The drawings appended show the form and dimensions of the boiler and the appearance of the ruptured plates.

The bursting took place by the collapse of the furnace, or the enlarged part of the flue; the plates of the crown tore away along two seams of rivets at right angles to each other, but otherwise the boiler was not damaged, nor was its setting in the brickwork disturbed in the least degree. The safety-valve was not moved, and was not out of working order, showing that it was not to any enormous increase of pressure that the bursting was due. The three unfortunate men who were killed had no duties which would take them to the boiler-house; they were in front of the boiler at the time, and were caught by the full force of the explosion. That this was not of a violent nature is proved by the reaction being insufficient to disturb the brick-setting, and were it not for the fatal results which followed, the accident in all probability would not have attracted much notice. But the cause of the explosion and circumstances leading to it are those surrounding many boilers, on the Thames Gold Field at least, and which, if not met with preventive measures, may at any time take effect, and from situation and surroundings be capable of equal or greater destruction to life and property.

The boiler had undergone repairs, and a new plate, one of those ruptured, had been put in the crown of the furnace, after which it had been at work for only five days when the collapse took place. The usual time for working each boiler before cleaning was four or five weeks. The steaming is continuous, day and night, Sundays excepted. Three firemen are engaged, each taking a shift of eight hours. The machinery and boilers are under the charge of one engineer. From the circumstances that two of the firemen have tended this boiler from the first starting of the battery, and the third almost as long, and all are, according to the testimony of the Company's mine manager and others, "perfectly steady and regular in their duties," the collapse of the boiler five days after being repaired certainly seems remarkable. But the cause of the accident is very evident to your Commissioners, and is plainly stated by nearly all the witnesses. The shaded portion of the drawings over the flue denotes an incrustration of nearly pure salt, which overspread the crown of the furnace exactly where the heat takes most effect. The position of the rupture is just where the heat would impinge on the crown with greatest intensity; and there the thickness of the salt scale was $\frac{1}{16}$ of an inch, forming a non-conducting material sufficient to cause the plates to become hot, thus losing their strength, and hence the collapse. This result was most likely accelerated by the non-conducting scale, as it formed, impeding the evaporating power of the boiler, thus causing the fires to be forced in some degree, in order to keep up steam. The draught of that furnace is stated to be intense, and under the circumstances it would be the work of a very few minutes to heat the crown to redness. The plate put in during the repairs mentioned was of rather a laminated nature; scales $\frac{1}{8}$th of an inch thick were taken off it after the rupture. Those present an appearance of having been red hot, and had parted from the body of the plate. An area estimated at 80 square inches was thus left at, according to the laws of the strength of such flues, of less than half the strength the original thickness of $\frac{3}{8}$ths of an inch. The area of this was too small, however, to seriously damage the strength of the flue, had the iron remained free from incrustation. The flue is, as we have stated, an unusually large one—50 inches in diameter. It is true, its length at this size is only 8 feet, being tapered in, with a flush crown, to 40 inches diameter at 10 feet from the front end. The full length is 30 feet 6 inches, and no stay rings were originally on it. Taking the most favourable view of this flue, its ultimate strength, when new, was, on the data of 30 feet long, 40 inches diameter, and $\frac{3}{8}$ths of an inch thick, 96 lbs. per square inch. And the consequence of the furnace end being, for a length of 8 feet, 50 inches in diameter, must have been to reduce to some extent, not easily determined, the above not very great collapsing pressure. Then as to the pressure at which it was worked. The engineer and firemen say 25 lbs. to 30 lbs., but the valve was set to 37 lbs. per square inch, according to the data furnished by the Mining Inspector in his evidence. This pressure is $\frac{1}{5}$ of the ultimate resistance, and an absurdly low factor of safety. The safety-valve was seen by Kay, the fireman on duty, just before the accident, to be slightly blowing off; and it must be very evident that a flue worked at so very small a margin of safety, if indeed such a term can be applied at all, would require but very small amount of weakening to insure the destruction which eventually happened. All the evidence points to sufficient water being in the boiler, and there is no reason for doubt on this point.

The incrustation, then, we are assured, was the immediate cause of the collapse; and we have as little doubt that the incrustation was only the effect of undue saltness of the water in the boiler. This even those in immediate charge admit, although they state that they are unable to account for it. But the fact is incontestable, in our opinion; and a careful study of the evidence, and an actual testing of the salinometer in use, together with calculations relating to the evaporation, feed, and blow-off of the boiler, lead, not to wonder that the salting took place, but to astonishment that it did not work its effect long ago.

The men in charge testify to having regularly tried the density of the water in the boiler by the salinometer, but they do not show that they used it intelligently, and the tests to which we put the instrument they say they used, show that it indicated much under the truth. It is right only at the density of sea water, at 200° Fahr., or $\frac{1}{32}$ on the scale; at zero, or rain water, at 200° it indicated too much, or $2\frac{1}{2}$ oz. to the gallon; and at the other extreme at which we tried it, or at $\frac{5}{32}$, or 25 oz. to the gallon, it indicated only full $\frac{3\frac{1}{4}}{32}$, or $16\frac{1}{2}$ oz. to the gallon. Without a table of corrections, such an instrument is worse than useless. The fireman, Kay, has seen the boiler water indicated by it as at $\frac{2\frac{1}{4}}{32}$. This, we find, corresponds on a true scale to about $\frac{3\frac{1}{4}}{32}$, a most