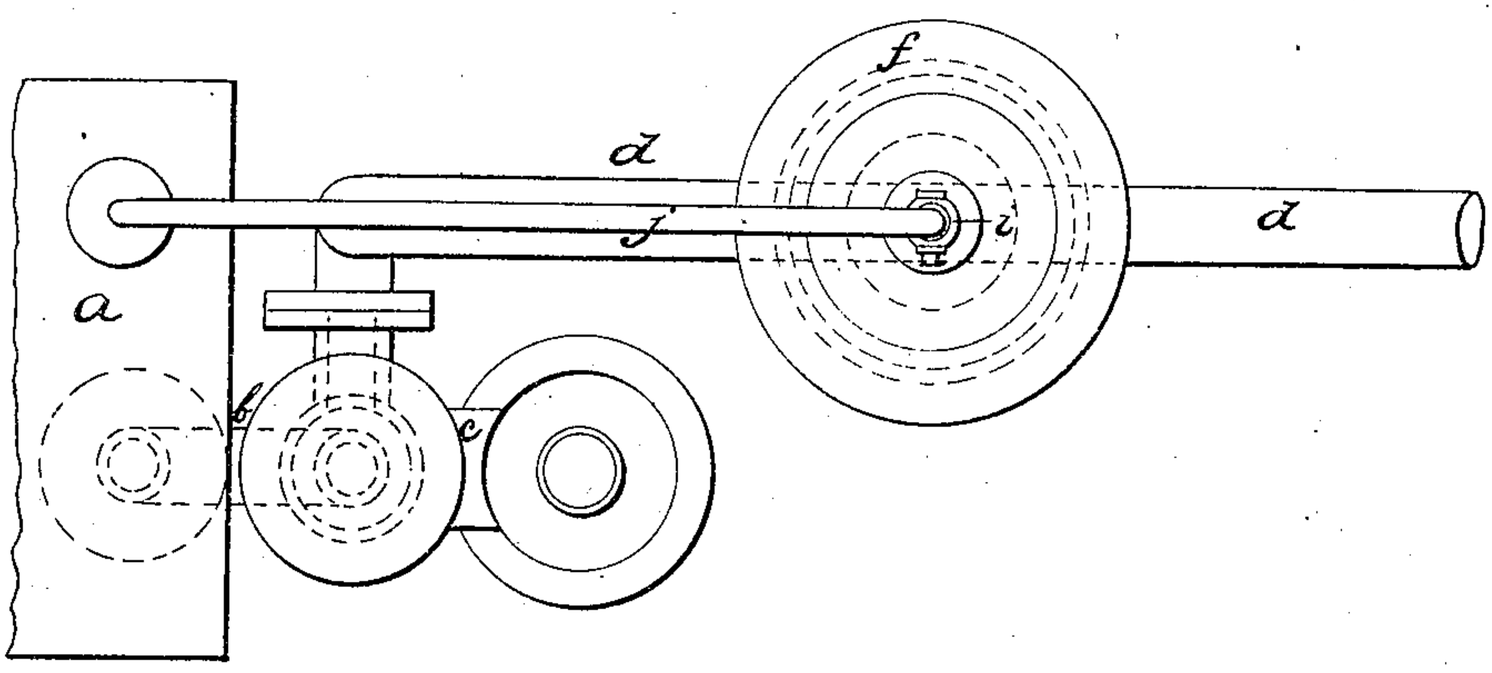



Fig. 1.

Fig. 2.

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## IMPROVED METHOD OF RELIEVING LIQUIDS OF GASES.

Specification forming part of Letters Patent No. **52,477**, dated February 6, 1866; antedated December 26, 1865.

*To all whom it may concern:*

Be it known that I, NORMAN W. WHEELER, of Brooklyn, in the county of Kings and State of New York, have invented a new and useful Method of Relieving Liquids of Gases; and I hereby declare that the following is a full and exact description thereof, reference being had to the accompanying drawings, forming a part of this specification, in which-

Figure 1 is a sectional elevation, and Fig. 2 a plan, like letters of reference indicating the same parts in the different drawings.

The essence of my invention consists in so combining a liquid-trap with the discharge-pipe of a force-pump or a vessel containing liquid and gas that that part of the gas or air not in intimate combination with the liquid will be set free automatically.

To enable others skilled in the art to make and use my invention, I will proceed to describe its construction and operation as adapted to the purpose of relieving the feed-water for a steam-boiler of any excess of air which may have been passed through the feed-pump along with it, especially when the said boiler is supplied from a surface-condenser, premising that for other and similar uses in chemical or other processes like objects may be accomplished by the same invention.

In the drawings, *a* is a portion of a hot-well or fresh-water tank which receives the fresh water from a surface-condenser; *b*, the suction-pipe of a force-pump; *c*, the pump, and *d* the discharge-pipe thereof, which leads from the pump to the boiler and through which the feed-water is forced; *e*, a branch pipe to the feed-pipe, connected thereto, by preference to the highest part thereof; *f*, a liquid-trap; *g*, its floating pot; *h*, its discharge-pipe; *i*, a stop-cock, and *j* a pipe leading from the cock *i*, and communicating with the hot-well *a*.

The trap *f* is composed of a cylinder or vessel containing a floating pot, *g*, open at the top and fitted with proper guides, so that it may have a limited vertical motion parallel with the pipe *h*, which pipe is secured to the cap or cover of the trap. In the example before us the guide is shown as a tube surrounding the pipe *h*, enlarged at the lower end and secured to the bottom of the pot *g* by a flange, the enlarged part of the guide-pipe having several holes therein to admit freely liquid or gas around the lower end of the pipe *h*. The lower end of the pipe *h* is faced off and made smooth, so that it will fit tightly against the bottom of the floating pot *g*, or, by preference, a piece of vulcanized rubber secured thereto.

