(No Model.)

F. M. WHEELER.

SURFACE CONDENSER.

No. 526,208. Patented Sept. 18, 1894.

Fig. 1.

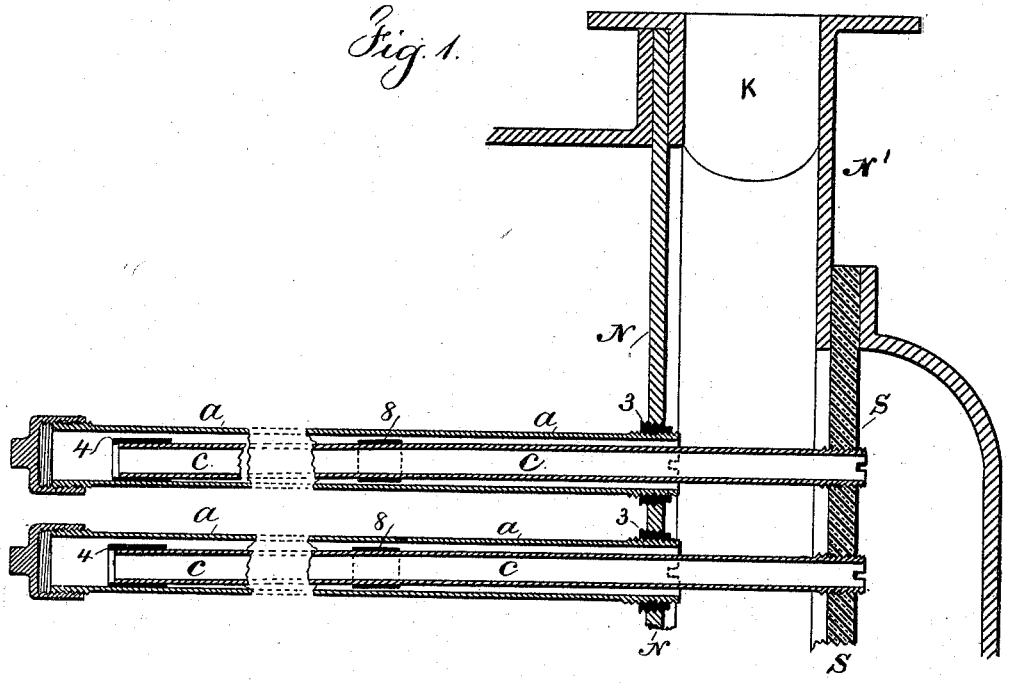


Fig. 3.

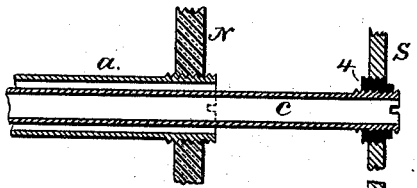
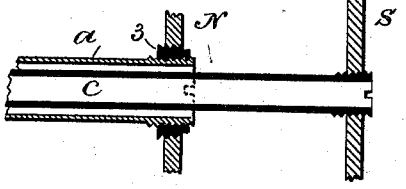


Fig. 2.



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SURFACE CONDENSER.

SPECIFICATION forming part of Letters Patent No. 526,208, dated September 18, 1894.

Application filed March 11, 1890. Serial No. 343,535. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK MERIAM WHEELER, a citizen of the United States, residing at Montclair, in the county of Essex and State of New Jersey, have invented an Improvement in Surface Condensers, of which the following is a specification.

Surface condensers have heretofore been made in which tubes of brass or copper have been introduced through heads, and in some instances a packing of paper, wood or similar material has been introduced between the head and the tube to allow for expansion and contraction of the tube and in other instances the condenser has been made with tubes fastened at one end and closed at the other end and containing interior tubes through which the water is caused to circulate. A condenser of the latter character is represented in Letters Patent No. 332,468, granted December 15, 1885.

In condensers, especially of the last named character, there appears to be an electric or galvanic action, especially where the condensing water is impure, whereby the acid or alkaline re-action is set up by the water circulating in contact with the brass or copper tubes of different temperature and especially when the water is traveling in two directions, the result of which is detrimental to the durability of the tubes and in some instances the tubes become perforated especially contiguous to the inner ends and places where the smaller tubes touch the interior parts of the large tubes.

