

(No Model.)

E. TWEEDY & T. SAUNDERS.
METHOD OF CLEANING SURFACE CONDENSERS.

No. 551,012.

Patented Dec. 10, 1895.

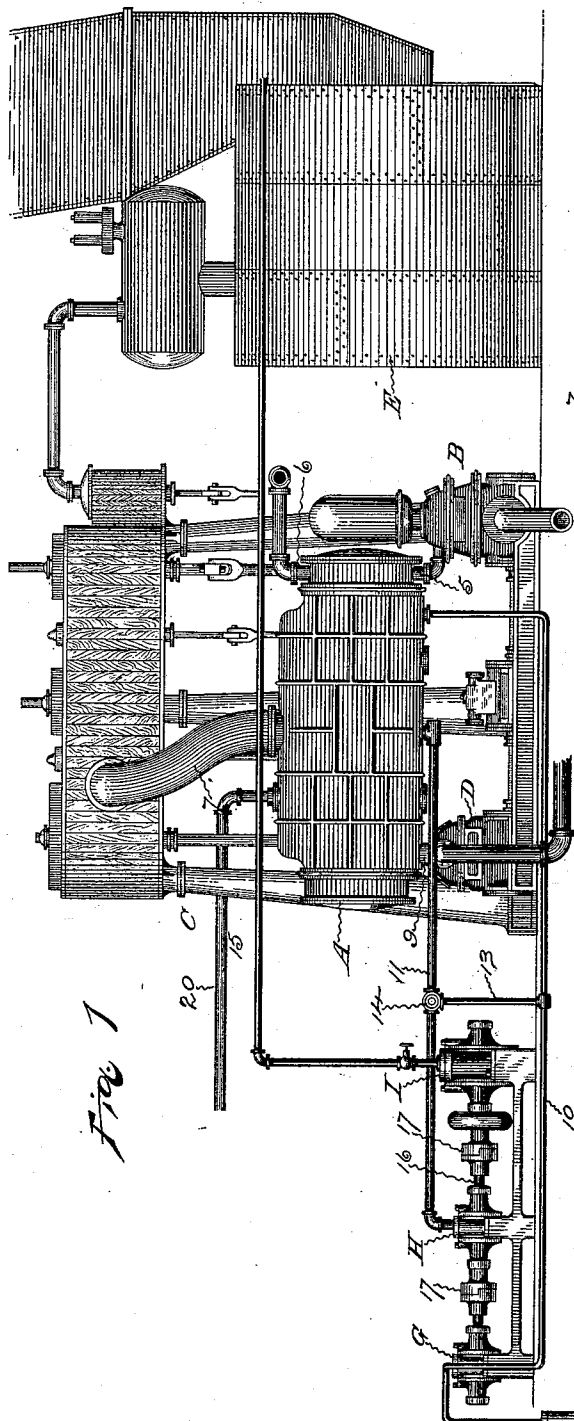


Fig 1

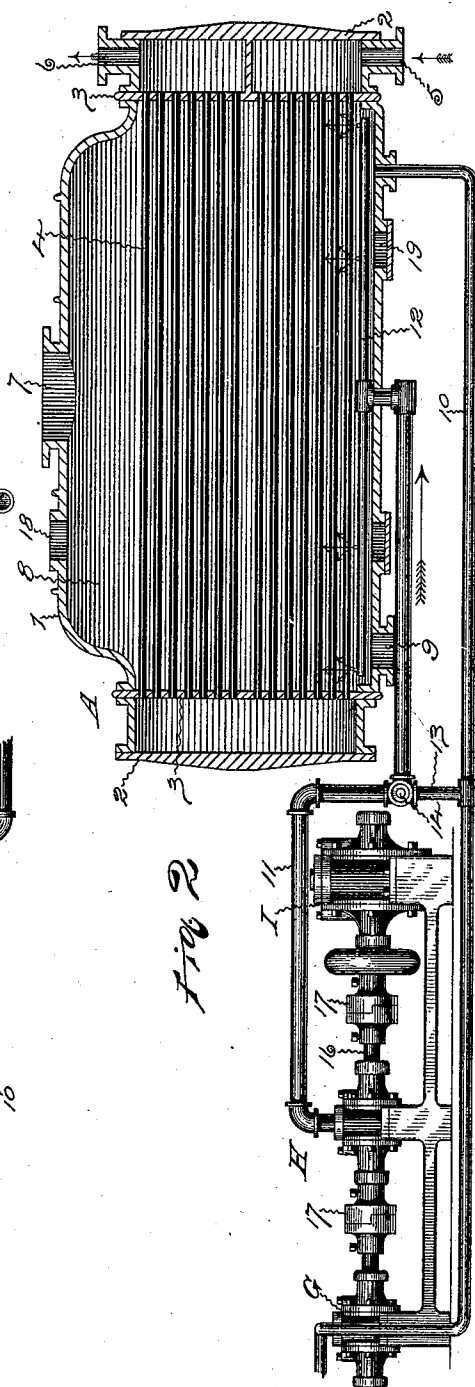


Fig 2

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UNITED STATES PATENT OFFICE.

