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H. T. WEIS  
TUBE CLEANING PLUG  
Filed May 27, 1925

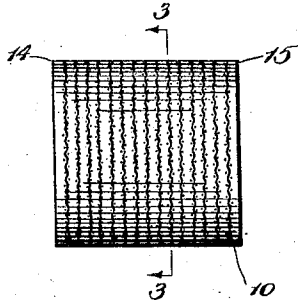


Fig. 1.

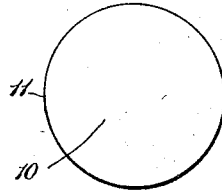


Fig. 2.

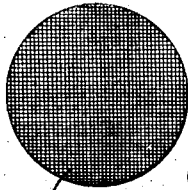


Fig. 3.

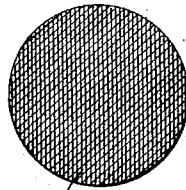


Fig. 4.



Fig. 5.



Fig. 6.

Inventor

Henry T. Weis

By Walter W. Burns

Attorney

## UNITED STATES PATENT OFFICE.

HENRY T. WEIS, OF RIVESVILLE, WEST VIRGINIA.

## TUBE-CLEANING PLUG.

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This invention relates to plugs used in the cleaning of the inner cylindrical walls of tubes, as for example, such as are found in condensers.

5 In devices utilizing the transfer of heat from the interior to the exterior or from the exterior to the interior of the tubes, for the purpose of liquefying gases or vapors or gasifying or vaporizing liquids, certain foreign substances, due to the actual conditions met, collect upon the inner walls of the tubes. A good example of such conditions is where a condenser of a manufacturing plant adjacent a river or of a steamer navigating a river, uses the river water for extracting the latent heat from steam to reduce it to water.

15 In these condensers, the steam enters the condensing space and comes into contact with the outer walls of the tubes through which the cool water flows. If the walls are clean in a properly designed condenser, the latent heat of the steam will be quickly taken from the steam with the resultant deposit of the condensed steam on the outer surface of the tubes. A small vacuum pump keeps air from the condenser and maintains a vacuum. When the water laden with mud or other undesirable substances, leaves a deposit on the interior walls of the tubes, there is a noticeable decrease in the vacuum with a consequent inefficiency on the part of the condenser, causing an increase in the back pressure on the engine at the exhaust. This lowers the efficiency and power output of the engine. These conditions are brought about by the heat insulation caused by the deposit on the inside of the tubes.

25 The problem of removing this deposit from the interior walls of these tubes is great. The three great elements involved in this problem are (1) time involved in cleaning and loss of use of the condenser, (2) labor in cleaning and (3) expense of cleaning devices.

45 Various devices have been constructed for performing this cleaning operation which for one reason or another have been more or less inefficient. One such device is a plug having soft flexible tube-wall engaging flanges.

This plug is intended to be forced into the end of a condenser pipe or other pipe to be cleaned and forced therethrough by air pressure or any suitable means.

55 It was found, however, that plugs of this type, after having been run through a tube

cleaning operation had decreased in size to such an extent as to render them useless for another operation.

The primary object of this invention is the provision of an improved tube-cleaning plug.

Another object of my invention is the provision of a tube cleaning plug having a tube scraping portion, means for guiding and reinforcing the tube scraping portion to hold it stiffly in place.

Another and still further object of my invention is the provision of a tube cleaning plug having a compressible tube engaging portion provided with reinforcements for preventing premature wear of the tube contacting surface.

To one skilled in the art, other and further objects of my invention will be apparent from a reading of the complete specification.

Referring to the drawing wherein I have illustrated preferred forms of my invention,

Fig. 1 is a side view of my improved plug.

Fig. 2 is an end view.

Fig. 3 is a cross sectional view on the line 3-3 of Fig. 1.

Fig. 4 is a cross sectional view similar to Fig. 3 but of a structure using reinforcements of cords such as are used in the manufacture of automobile tire casings.

Fig. 5 is an enlarged fragmental view of the reinforcement illustrated in Fig. 3.

