O. Newton,

Steam-Boiler Superheater.

No. 21,017. Patented July 27, 1858.

Fig. 2

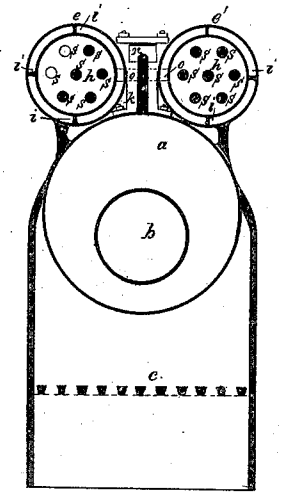


Fig. 3

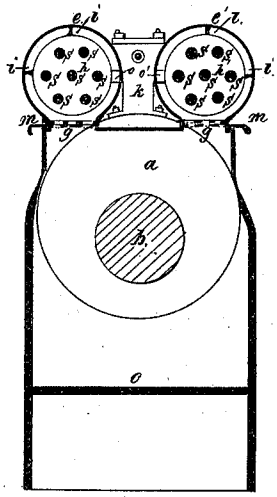
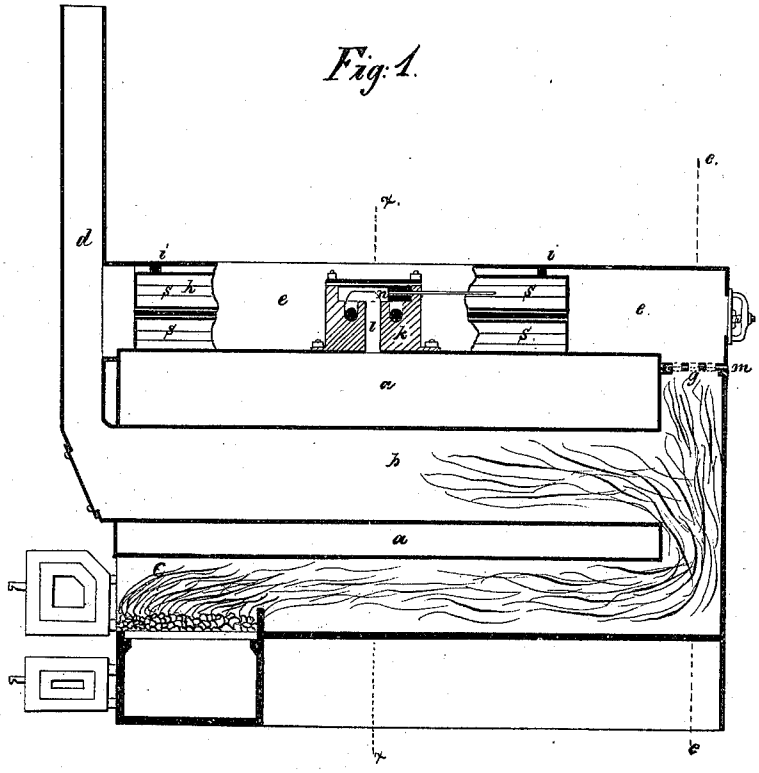


Fig. 1.



N. PETERS, PHOTO-LITHOGRAPHER, WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

ORRIN NEWTON, OF PITTSBURG, PENNSYLVANIA.

IMPROVEMENT IN STEAM-BOILERS.

Specification forming part of Letters Patent No. **21,017**, dated July 27, 1858.

To all whom it may concern:

Be it known that I, ORRIN NEWTON, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Steam-Boilers; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the annexed drawings, forming part of this specification, and to the letters of reference marked thereon.

In the several drawings forming part of this specification, Figure 1 is a longitudinal section of a steam-boiler constructed on my improved plan. Fig. 2 is a transverse sectional view through *x x*, Fig. 1. Fig. 3 is a transverse sectional view through *c c*, Fig. 1.

In the several figures like letters of reference designate similar parts.

In all steam-boilers of ordinary construction, where the steam passes immediately from the vessel in which it is generated to the steam-engine, a great loss of power and waste of heat occur from the fact that the steam as worked is not fully charged with caloric, being more or less mixed with water in an imperfect state of vaporization, so that when the steam is allowed to pass from the boiler to the engine it of necessity carries with it steam not fully charged with caloric, and therefore not fully prepared for exerting as great a force as it would do if more fully anhydrated, and this difficulty must occur so long as water is present with the steam in the same chamber from which it passes immediately to the engine. This does not occur when the steam is superheated before being worked; but, as I regard the practice of superheating steam as worse than useless, I design by my invention to avoid the difficulty of using steam imperfectly charged with caloric and to effect increase of power with economy of heat (or, what is the same in effect, economy of fuel) without superheating the steam or raising it to a higher temperature than that at which steam is ordinarily used. To accomplish this object I make use of two steam-chambers connected with the steam-generator or prime boiler by a pipe furnished with a cut-off valve. These steam-chambers are traversed longitudinally by pipes through which hot air (but no flame or fire) from the furnace is allowed to pass, with an arrangement for so regulating the heat that the steam may be more fully charged with caloric in these steam-chambers without being superheated. The communication between the prime generator and the steam-chambers is so arranged by means of a valve that at each alternate stroke of the engine one of the steam-chambers is filled with steam from the prime boiler, while from the other steam-chamber, which is then disconnected from the prime boiler, the steam which has there been more fully expanded and charged with caloric, so as to convert the vapor carried with it into steam (this of course requires a further degree of heat, which is supplied by means of the pipes before referred to,) passes to the engine. Thus one chamber, being disconnected from the engine, is being charged from the prime boiler with steam which is there being prepared, as before described, while the other steam-chamber, being disconnected from the prime boiler and in connection with the engine, passes into the cylinder the steam prepared for use during the previous stroke of the engine, and so alternately the steam in its passage from the boiler being always detained during one full stroke of the engine in one of the steam-chambers before it is worked in the engine.

