R. C. BRISTOL.

WATER AND STEAM SEPARATOR FOR STEAM GENERATORS.

No. 60,470. Patented Dec. 18, 1866.

Fig. 1.

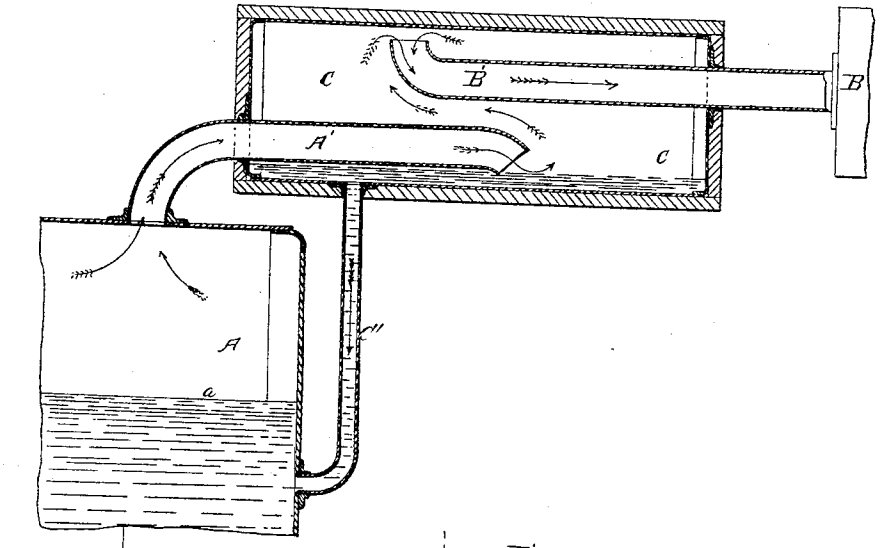


Fig. 3.

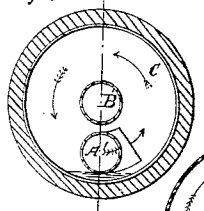


Fig. 2.

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THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

United States Patent Office.

IMPROVED WATER AND STEAM SEPARATOR FOR STEAM GENERATORS

RICHARD C. BRISTOL, OF ST. CLAIR, MICHIGAN.

Letters Patent No. 60,470, *dated December* 18, 1866.

The Schedule referred to in these Letters Patent and making part of the same.

TO ALL WHOM IT MAY CONCERN:

Be it known that I, RICHARD C. BRISTOL, of St. Clair, county of St. Clair, State of Michigan, have invented certain new and useful improvements in Means for Separating Water from Steam; and I do hereby declare that the following is a full and exact description thereof.

My invention is intended for use in connection with steam boilers and steam engines in situations where the boiler is liable to throw up considerable quantities of water mingled with the steam, in the manner known to engineers as "priming" or "working water." This evil is due to want of space for proper separation in the boiler, and various causes not always thoroughly understood. The rise of water into the steam pipe, and its flow through the steam into the engine, is a source of much difficulty, not the least of which is the occasional reduction of the water in the boiler to a dangerous extent, by the great quantity which may be suddenly withdrawn from the boiler in lieu of steam. My apparatus differs very greatly from the ordinary apparatus known as steam traps, both in its construction and in its mode of operation. There is no necessity for any movable part, either float, valve, or the like, and it is eminently self-operating, or, rather, allows the water to flow back of itself into the boiler without any operation of the apparatus, and requires no care or attention.

I will first describe what I consider the best means of carrying out my invention, and will afterwards designate the points which I believe to be new. The accompanying drawing forms a part of this specification.

Figure 1 is a vertical section through my apparatus, with a portion of the boiler and engine employed in connection.

Figures 2 and 3 represent modifications of the same idea.

The marks of reference agree with those in the following description.

The drawing represents the novel parts, with so much of the ordinary parts as is necessary to understand their relation thereto.