Fig. 6 is an enlarged fragmental view of the reinforcement illustrated in Fig. 4.

The same reference characters refer to the same or similar parts throughout the drawing.

In using my invention I propose to make the initial diameters of the plugs slightly larger than the bores of the tubes. These plugs will preferably be forced into and through the tubes by an air gun which will have sufficient pressure to force the plugs through the bore of the tube.

The plug comprises a cylindrical body having an outer tube engaging surface and is constructed of rubber, rubber composition or any suitable material. The body portion has a sufficient axial length to prevent its axis getting out of alignment with the axis of the tube being cleaned and to give the plug, as a whole, stability. In order to cause the outer surface of the plug to properly engage the wall of the tube to be cleaned, I make the diameter, of the plug

body, slightly larger than the bore of the tube.

In order to hold the plug stiff, to prevent excessive wear and to provide additional means, aside from the edges 14, 15, to scrape the inner surfaces of the tubes to be cleaned, I provide reinforcements indicated at 16 on the drawing.

These reinforcements may take the form of fabric such as I have illustrated at 16 in Figures 3 and 5 and be constructed of any suitable material such as cotton, asbestos or wire, or they may be constructed by placing of cords or wires, in layers as illustrated at 16' in Figures 4 and 6. These cords may be of wire, asbestos, cotton or of any other suitable material. The incorporation of the reinforcing means 16, 16' in the body portion 10, may be carried out in any well known or suitable manner.

The term "reinforcing means" is intended to cover a structure where means are embedded in the body and project slightly from the surface thereof and act to clean the tube by their contact therewith and is not intended as a means merely to make the body of the plug stronger or stiffer.

In the event wire or wire mesh is used, it should preferably be bent in such a way that there will be an outward tendency of the ends of the individual wires in order to have them normally in position to scrape the inner wall of the tube. It has been found that plugs having the ends of the wires or fibers in contact with the wall of the tube being cleaned, are very much more effective to remove the foreign substances than the same structure without the fiber or wire. It has also been found in practice that the tendency to wear is very much less in the plugs with the reinforcements, than in those without such reinforcements.

While I have shown and described in detail modifications of my invention, I desire to have it understood that I do not limit myself to the exact showing in the drawing and that modifications and changes may be made without departing from the spirit of my invention and within the scope of the appended claims.

Having described my invention, what I claim and desire to secure by Letters Patent, is:—

1. A tube cleaning plug having a yielding body portion provided with a tube contacting surface, a non-rigid reinforcing means

comprising elongated elements of relatively small cross section embedded in the plug body and having portions of said elongated elements extending through the tube contacting surface in position to engage the wall of the tube.

2. A tube cleaning plug having a yielding body portion provided with a tube engaging surface, a flexible reinforcing means, the component parts of which are elongated and of relatively small cross section and which extend through the body of the plug and have their ends at the tube engaging surface in position to engage the wall of the tube to be cleaned.

3. A tube cleaning plug having a yielding body portion provided with a tube engaging surface, a flexible woven reinforcing means, the component parts of which extend through the body of the plug and having their ends at the cylinder contacting surface in position to engage the wall of the tube to be cleaned.

4. A tube cleaning plug having a yielding body portion provided with a tube engaging surface, a fibrous reinforcing means, the component parts of which extend through the body of the plug and having their ends at the cylinder contacting surface in position to engage the wall of the tube to be cleaned.

5. A tube cleaning plug of rubber or the like having a tube engaging surface, a fibrous reinforcing means, the component parts of which extend through the body of the plug and having their ends at the cylinder contacting surface in position to engage the wall of the tube to be cleaned.

6. A tube cleaning plug of rubber or the like, having a tube engaging surface, a woven cotton reinforcing means, the strands of which extend through the surface of the plug in position to engage the wall of the tube to be cleaned.

7. A tube cleaning plug having a resilient body portion provided with a tube contacting surface, a flexible reinforcing means comprising elongated elements of relatively small cross section embedded in the plug body and having portions of said elongated elements extending in position to engage the wall of the tube.

In testimony whereof I hereunto affix my signature.

HENRY T. WEIS.