In order to enable others skilled in the art to make and use my improvement in boilers, I will proceed to describe particularly its construction and operation.

In the drawings, *a* is a cylindrical boiler, in which the steam is generated, and which I call the "prime boiler." It may be traversed with a cylindrical flue *b*, through which the flame and smoke of the furnace *c* under the boiler escape into the chimney *d*. A fire-space *f* in the rear of the boiler and furnace, into which the hind end of the flue *b* opens, extends up to the height of the top of the boiler.

The boiler, flue, and furnace are constructed in the usual manner, with the exception of the addition of the fire-space *f*.

Two steam-chambers *h h*, which are steam-tight iron cylinders traversed longitudinally with a convenient number of small flues or pipes *s s*, &c., and covered with cylindrical jackets of iron *e e'*, are placed side by side immediately over the prime boiler or in some other

convenient position. The steam-chambers are each about two-thirds of the length of the prime boiler and about one-third its diameter, while their jackets *e e'* are longer than the boiler, the rear end extending over the fire-space *f*, and the front end, being open, enters the chimney *d*. There is a space all around each steam-chamber *h* of about two inches between it and its jacket, the steam-chamber being supported inside its jacket by braces *i i*, &c. There is an opening at the rear end of each jacket *e* where it extends over the fire-space *f*. In this opening is a grating *g*, furnished with a slide *m*, by means of which the size of the apertures in the grating *g* (which fills up the opening between the fire-space *f* and the jackets *e e'*) is so regulated as to graduate the degree of heat to which the steam-chambers are exposed and prevent the passage of fire or flame into the jackets or into the flues *s s*, &c., of the steam-chambers, which would be highly injurious. Heated air from the furnace passes through the grating *g* into the jacket *e*, and thence through the flues *s s* and around the outside of the steam-chambers *h h*, and thence escapes up the chimney *d*. The steam-chambers will not require the direct action of the fire. The heated air, passing through the flues *s s* and between the jackets and steam-chambers, serves to keep up the heat of the steam and supply the extra caloric required to anhydrate the steam. A pipe *l* leads from the boiler *a* and communicates through a valve *n* and the pipes *o o* with the steam-chambers *h h'*, admitting the steam from the prime boiler *a* immediately into one or other of the steam-chambers *h h'*, according to the position of the valve *n*, which allows of the passage of the steam through the pipe *o* or *o'* alternately into its steam-chamber *h* or *h'*. There is no passage for the steam directly from the prime boiler to the engine, and, as the valve *n* opens the pipes *o* and *o'* alternately, when one steam-chamber is in communication with the boiler the other is entirely disconnected with it.

The engine is worked with steam from the steam-chambers alone, that steam-chamber which is not in communication with the boiler being the one from which the engine is worked, this of course varying with every alternate stroke of the engine, the office of the valve *n* being simply to supply the steam-chambers alternately with steam and to regulate the amount of steam furnished to the steam-chambers from the boiler, and not to regulate the supply of steam to the cylinder of the engine, which is effected in any ordinary way by the interposition of a valve or valves between the steam-chambers and the engine.

The operation of my improved construction of boilers is as follows: Steam from the prime boiler *a* being allowed to pass through the valve *n* into one of the steam-chambers *h*, the valve *n* is closed as soon as the steam-chamber is charged, shutting off all communication with the boiler *a*, and the steam in the steam-chamber *h* is expanded by the action of the heated air which passes around the steam-chamber and through its flues, and the imperfectly-vaporized water, which was forced with the steam out of the boiler, is duly converted into steam. The steam is thus prepared without losing any of its heat (which is not only sustained by the heated air surrounding and passing through the steam-chamber, but so much additional heat is supplied as is necessary to complete the anhydrating process) for exerting its full force when it enters the cylinder of the engine, and it becomes no longer necessary (so far as the saving of the steam is concerned) to cut off the steam in the middle of a stroke, as is usually done; but it may be economically worked at full stroke, if desired. The advantages of this arrangement in the saving of fuel and increased effectiveness of the steam will be manifest to all who are acquainted with the nature of steam and the ordinary modes of working it.

It will not be necessary, of course, to adopt the exact arrangement or precise relative size of parts indicated in the foregoing specification. The arrangement may vary to suit the various kinds of boilers in use.

I am aware that superheated steam has often been used; but I do not design by my invention to superheat steam nor to make any chemical change whatever in the steam itself, but merely to fit it for exerting its full power when it reaches the cylinder of the steam-engine by previously subjecting it, after it leaves the prime generator, to a sufficient degree of heat to expand the steam and convert into steam any water or watery vapor which has passed with it from the prime generator, anhydrating and expanding without superheating it. I therefore do not claim the use of superheated steam nor any apparatus for superheating it; but

What I do claim as my invention, and desire to secure by Letters Patent, is—

The mode hereinbefore described or its equivalent for producing a more perfect calorification and expansion of the steam after it leaves the prime steam-generator and before it enters the cylinders of the steam-engine by means of two or more steam-chambers constructed, as described, separate from the boiler and heated by hot air from the furnace, the steam thus anhydrated passing to the cylinder of the engine from one of these separate chambers while the steam in the other chamber is being prepared for the next stroke of the engine, substantially in the manner and for the purposes hereinbefore set forth.

ORRIN NEWTON.

Witnesses:
WM. N. HOWARD,
N. BUCKMASTER.