

by far the best, and for boiler purposes could not be better adapted; but its supply is exceedingly limited, and the cost for steam raising almost prohibitory. As a consequence, boilers are in use with water of every degree of quality short of that of the more highly acid mine and creek waters. Some small boilers derive an excellent supply from wells, some from the creeks above the influence of minerals from the mines. Some use the creek and mine waters of average quality, but still very bad, and just short of being dangerous. Several of the largest sets of boilers near the beach use sea water, as the Kurunui does. The danger and injury to boilers using the Karaka Creek water was forcibly presented to us by the inspection of the interior of four boilers situated close together in that locality. Three of these use the water of the creek, and the other uses the town supply. The creek water, at the time of our visit, when freed from the sand and mud constituting battery tailings, appeared to the sight quite pure, but in the boilers it becomes almost blood red, and the water from the cocks stains everything within reach with a deep dull red colour. As a matter of course this is owing to the solvent powers of the waters on the iron, and the interiors of the boilers are being corroded and pitted all over the surfaces of the water spaces. In these cases it is the purest and softest iron that is first attacked, and the action will cause the boilers to become useless in a fraction of the time they would last with good water.

The fourth boiler mentioned is one which at one time, from its faulty construction and the use of creek water containing much sediment, narrowly escaped a disastrous explosion. It is now fed with the town supply, and has all the appearance of lasting a very long time. No contrast could be greater than that presented by the interior of this boiler compared with those of the others, one of which, having been off steam for some weeks, had been shut up wet, and the flue was covered with about half an inch of a rich red paste of oxide of iron. In the management of the other salt-water boilers we found no salinometer in use; the boilers are worked a good deal by guess. In one we found more incrustation than was good for it; it was not salt as at the Kurunui, but carbonate or sulphate of lime.

The extraordinary effect of mine water on the Caledonian boilers is described by several witnesses. These proved impossible to be worked by that water, and in a very few hours after thorough repair were as bad as ever. So also with those in the Golden Crown Battery. In both these cases the remedy was the use of purer water.

The corrosive action of water in the Albion shaft is stated by Captain Richards in his evidence to be sufficient to drill holes in a quarter-inch boiler plate by dripping on them in the chambers for three or four days.

The first and greatest desideratum is a proper supply of pure water. The town supply is conducted in a main of only four inches diameter; and although it has been proved exceedingly beneficial to the town, yet the quantity available is totally inadequate to the requirements, and, unless largely increased, steam users cannot hope to avail themselves of it, at present. £50 per annum is charged to the Caledonian Battery for a half-inch bore of water.

Regarding the inspection of these boilers, it appears the Mining Inspector has some powers under regulations by the Superintendent. The practical effect of these, however, seems to us to amount to nothing, and no system has been established for the regular conduct of any supervision in a practical sense.

Bad water is only one of the dangers to which boilers are subject. Malformation is often a source of danger. The water-glasses are sometimes so connected with water and steam spaces that a false height of water is indicated when the engine is drawing steam. Manholes are often weak, and are sometimes placed so as to weaken the shell more than need be. Corrosion and grooving are sometimes steadily cutting into the plates, unsuspected, if not looked for by an experienced eye. Flues are to be found of undue length in proportion to the diameter, thickness, and pressure; stays and angle fastenings are often to be seen of ample size, and to spare, but which are fastened to the shell or parts they ought to strengthen by absurdly disproportionate sizes of bolts or rivets. Safety valves are not uncommonly faulty in proportion of parts and out of order from rusty pins. Pressure gauges are not uncommonly found 10 lbs. to 20 lbs. wrong in indication. Often a blind dependence is placed on a boiler because it had stood an hydraulic test to perhaps twice or more times its working pressure, when that very act may have crippled it in part, and rendered it dangerous from the strains exceeding the elastic limit of the iron. This mode of testing should be done with great circumspection, and more as a test of workmanship than of sheer strength, which is, provided the material is good, more easily and surely determined by calculation. But hydraulic pressure is of much value in testing flues, which ought to be carefully examined while under it with lathes set so as to detect the slightest change of form. One custom seems to obtain universal adoption on the gold fields, viz. the covering in entirely of boilers, wherever possible, with bricks and mortar. This practice is costly and dangerous. It has not one merit to recommend it, as radiation of heat can be much more effectually prevented by other and cheaper means. It is next to impossible for a boiler so covered to be detected in a small leakage, which may go on till the parts around are reduced to the thickness of a shilling. The destructive action of a leak is so well known to engineers that it is strange so much trouble and expense is taken to brick in boilers, when this effectually conceals such leakage and its effects. Brick setting of any ordinary sized boiler need not touch the plates for greater width than nine inches in any one place, and that is too narrow to conceal any fault from a practical eye. Perhaps the most imminent danger to which some of the boilers on the gold field are subject is that of unqualified attendants. On this point, the evidence of