The object of my present invention is to insulate the metallic tubes in such a manner as to prevent an electric or galvanic action being set up or concentrating in its action at any places between the tubes, thereby rendering the tubes more durable, especially when exposed to impure water passing through the same.

In carrying out my invention I provide for insulating the inner tube from the outer tube by interrupting the metallic continuity of the parts by the introduction of material such as hard rubber, vulcanite or analogous material that is an inferior conductor of electricity.

In the drawings I have represented portions of the tubes employed in a condenser similar to that shown in my aforesaid patent, Figure 1 being a vertical section with the insulating material applied to the tubes. Fig. 2 is a similar view with the inner tube composed of insulating material, and Fig. 3 is a section showing the heads or diaphragms of different materials.

The outer tubes *a* and inner tubes *c* are to be arranged in a similar manner to those shown in the said patent and the tubes *a* are secured into the head N of the condenser and the ends of the tubes *c* are secured into the partition or diaphragm S and a reference is hereby made to the aforesaid patent for the arrangement of the water ways by which the water is caused to circulate through the tubes *c* and return through the tubes *a* the tubes *c* being open at their inner ends.

In condensers of this character I have discovered that with water circulating through the tubes *c* and *a* that is impregnated with acid or alkaline material or foreign substances, the interior surface of the tube *a* is liable to become disintegrated especially where the tube *c* comes into contact with the same and this appears to arise from an electric or galvanic action. I therefore insulate these metallic tubes to prevent or lessen this galvanic action. In Fig. 1 I have represented the tube *a* as having an insulating ferrule 3 between the end of the tube *a* and the diaphragm N and the tube *c* as insulated at the hard rubber head or diaphragm S and also as having an insulating sleeve 4 of hard rubber or equivalent material around the inner end of this tube *c* to prevent the direct contact with the metal of the tube *a* in consequence of its bending or sagging at the inner end.

In Fig. 3 I have represented the head or diaphragm N of insulating material such as hard rubber and in Figs. 1 and 3 ferrules 3 of insulating material are shown in order that there may be no metallic connection between the ends of the tubes *a*. In Fig. 2 the tube *c* is represented as composed of insulating material such as hard rubber or vulcanized fiber which is not injuriously affected by the water that circulates through the same, whether such water is fresh or whether it is

salt or contains impurities, and this hard rubber or vulcanized fiber being a poor conductor prevents the electric or galvanic action being set up. Hence the metallic tubes *a* are not injured and are rendered durable. When the diaphragm S is of hard rubber or similar material as illustrated in Fig. 1, the metal tubes C will be insulated thereby at the ends that are connected with such diaphragm but in cases where the metal tubes *c* are connected with a metal diaphragm S, Fig. 3, the non conducting ferrules 4 should be applied around the tubes and within the holes in the diaphragm.

My present improvements are available with surface condensers with tubes and heads varying in shape or arrangement from those shown in my aforesaid patent and the manner in which the insulating material is applied in such condensers will necessarily vary, the object in all cases being to prevent an electric or galvanic action between the respective parts, by insulating such parts in the manner before set forth.

In Fig. 1 I have represented the diaphragm N as separate from the inlet or outlet pipe K and the cylindrical case or chamber N′ therewith connected, in order that such diaphragm N may be of any suitable material that is adapted to prevent or lessen galvanic action.

There may be hard rubber sleeves as at 8 to prevent the inner tube *c* coming into contact with the interior of the outer tube *a* at any intermediate points of its length.

I claim as my invention—

1. The combination in a condenser having heads and metal tubes closed at one end and connected at their open ends with one head, of internal tubes open at both ends and connected at one end with the other head, and insulating material to prevent galvanic action between the inner and outer tubes where one rests against the other substantially as specified.

2. The combination in a condenser having heads and metal tubes closed at one end and connected at their open ends with one head, of internal tubes of insulating material open at both ends and connected at one end with the other head for preventing galvanic action between the tubes, substantially as specified.

3. The combination in a condenser having heads and metal tubes closed at one end and connected at their open ends with one head, of internal tubes open at both ends and connected at one end with the other head, one of the heads being made of insulating material to prevent galvanic action between the tubes, substantially as specified.

Signed by me this 3d day of March, 1890.

FREDK. MERIAM WHEELER.

Witnesses:

GEO. T. PINCKNEY,

CLIFTON H. WHEELER.