A is a steam boiler; *a* is the water level therein. A^1 is the part of the steam pipe which is connected to the boiler. B is the steam chest of the engine, and B^1 is the portion of the steam pipe which is connected thereto. C is a vessel considerably larger than the steam pipe, and surrounding the same. C^1 is a pipe leading from the bottom of the vessel C to the steam boiler, and carried down therein to a level below the water line. The steam pipe A^1 B^1 is not continuous through the vessel C, but is divided into two entirely distinct pipes, having open mouths, not in line with or presented towards each other. The water and steam rising through the pipe A^1 are thrown into the vessel C, and caused to circulate therein. The water separates from the steam by gravity, while moving across or about in this chamber, and the steam alone enters the open end of the pipe B^1, which is not presented so as to receive the water ejected from the pipe A^1. The steam alone goes to the engine, while the water, collecting in the bottom of the vessel C, flows back into the boiler by its gravity. The fact that the drain pipe C^1 opens into the boiler below the water line forbids the possibility of a current of steam rising through this pipe. If any current rises through this pipe, it is not steam, but water. The considerable difference in level between the vessel C and the water line of the boiler prevents water from flowing upwards through this pipe, unless the pipe A^1 be of so limited area as to induce considerable difference of pressure in the boiler and in the vessel C. Care must be taken to avoid this by placing the throttle-valve or obstructions of that character in the portion B^1, (not in the portion A^1,) of the steam pipe, and by making the pipe A^1 of very great area, so as to reduce the possibility of the passage being choked, even in extraordinary instances, when an unusual quantity of water is drawn up with the steam. I prefer to so deflect the open end of the pipe A^1 that the contents shall be projected into the vessel C in a direction somewhat tangentially to the surface of the vessel. This insures that the steam and the water shall traverse around the inner surface of the vessel, in which condition the centrifugal force of the water particles will tend to keep them always to the outside, and cause them to strike against and adhere to the surface of the vessel, while the pure steam alone will remain free. By placing the open mouth of the pipe B^1 in or near the centre of the vessel, the best conditions for the reception of pure steam therein are obtained. The entire apparatus may be covered with felt, clothing, wood—lagging, &c., and with all such protection against the loss of heat by radiation as will be obvious to any good engineer. The drawings indicate the pipes as simply covered with felt or the like ordinary protection. I do not limit myself to any precise proportion between the vessel C and the several pipes. I believe that a very small chamber C will prove tolerably efficient in separating the water from the steam, although I

prefer one of considerable capacity, for the purpose of greater efficiency in separating the water, as well as affording more steam chamber, in which most boilers are insufficient. After the water has been properly separated, to be returned to the boiler, as indicated, the steam may be led either upwards, downwards, or laterally to any distance. In cases where it may not be practicable to lead the water directly back to the boiler by gravity, as where my apparatus is far removed from the boiler, or where it is by any necessity lower than the boiler, the water, after descending into a pipe corresponding to my pipe C^1, may be allowed to escape into the atmosphere, or into any suitable receptacle, by the operation of an ordinary steam trap, placed at the bottom of the pipe C^1. The same trap will prevent the escape of steam and allow only the escape of the water, while my vessel C and the several pipes will perform the same functions, as above described, except that the water will not be returned directly to the boiler, but will require to be acted on by a pump or the like, in order to return it. It will be observed that I attach some importance to the fact that the dense particles are thrown out of the current of steam by their momentum; but I should add that I ascribe much of the effect of my invention to another cause, to wit, the reduced velocity of the steam in flowing through the large chamber C. The velocity being reduced, the water is allowed to separate more readily, and will do so to some extent, even if momentum is not availed to render the action more efficient. My invention may, and in many cases where the vertical space is small must, be used in a horizontal, or nearly horizontal, position. It is never possible to separate all the water from wet steam by any mechanical means, but my invention will remove the greater part.

Some of the advantages due to certain features of my invention may be separately enumerated, as follows:

1. By reason of the fact that my vessel C receives the steam from the portion A^1 of the steam pipe, which is not connected to or in line with that portion, B^1, through which the steam is discharged, and is provided with the passage C, leading from its lower portion, as specified, I allow the water to escape from the influence of the current of steam which conveys it, and to descend by its gravity into the bottom of the vessel, and thence into the pipe C^1, while the steam alone flows off through the portion of the steam pipe B^2, without appreciable diminution in its pressure, and without any of the expense or risk of derangement due to the employment of working parts.

2. By reason of the fact that my pipe A^1 discharges the water and steam from itself into the vessel C, in a direction out of line with the mouth of the pipe B^1, and, in one form of the apparatus, with a whirling motion, or tangentially, and that the pipe or portion of the pipe designated by B^1, which conveys the steam from the vessel C, receives the steam at a point out of the path of the incoming current, and, in one form of the apparatus, at or near the axis of the vessel C, I am able to render available the inertia, momentum, or centrifugal force of the water to aid in preventing any considerable quantity from passing out through the pipe B^1, and in compelling the whole of the water to fall down through the pipe C^1.

3. By reason of the fact that my vessel C is located nearly over the boiler, and with the pipe C^1 opening into the boiler at a low level, I am able to return the water from the vessel C directly into the boiler, without any pump or analogous device to effect such return.

Having now fully described my invention, what I claim as new therein, and desire to secure by Letters Patent, is as follows:

1. I claim, in combination with the steam-generating apparatus A, the vessel C, disconnected portions A^1 B^1, of the steam pipe, and the drain pipe C^1, arranged for joint operation in separating the water and steam flowing through the pipe A^1, discharging the water through the pipe C^1, and the steam alone through the pipe B^1, substantially as herein set forth.

2. I claim the within-described arrangement of the vessel C, and its connections relatively to the boiler A, so that the water separated from the steam, and descending in the pipe C^1, shall flow directly back to the boiler, without the necessity for intervening mechanism, substantially as and for the purpose herein specified.

RICHARD C. BRISTOL.

Witnesses:

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E. S. WRIGHT.