EDMUND TWEEDY AND THEODORE SAUNDERS, OF DANBURY, CONNECTICUT, ASSIGNORS TO THE BOILER CAPSULE AND GASKET COMPANY, OF SAME PLACE.

METHOD OF CLEANING SURFACE CONDENSERS.

SPECIFICATION forming part of Letters Patent No. 551,012, dated December 10, 1895.

Application filed March 26, 1894. Serial No. 505,131. (No specimens.)

To all whom it may concern:

Be it known that we, EDMUND TWEEDY and THEODORE SAUNDERS, citizens of the United States, residing at Danbury, in the county of Fairfield and State of Connecticut, have invented certain new and useful Improvements in Methods of Cleaning Surface Condensers, of which the following is a specification.

Surface condensers are constructed with a large congeries of pipes, tubes, or other passages for the circulation of a cooling liquid, placed closely together for obtaining a great extent of surfaces in a limited space, which surfaces, after some use, become fouled by a gummy or greasy deposit, so that the efficiency of the condenser is reduced, and as this deposit has to be removed and the surfaces upon which it collects are too near together to be scraped while in place it has been customary to have the surfaces removed and separately scraped, which with a condenser having a large number of pipes is a very expensive operation, as it requires much labor and loss of time; and the object of this invention is to provide a cheap and convenient method of cleaning such condensing-surfaces without removing them from the condenser or disturbing the condenser or its connections and also to provide a simple apparatus for rapidly carrying out this method.

To this end the invention consists in the method of and means for applying to the condensing-surfaces a cleaning fluid that will act chemically on the deposit to be removed and agitating the same by currents of air or other gas, whereby the chemical action of the cleansing fluid on the deposit will be facilitated by a mechanical action, which more thoroughly causes the fluid to be brought into intimate contact with all of the deposit, thus insuring its entire dissolution and complete removal.

Referring to the accompanying drawings, which illustrate means capable of carrying out the invention, Figure 1 represents a marine engine and boiler with a condenser and means for cleaning it. Fig. 2 shows an enlarged sectional view of a condenser and an apparatus that may be used for cleaning the same according to this method.

Surface condensers A, as usually constructed, have a cylindrical or rectangular shell 1, of iron, brass, or other metal, with removable outer heads 2 and inner heads 3, which are perforated to support and hold a large number of pipes 4, that are placed closely together within the shell, and the water or other cooling fluid is forced by a pump B through an inlet 5 and caused to circulate through some of the pipes in one direction and others in the opposite direction and then pass away through an outlet 6. The exhaust-steam from the engine C passes through the steam-induct 7 into the chamber 8 and is there condensed by contact with the cooling-pipes, the water of condensation, together with the air and other gases in the chamber, being drawn through the educt 9 by an air-pump D, which retains the vacuum in the condensing-chamber and sends the water to the hot-well, from which it is pumped to the boiler E to be again converted into steam for driving the engine.

When the exhaust-steam from the engine passes into the condenser, it carries particles of the lubricants used in the engine and other impurities which are volatilized by the heated fluid, and these particles coming in contact with the cooling-pipes or other condensing-surfaces are precipitated and deposited upon the pipes and interior surface of the condensing-chamber in the form of a thick viscous substance, the accumulation of which prevents the proper condensation of steam and causes a lowering of the vacuum, with a consequent loss of power. As the lubricants mostly used are mineral oils, this deposit is of a pitchy character, which adheres to the pipes with great tenacity and is not readily soluble, and to remove it from the pipes, which are too close together to admit of the insertion of a mechanical mixer for agitating any cleansing compound or to permit of the surfaces being scraped when in place, it has been considered necessary to take out the pipes and scrape each one separately, which is a laborious and expensive operation, requiring considerable skill, and can only be performed when the condenser is not in use.

With this present process a considerable

quantity of cleansing fluid is placed in the steam-chamber 8 of the condenser A. The cleansing fluid preferably is in a liquid state and may be composed of a variety of substances, its composition depending mainly upon the character and quantity of the deposits to be removed. When animal or vegetable oils or substances are used for lubricating the engine, an alkaline solution composed of soda or potash dissolved in water may be used with good effect. When mineral oils are used for lubricants, a hydrocarbon liquid, such as naphtha, will be found effective in dissolving the gummy deposits and separating the mineral from the other constituents thereof.

Various suitable and effective substances or compositions may be found which will accomplish the required results under the varying conditions which will exist in practice, and we do not limit ourselves to the particular ones herein specified, our invention being present when the cleaning fluid used contains a solvent of one or more of the ingredients of the deposit.

