to the film of water in immediate contact with the inside and outside surfaces of the tube, and is little influenced by the kind of metal of which the tube is composed, or by its thickness up to the limits of that of ordinary tubes.

5. The conductivity increases up to a limit as the rapidity of the stream of water is augmented.

6. By the use of a spiral of wire to give a rotary motion of the water in the concentric space, the conductivity is increased for the same head of water.

The author, in conclusion, gives an account of experiments with atmospheric air, as the refrigerating agent; the conductivity is very small in this case, and will probably prevent air being employed for the condensation of steam except in very peculiar circumstances.

Incrustation in Steam Boilers. By HENRY RANSFORD.

From the Journal of the Society of Arts, No. 424.

All the world knows that the incrustation in steam boilers is deposited from the water, and that, in tubular boilers, it is very difficult to get rid of; but few are aware that "blowing out" a boiler, to get rid of the sediment on the bottom, hardens the sediment that adheres to the tubes, converting it into a calcareous shell, requiring a smart blow of a hammer to dislodge it.

Will you oblige me by giving to the world, through the columns of your *Journal*, a very simple and efficacious remedy?

I tried the experiment on a 30-horse tubular boiler. In addition to the blow-off cock at the bottom another was fitted over the fire-pan, at the usual level of the water, and to the end of it, inside the boiler, was screwed on a funnel of sheet iron, partly flattened, so that, on the cock being opened, anything floating within eight or ten inches on each side was drawn through.

The engine-driver had directions to open the lower cock once a day, and the upper one when he saw the water in the glass gauge was thick, and keep them open until the water ran clear, but never to blow out the boiler as formerly. Three or four gallons from the lower, and half that quantity from the upper cock was sufficient to carry off all thick and dirty water.

At the end of *three months*, first allowing the water to get nearly cold, the boiler was emptied; a stream of water was then introduced by the man-hole, and the tubes thoroughly washed. On examination the under half of the tubes was as clean as the day they were made, the upper half discolored, but no scale, and the sides of the boiler in a similar state; on the bottom was about a half bushel of thin scale, broken up into small pieces, that apparently had fallen or been washed from the tubes; thus, after three months' work, there was nothing to do but to get up steam again.

The secret consists in never blowing out the boiler when hot, the usual custom, as the result is—the heat of the tubes and sides instan-

taneously convert the soft deposit into a hard calcareous substance, and every time the boiler is blown out an additional stratum is added. If the man-hole is taken off on Saturday afternoon, and the flues opened, the water is cold enough to run off by Monday morning, so that no time is lost, and I have no doubt the hot water might be allowed to run off on the Saturday provided an equally large stream of cold water was allowed to run in at the same time, until the boiler and tubes were cold. I will merely add, the water was pumped from the Thames, and allowed to settle, before being used for the boiler. There is no reason why the plan should not answer equally well for locomotives.

Brompton, Dec. 19th, 1860.

For the Journal of the Franklin Institute.

The Manufacture of Cast Iron Pipes. By ED. BRANDT, Esq.

At the expense of much time, and subjecting myself to no inconsiderable labor and inconvenience, I have been enabled to accumulate the annexed particulars, which were the prominent features embodied in a Report upon the manufacture of cast iron pipes, submitted by John H. Rhodes, Esq., Inspector, &c., to the Chief Engineer of the Water Works, Brooklyn, New York. It deserves the closest perusal of all who are in any way whatever connected with water pipe castings, as its descriptions of the defects most usual, with those that only periodically and under certain circumstances occur, are clearly given, together with such rules and suggestions as will enable manufacturers to avoid them in the future.

As it will be observed, the Report compares the vertical pipe castings with the horizontal, and advocates the former.

The acceptance of defective castings and their use in the pipe distribution of a city, create, sooner or later, leaks and breaks in the works of which they become a part, causing much trouble and expense to the public; therefore, that intelligence which will cause the arrest of such imperfections in the manufacture of cast iron pipes should commend itself to the attention of public authorities, as well as that of manufacturers, inspectors, &c.

Mr. Rhodes says:

SIR:—Having concluded the duties to which I was ordered by you, I now present my Report, together with such information in reference thereto as I have been enabled to obtain.

In the course of the discharge of my duties, I have found a great proportion of the work so faulty as to lead me to a critical examination of the manner of manufacturing, and the cause of the defects. The proportion of bad pipes which I have from time to time met with has been so great (sometimes as high as 50 per cent.) as to create great doubt as to whether the remainder would be practically safe, although showing no defects to the eye or weakness under the application of the required pressure. I have observed, and hereafter shall endeavor