

The boiler is first thoroughly washed inside by means of a hose, held by a person inside the boiler, and directed to the sides of the shell, crown sheet, and tubes—one of the mudhole covers being taken off, and the water and mud run out at this hole and conveyed away in a spout, if necessary. A scraper is also introduced at this hole, for raising up any hard clay or other sediment that may have got stuck on the bottom. The legs of square fire-boxes to be scraped out in the same way. After being thoroughly washed with the hose, and scraped, a thin hard broom is now used, with which the shell is scrubbed and washed clean, a supply of water being admitted into the boiler to facilitate these operations. The tubes also are all to be cleaned out between each other by means of scrapers suited for the purpose, the scrapings being all broomed and washed forward to the mudhole, and partly run and partly drawn out at that orifice, along with the other sediment. The tubes to be also well cleaned internally at this time. The advantages gained by this simple process are incalculable. It prevents the boiler in every part where the flame strikes from being damaged, as these parts would be with a hard-baked cake of clay laying on them. It also keeps the heating surface up to its original power and efficiency; prevents to a great extent that troublesome condition of things inside the boiler, called "foaming," and is the means of discovering any undue wear of any part of the boiler, as soon as it shows itself.

Foam.

Foam is produced by the action of water, in a certain state of evaporation, upon some other substance or ingredient in the water, generally of a greasy nature. When a boiler is foaming, it is known by the nature of the discharge from the gauge cocks; and also from the foam running over the cover of the safety-valve, finding its way through the cover by the stem of the valve. The lever of the safety-valve will also be observed to jump up and down every few minutes; and if there is a water-indicator on the boiler, the pointer will be seen to play all the fantastic tricks imaginable, and causing no little consternation to the attendant. Various are the devices that have been tried for this disorder. We have been told by a practical engineer that beef shanks and hoofs are sure preventives; and by another, that oiling the tubes was an excellent thing—both these parties had some reputation in their profession—so we need not wonder at the number of boilers we hear of having been burnt, and the number of passably good jobs that have been spoiled in the starting, under such circumstances—the boilers probably being damaged within forty-eight hours of their

having been started. As already stated, the discharge from the gauge cocks will show when the boiler is foaming, both from the peculiar sound it makes, and from its appearance to one acquainted with steam boilers. When the boiler is not foaming, the steam will be pure and free from froth in the upper cock, and the water nearly free from steam in the lower ones, and both the steam and water will issue from their respective cocks in nearly straight lines.

Remedy for this occasional Foaming.

When the boiler is foaming, the remedy is, to pump in plenty of water, until the upper cock shows a large proportion of water in the discharge. When this is obtained, blow freely from the safety-valve for about half-a-minute; repeat this at short intervals until the foaming ceases, which in most cases will be within an hour, keeping always in view to blow no more out from the safety-valve than you are putting in with the pump, besides giving enough for the engine.

The precautions to be observed in applying this remedy, are: to keep the pump at work until the upper gauge cock shows this large proportion of water, before attempting to blow from the safety valve; otherwise, by blowing from the safety valve when there is already too little water in the boiler the crown sheet and tubes would immediately sustain damage.

An English work says of incrustation, that it has been found greatly to facilitate the cleansing of boilers if the plates were greased after every cleaning. For this purpose, in the Royal Gun Factories, at Woolwich, the refuse oil from the drip cans of the shafting is collected, and, after the boilers are cleaned, it is laid on inside with a brush. Although this does not stop the incrustation, it causes it to come off the plates much more rapidly, and is found to effect a great saving in time and expense in cleaning the boilers.*

Inspection.

In some cases it is found advantageous to have a running or weekly inspection of those parts of the boiler which are most exposed to the flame, and a thorough professional inspection for larger repairs once in six months. The weekly inspection comprises the fire box, tubes and shell, the feed and blow-off pipes and valves. In the morning before commencing to clean out the boiler, the outer part of the shell below the brickwork is broomed off,

*Of the two evils, incrustation and foaming, the former is the most disastrous, being an organic change in the material, while the latter is simply a deranged state of action; and at the Royal Gun Factories referred to, proper care will be taken of the boilers when lighting up, in the event of their foaming, which in all probability they will do.