THE LLEWELLYN FEED-WATER HEATER AND CONDENSER.

The evil consequences following the use of impure water for feeding steam boilers, both with respect to the loss of useful heating effect and the serious dangers following the overheating of the plates, have been so often pointed out in this journal, and are already so well known to all intelligent steam users, that their repetition in this place appears to us to be quite unnecessary. The subject, in fact, has come to be a stereotyped warning, and we shall boil it down to the briefest statement of facts.

The attachment of scale to the heating surfaces of a boiler, means the interposition between the iron shell and the water to be heated, of a stratum having about 50 times less heat-conducting capacity than the metal. The interposition of this non-conducting substance presents a serious obstacle to the rapid transfer of heat to the water—so serious, in fact, that when the deposit is permitted to accumulate until it attains a notable thickness, it represents an enormous loss of heating effect, or, to put it differently, an enormous waste of fuel. The attachment of scale to the heating surface, again, is also attended with serious danger to the plates of the boiler, because of the necessity of excessive firing to produce the required amount of steam. With water in contact with clean metallic surfaces, no amount of firing can work any injury, the plates can never be overheated, and the consequence will be simply the more rapid and energetic formation of steam. Where the metallic surface, however, is covered with a firmly adherent layer of cement-like scale, which opposes the free transmission of heat, the fire must be correspondingly increased, and the metallic surface exposed to the flame, not being able to transmit the heat freely to the water through the opposing stratum of non-conducting material, is liable to suffer severely from overheating. Where the evil is allowed to go on unchecked by carelessness or ignorance, or where, from the exigencies of business, the removal of the scale is not effected at frequent and regular intervals, the evil consequences here spoken of soon become apparent in the serious deterioration of the iron from overheating. Disastrous explosions, due to the weakening of the boiler plates from this cause, are not uncommon.

Knowing the wastage and danger of scaling in their boilers, intelligent steam users have adopted various methods of meeting and avoided them. As all natural waters (whether derived from springs, wells, rivers, lakes, etc.) invariably contain scale-forming impurities, preventives of this form of trouble are almost universally in use. They are in many cases simply mechanical; the boiler being shut down and emptied, and when cooled off, entered by a workman who removes the scale as far as it is possible to reach it, with a hammer. Another plan which is generally practiced, is the chemical method. It consists generally in putting into the boiler from time to time a quantity of some anti-incrustator, which shall have the effect of precipitating the scale-forming impurities of the water in floculent or pulverulent form, so that they will not adhere to the plates or boiler. The loosely aggregated mass is permitted to accumulate in the mud drum, from which it may from time to time be blown out. By another plan of a similar nature, the purification of the feed water is sought to be effected before its admission to the boiler, by employing large settling or precipitating tanks, and adding the chemical precipitant in sufficient quantity to effect its deposition.

Another system, which effects much the same results in a more practical and less circumstantial manner, is represented by the use of what have been popularly named feed-water heaters and purifiers. These, as the name implies, accomplish the purification of the feed-water by heating it in a suitable apparatus in connection with the boiler, to the point where the separation of its scale-forming constituents occurs, provide for the retention of these separated impurities, that would otherwise attach themselves as scale to the boiler surfaces, in the chamber of the apparatus, either by subsidence or filtration, and pass the purified water into the boiler.

Many devices of this nature have been invented, all of them exhibiting more or less mechanical ingenuity in their construction, and as a class they have been found to be so convenient and efficient in practice, that they have come to be very generally used. It is hardly necessary to add that the exhaust steam is invariably employed to furnish the heat necessary to effect the precipitation of the mineral impurities. They not only, therefor, measurably purify the feed water, but utilize more or less perfectly the heat of the exhaust steam, which would otherwise be wasted, to heat the feed, putting this into the boiler at a temperature at or near the boiling point, thus accomplishing at once two desirable objects.

We have occasion from time to time to present to our readers new devices of this character, embodying some novel or meritorious features of construction or operation and will take the opportunity in this article to describe one of the latest of these—the Llewellyn feed-water heater and condenser, which has been largely and successfully employed by steam users on the Pacific coast during the past year, and it comes to our notice with a high reputation for simplicity of construction and effectiveness in service.

It consists of a cylindrical shell or case of wrought iron, furnished above with a flat covering having a central orifice for the escape of any uncondensed vapors, and terminating below in a hopper-shaped base of cast iron bolted to the shell, which is provided with a pipe and valve for drawing off the sediment and precipitated material which accumulates therein. The feed-water is admitted through an inlet pipe, seen at the upper left-hand side of the apparatus, and provided with a hose-jet, by which the water is distributed in the form of a fine spray. A little below the centre of the heater a grating is placed across the shell, resting on an angle-iron flange, and dividing the cylinder horizontally into an upper and lower part. This grating is intended to support about 3 feet of stones of irregular shape and size (stones of from 4 to 6 inches diameter are preferred), cobble stones being the most desirable if they can be procured. For the admission and removal of these stones two doors are provided, seen in the cut, on the left-hand side of the shell.

Below the grating, on the right-hand side, is seen the opening for the admission of the exhaust steam: below this, on the same side, the pipe communicating through a pump or injector to the boiler; and between the two an overflow pipe to draw off the surplus should the heater act faster than the boiler requirement. To provide against this contingency, however, a float regulator is employed (seen on the opposite of the chamber), which automatically governs the valve of the feed-water pipe and regulates its supply.

The action of the apparatus is as follows: The cold feed-water entering through the inlet at the top, is distributed uniformly in spray over the surface of the stones, and trickles down through them. The exhaust steam entering from below, is thus met with an extended condensing surface of cool water, by which it is quickly and completely condensed before it reaches the upper surfaces ot the stones, The mineral matter held in solution is more or less perfectly separated by the heating of the water, and is deposited chiefly upon the surfaces of the stones, while the heated and purified water finds its way through the grating into the reservoir below, from which it is fed to the boiler, the surplus of sediment and precipitate accumulating in the hopper below from which it can be blown out from time to time by opening the valve provided for the purpose.

This apparatus differs from most of the feed-water heaters of its class, by bringing the exhaust steam into direct contact with the feed-water; its condensation, is, therefore, very rapid and complete, and a material saving in water is thus effected, which, in some situations where water is measured through a meter, will amount to a substantial saving in the year. The heater delivers the water into the boiler at or near the boiling point, and materially free from scale-forming impurities. After a certain period, variable according to the quantity of impurities the water contains, the interstices between the stones become filled up, and they must then be removed and replaced by others. This state of things is indicated by the fluctuations of the load on the water gauge.

The makers claim for this apparatus that it is a simple and rapid condenser; that it can be placed in any convenient position near to or removed from the boiler; that it assists the engine by affording immediate relief to the exhaust; that its construction is so simple that there is nothing about it to become disordered; that the inflow of feed-water is automatically controlled, making the apparatus self-regulating; and that as a heater, purifier, condenser and fuel-saver it represents a simple and effective device, from which the best results and highest economy possible with this class of apparatus may be realized.

Messrs. Parke & Lacy, of San Francisco, Cal., have purchased the Eastern state-rights for the manufacture and sale of this heater and condenser, and are now sole proprietors for this section. H. N. Black, 21 Park Row, New York is their representative there, and will receive and give prompt attention to all communications.—*Manufacturer and Builder.*