

UNITED STATES PATENT OFFICE.

JOHN DRAPER AND ALFRED HOLMGREN, OF BROOKLYN, NEW YORK,
ASSIGNORS OF ONE-HALF TO HENRY RITTER MOUNT AND JOHN
BARNES, BOTH OF SAME PLACE.

INCRUSTATION-PREVENTIVE.

SPECIFICATION forming part of Letters Patent No. 453,882, dated June 9, 1891.

Application filed April 26, 1890. Serial No. 349,658. (No specimens.)

To all whom it may concern:

Be it known that we, JOHN DRAPER, chemist, and ALFRED HOLMGREN, consulting engineer, both of the city of Brooklyn, county of Kings, and State of New York, have invented an Improved Method or Process for Removal and Prevention of Scales or Incrustation in Steam-Boilers; and we do hereby declare that the following is a full, clear, and exact description of the invention, which will enable others skilled in the art to which it appertains to make and use the same.

The chief object of said invention is to prevent the formation of scales and incrustations in steam-boilers and to remove scales already formed in boilers and boiler-tubes; and it consists, essentially, in placing mercury in connection with bichloride of mercury and metallic sodium in the boiler, which, subjected to heat and steam-pressure, forms a smooth glassy coating or surface. The formation of said coating or surface is hastened by the addition of the bichloride of mercury, and when boilers are supplied with fresh water we find the addition of metallic sodium an advantage, and that the addition of bichloride of mercury and metallic sodium renders the process more speedy and perfect. The metallic sodium is of no appreciable advantage when the boiler is supplied with salt-water, and may be then omitted. The coating or glassy surface is formed by the action of these substances on the iron or steel with which they come in contact. Our experiments indicate that chemical action takes place in the boiler, forming a union of these substances with the metal; but the success of the method seems dependent upon the effect of heat and steam-pressure in the boiler, whatever may be the nature of the action. The exact degree of heat in the boiler to produce the best effect has not been determined; but it should be sufficient to produce steam-pressure. The mercury, having an affinity for iron and steel, forms under these conditions a permanent coating or smooth glassy surface which resists rust and prevents the formation of scales or incrustations. The minute particles of mercury penetrate between the scales, when these have been formed,

and the surface of the iron or steel, and by the action of the heat upon the mercury or upon the water which may enter the crevices the scales are detached from the metal and may readily be removed from the boiler. The best results have been obtained in our experiments by the use of about ninety per cent. of mercury and ten per cent. of bichloride of mercury when the boiler is supplied with salt-water. When fresh water is supplied to the boiler, the proportions to produce the best effect have been attained by the use of eighty-seven per cent. of mercury, ten per cent. of bichloride of mercury, and three per cent. of metallic sodium. The proportions requisite to produce a uniform effect will vary somewhat with the character of the boiler and the qualities of the water.

In carrying our invention into practice we first introduce the bichloride of mercury into the boiler, and after the same has been dissolved in the water we introduce the mercury or a mixture of mercury and metallic sodium. We prefer to mix the mercury and metallic sodium before application; but these substances may be applied separately without materially impairing the beneficial results.

The object of first introducing the bichloride of mercury, which is easily dissolved in water and has a strong affinity for metal, is to quicken the process and improve the character of the coating or glassy surface. The metallic sodium assists the process and acts as an amalgamator.

We have ascertained by a series of experiments that two pounds of the material for every one hundred horse-power will keep a steam-boiler supplied with fresh water clean for six months. In some conditions it may be desirable to renew the applications at shorter intervals. The engineer by examination of the boiler will be able to determine the necessity of introducing more of the material. The said substances have no injurious effect upon the metal with which they come in contact and are open to none of the objections urged against the means heretofore adopted for a like purpose.

The vegetable substances heretofore sup-

plied to boilers have proved injurious to the iron and steel and the metallic substances have proved too expensive for general use, while none of the substances used have proved
5 permanently effective in preventing the formation of scales.

The method herein described is comparatively inexpensive. The coating or glassy surface is speedily formed. The application
10 of the substances to the boiler, which is required only at long intervals, requires no special skill or attention of the engineer. The coating, being metallic, is a good conductor of heat.

15 The advantages of having boilers kept clean are well known, among which is economy of

fuel, which we have proved is effected by the use of our invention.

Having fully described our invention, what we claim, and desire to secure by Letters Patent, is—

The method of internally coating a steam-boiler to prevent incrustation, consisting in subjecting the surface of such boiler to the action of water, bichloride of mercury, and
25 mercury and sodium under heat and pressure, as set forth.

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Witnesses:

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