The cleaning fluid may be kept in a conveniently-located tank F and forced by a pump G through a pipe 10 into the condenser-chamber when it is desired to clean the pipes until it nearly fills the steam-chamber and surrounds the cooling-pipes 4. The fluid is then violently agitated and caused to rapidly circulate around and between the pipes by air or other gas currents or blasts ejected into the chamber by means of a gas-pump H through a pipe 11, which preferably extends from the pump H to the bottom of the condenser, where it passes through the shell and terminates in the interior in a pipe 12, having suitable nozzles or openings for projecting the gas-currents in the proper directions to cause the most effective and violent agitation of the cleaning fluid. The strong gas-currents pass between and around the close-lying cooling-pipes and carry the cleansing fluid, which is thus not only well mixed and circulated to every part of the interior of the chamber, so as to be brought into contact with all of the foul surfaces, whereby the substances can chemically act on all the mass to be removed, so as to dissolve it, but the particles conveyed by the gas-blast act with a mechanical friction or attrition on the viscous mass and clean or scrape the partially-dissolved portions from the surfaces of the pipes to be cleaned, which mechanical action also aids the rapid dissolution of the substances under action of the solvent by circulating the dissolved portion and exposing the undissolved quantities to the chemical and mechanical action of the gas-ejected cleaning fluid. This gas-agitated cleaning fluid that acts mechanically and chemically on the substances to be removed will pass through small spaces between the pipes and into corners in which a scraper or mechanical mixer could not be inserted and will very quickly

and thoroughly dissolve and hold in suspension the fouling substances, so they can be removed with the cleaning fluid by reversing the action of the pump and drawing out the liquid or allowing it to run into a discharge. The cleaning fluid can be used more than once if the condensers are not too foul, and when it is desired to keep it for further use the fluid can be readily pumped back into the tank and retained ready for use.

It is preferred to first put the cleaning fluid into the condenser-chamber and then agitate it by the gas-blasts; but, if desired, a pipe 13 may be connected between the pipe 11 from the gas-pump and the pipe 10 from the liquid-pump, so that the gas may be forced with the fluid into the chamber and a more violent agitation produced while the condenser is being filled with fluid, a three-way or other suitable controlling-cock 14 being placed in the pipe system, if this is desired, to properly direct the air-currents for this purpose. A very convenient and simple apparatus for accomplishing this method is illustrated in the drawings, where a rotary gas-pump H and a rotary liquid-pump G are placed on the same base with a rotary engine I, that can be connected with the boiler E by a pipe 15, all being arranged so as to be connected to the same shaft 16 by couplings 17. Of course, if desired, the cleaning fluid can be placed in the condenser-chamber through one of the top manholes 18 and after use may be allowed to escape through a bottom manhole 19; but it is preferred to utilize the pump and save the fluid for further use.

If desired, a pipe or hose 20 may lead from the interior of the condenser to the exterior of the engine-room or other convenient locality for leading away the air or other gas currents used in agitating the cleaning fluid, and this is particularly important if such a cleaning fluid is used that its agitation liberates noxious or otherwise dangerous gases or vapors.

By means of this method the pitchy deposit which is caused by the precipitation of the solid matters of the lubricant used in the engine, with the other impurities from the water, can be quickly dissolved and rapidly washed from the close-lying pipes or other condensing-surfaces without removing them from the condenser, obviating a great amount of labor, saving a vast period of time, and without in any way disturbing the condenser or its connections and the many joints of the pipes, and while saving the expense incident to this the condenser can be cleaned more often, thus economizing the power and saving waste. This method also, furthermore, leaves the pipes and their connections in the condenser in a better condition—that is, less worn—than when they are removed and mechanically scraped or when subjected to a very powerful acid solvent which cannot be violently agitated.

This method is particularly applicable and

effective for use in connection with marine-engine plants, which previously could only be cleaned when the vessel was in port; but this present application of the cleansing fluid and its agitation can be accomplished by a simple portable apparatus that can be brought aboard when the vessel is in port, or it can be made a part of the plant of the ship, so that the method can be practiced very effectively at any time the ship is hove to or anchored in a very short period by unskilled labor, obviating an expensive delay in port. The great advantages of this method, however, result from its simplicity, its effectiveness, the rapidity with which it can be practiced, and the little wear it effects upon the parts of the condenser, with the consequent saving of labor and expense, and the additional purity of the water for the boiler obtained by the frequent use of this method economizes the power and also relieves the filter usually placed in the hot-well.

We claim as our invention—

The method of removing the deposit from the condensing surfaces in condensers without dismantling the same, which consists in introducing into the condenser which is to be cleaned, a liquid which is a solvent of one or more of the oleaginous, pitchy or gummy binding components of said deposit, and in violently agitating said liquid by forcing a gas into the liquid in the condenser between the surfaces to be cleaned, thereby forming a partial solution and a partial mixture of the ingredients of said deposit with said liquid, and causing said solution and mixture to abrade said deposit, and in withdrawing the resulting fluid from the condenser without removing the surfaces cleaned, substantially as specified.

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