Now, when the bottom of the floating pot *g* is pressed up against the lower end of the pipe *h* no escape of gas or liquid can take place through the pipe *h*; but when the floating pot *g* rests upon the bottom of the trap *f*, or is not pressed against the lower end of the pipe *h*, gases or liquids present in the pot *g* may escape freely through the pipe *h*.

Now, if we observe what takes place when a steam-engine fitted with a surface-condenser in the usual way is set in motion, we shall find that from leakage or other causes there has considerable water collected in the condenser, and is thrown by the first movements of the air-pump into the hot-well, and the feed-pump receives for a time a full charge of water at each stroke; but as the feed-pump has usually and necessarily a much greater capacity than that required to barely supply the boiler when all parts are tight, in good order, and in perfect adjustment, it will quickly empty the hot-well *a* of its surplus water; and after having been at work a considerable time there will not be sufficient water condensed to fill the pump at every stroke, and hence it will receive and discharge air as well as water, which air will pass into the boiler, mingle with the steam, and pass with it through the engine into the condenser, vitiating the vacuum.

To remedy this defect attempts have been made to prevent air entering the suction-pipe *b* by placing therein a valve connected by a system of levers and rods to a float in the hot-well *a* in such a way that when the water in the hot-well fell below a certain level the valve in the pipe *b* should be closed and the supply to the feed-pump shut off; but the extreme delicacy and exactness required in the construction and adjustment of this device and the disturbance to which it was exposed by the motion of the vessel, and, further, its liability to derangement from the collection of sediment about its parts, render it practically useless, and the vitiation of the vacuum has been endured. But had this last-described

device been successful, and it or its analogues accomplished the object sought, it is questionable whether there would have been anything gained, for it is well known that water that has been newly condensed from steam with such limited contact with air or gases, as is the case when ordinary surface-condensers are used, is very nearly deaerated, and had it been returned to the boiler in that state would have required a greater amount of heat to vaporize it than if it had been aerated, and that its ebullition might at any time become uncertain and dangerous.

It is well known that many of the boilers of lately-built naval steamers have foamed to an almost disabling degree for a considerable time, but performed afterward in a much more satisfactory manner; and it is deemed fair to surmise that the disabling of the float apparatus might probably be connected with the phenomenon, as when that occurred the feed-water would be aerated.

I have dwelt upon the difficulties heretofore met with in order that the characteristics of my invention may be the more readily understood and appreciated when I describe its action.

When the engine to which my invention is attached is set in motion and the feed pump begins to force water into the boiler there will probably be a considerable quantity of water in the condenser, which being thrown by the air-pump into the hot-well furnishes the feed-pump with full charges for a number of strokes. Then the water will be forced into the pipes *d* and *e* and the trap *f*, compressing what air was contained in them into the upper part of the trap, whereupon the water will run over the open top of the floating pot *g* and cause it to sink, thus opening a passage through the pipe *h*, and if the stop-cock *i* be open a portion of the water from the pipe *d* will pass through the pipe *j* into the hot-well *a*. This will be an undesirable result; hence at starting the stop-cock *i* should be closed, in which case, the air being retained in the trap *f*, the feed-pump will speedily dispose of the surplus water in the hot-well, and after a short time force mixed air and water into the pipe *d*, as previously described. The passage of air and water through the feed-pump and its valves will cause them to be intimately mixed while under considerable pressure, and will cause the air and water to combine as they are found combined in nature, or, in other words, the previously deaerated water will become aerated. That portion of the air which does not combine with the water will seek the highest part of the pipe *d* and its connections, and eventually lodge in the upper part of the trap *f*. If the stop-cock *i* be opened after the feed-pump *e* has been in operation for some time, and when the greater part of the trap *f*, is occupied with air, so that the pot *g* does not float, what water is contained in the pot *g* will be blown out through the pipes *h* and *j*, followed by what air is contained in the trap *f*, until the water will rise around the pot *g* and float it into contact with the lower end of the pipe *h*, thus stopping the flow. The pump continuing in action, more air will find its way into the trap *f*, displacing its bulk of water, which will flow slowly back through the pipe *e* until there will not be enough water in the trap *f* to float the pot *g*, when it will again fall out of contact with the pipe *h* and discharge air until more water has entered the trap and the flow is stopped, as before described, and so on continually.

It is not necessary that the pipe *j* discharge into the hot-well, but in most cases it will be convenient to so construct it.

The pipe *e* may be replaced by two pipes, one leading from the higher part of the feed-pipe *d* to the upper part of the trap *f*, and the other connecting the lower part of the trap *f* with the lower part of the pipe *d*, thus avoiding counter-currents of air and water in the same pipe, or the pipe *e* may have a diaphragm within it to prevent the conflict between the two currents.

The trap *f* and the other parts of this apparatus may be made in many different forms, and I desire that it be understood that I do not limit myself to the precise construction herein described; nor do I claim the several members of this combination as new when they are used separately and for purposes other than herein set forth.

Having now fully described my invention, I will proceed to set forth what I claim as new and for which I desire to secure Letters Patent, to wit:

Relieving liquids of free gases or air while they are under pressure by means of the liquid-trap *f*, or its equivalent, when the trap *f* is combined with the pump *e*, substantially as and for the purposes described.

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Witnesses:

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