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THE HARRISON CAST-IRON BOILER.

The London *Engineer* of 13th May, 1864, contains an illustration of this boiler, and also a paper descriptive of it, communicated by Mr. Zerah Colburn, the eminent engineer, to the Manchester *Institution of Mechanical Engineers.*

These boilers are made up of a series of spheres, eight inches in diameter, by three-eighths of an inch thick. These are strung on bolts like beads, and the necks, where the bolts pass through, are three inches in diameter. The spheres weigh each about 22½ lbs., or about one hundred of them to the ton; and the boilers are rated as "4-ton boilers," &c. Each shell holds seven pints of water, and presents about one square foot of heating surface, while a ton of one hundred spheres represents three nominal horse-power.

Mr. Colburn says:—"It was the object of the inventor, Mr. Joseph Harrison, of Philadelphia, U. S., to provide great strength against bursting, and to obtain, also, a large extent of heating surface in proportion to the weight and external dimensions of the boiler. It was important, moreover, to obtain perfect circulation for the water. An experience of several years in America, and for upwards of two years in London and Manchester—in one case with a boiler supplying steam to the extent of 200 indicated horse-power—has proved that these objects, as well as other important advantages, have been secured."

Trials of these boilers were made in Brussels, in 1852, when a pressure of 1,440 lbs. the square inch was applied, without bursting any one of the spheres. Subsequent trials were made in England, at a pressure of 1,470 lbs., with the same result; they were, however, finally burst at a calculated pressure of 1,650 lbs. per square inch.

In a series of one hundred spheres, bolted together, the "bolts being upwards of 9 feet in length, the application of a strain considerably below the bursting pressure, so stretched the bolts as to cause the joints to open everywhere, and relieve the pressure. In this way every joint becomes a safety valve. This never occurs with any practicable steam pressure, but it did take place in many of the earlier experiments made to burst the spheres, although leakage seldom commenced until a strain of nearly half a ton per square inch had been applied."

According to Mr. Colburn, this boiler is as safe under a pressure of 225 lbs. per square inch, as a 7 feet Lancashire boiler is under 50 lbs. pressure. If, however, one of the spheres should burst, it could but empty itself, and open one or more 3-inch apertures into the adjacent spheres. In the bursting of an ordinary boiler, however, containing perhaps 20 tons, more or less, of highly heated water, the consequences are generally very disastrous.

Mr. Colburn considers this boiler satisfactory as to the absence of leakage, under ordinary working; the absence of scale in the spheres after many months' working; entire freedom from corrosion; and the facility with which the horse-power of a boiler may be either increased or diminished, by adding to or reducing the number of spheres; but one strong recommendation of this boiler is, the apparent impossibility of an explosion occurring, under any known circumstances—a very important consideration, in view of the large number of inexperts now-a-days having charge of steam-boilers.

The *Mechanics' Magazine* of the same year, in an article quite as commendatory as the paper already quoted, says:—"Strange as it may appear, no deposit ever collects thickly or permanently on the interior of the spheres. That it is formed is proved beyond doubt, as the scales are blown out. The truth seems to be that the cast-iron spheres expand in every direction—dilate in fact, when heated. It is at such a time that the deposit is formed"; and deposit, or scale being inelastic, the moment "the fire is drawn, and the boiler cooled down, the iron contracts, and the deposit within being unable to do the same thing, is broken up like an egg shell, and of course can be blown out at the end of each week." Boilers worked for upwards of two years were practically as free from scales as when they were first set to work.

After an interval of upwards of two years from the time of making the European experiments, a committee of the Franklin Institute, U. S., having been appointed for the purpose, have made a report (*See Scientific American* March 30th) on a series of Experiments and thorough inspection of these boilers, fully confirming the opinions of the authorities already referred to. Sections of from sixty to eighty spheres were tested by them, by hydrostatic pressure, one sphere bursting at six hundred lbs. per square inch, another at six-hundred and twenty-five, another at nine hundred, and another at eleven hundred pounds.