months, or longer, as the case may be, apparently considering that such things are complimentary to their ability as an engineer. In some cases it is all right, no doubt, for any engineer that gives his boiler a careful examination and inspection every two or three months may be reasonably assured of its safe condition for that length of time, providing everything was found as it should be when the last examination was made. The use of mechanical boiler cleaners tends to increase the length of time between which examination of the interior of the boiler is made, as some of these devices are capable of keeping a boiler free from scale for several months time without special attention. But no boiler should be allowed to go so long without careful examination, for a sufficient amount of corrosion can take place within the time to change the condition of the boiler from that which would be considered safe to that which might be positively dangerous and unreliable under ordinary conditions of usage. A practical knowledge of the subject would indicate that every engineer, worthy of the name, who had charge of a boiler, would make a careful examination of both the inside and outside, at least, every month, closely examining all parts for signs of corrosion, grooving or pitting, sounding plates and laps in joints for unusual and unsafe conditions.

The safety valve is a factor that cannot be ignored, and the usual practice of opening the valve or causing it to blow off at least once per day, does not really seem sufficient to be a guarantee that it will perform the duty required of it just at the time it should work to best advantage. A safety valve may readily stick, especially those that are constructed to prevent the steam blowing into the engine room whenever the safety valve performs its duty. A valve of this kind is usually fitted with a cap surrounding the stem through which it is intended to move without friction, and also without permitting an escape of steam around the sides of the stem, and for this reason there is great danger of its sticking, and that without any indications which will call attention. Valves of this kind, whenever inspected, will be found to have the stem thickly covered with mineral matter which has been carried off with the steam and finally adheres to the stem with such tenacity that it can only be removed by filing or sand-papering. Such accumulation enlarges the stem and a similar deposit in the cap often produces such a condition of affairs that to start the valve from its seat, even when the lever is removed, requires considerable of an effort. Under such conditions the valve is not corroded to its seat as usually expressed, but the stem and cap are caused to adhere on account of the accumulation deposited from the flow of steam, which carries with it more or less water from the boiler, which in turn deposits the sedimentary matter carried over.

As near as can be judged from what we find, the water in a boiler while in a state of ebullition is covered with scum formed from mineral and vegetable matter introduced in the water, and in some cases oil is also found which is brought in from the exhaust. It is generally shown that when water is carried over with steam, a large amount of this sedimentary matter is carried over also, and frequently a great quantity of it passes through the engine and out of the exhaust pipe, as may be noticed by the streaks of whitewash with which the exhaust pipe is marked. These substances when blown out through the safety valve are what cause such trouble, and to keep a boiler entirely free from such accumulation on the surface of the water would require the frequent use of a surface blow off, or the constant use of a mechanical boiler cleaner. But as the proper care of a boiler requires a consideration of a number of points that cannot be given in a single article we will continue the subject in another paper.—D. RIVERS, in *Invention*.

"STEPHANITE."

Several experiments with a new aluminium flux called Stephanite were carried out at Leeds recently. It is pointed out that the addition of metallic aluminium to iron and steel in a molten state greatly improves their quality, but the high cost of the metal, the impossibility of using it in a blast furnace, owing to its easy volatilization, and the great difficulty of obtaining a perfectly uniform alloy with the iron or steel in the crucibles, had so far limited its use, and stood in the way of generalizing its employment in the iron industries. These difficulties, the promoters say, promise to be overcome by the patent flux; composed of alumina and emery, which they are now introducing. It contains about 70 per cent. of alumina. In its natural state this flux is not volatilisable, like the refined commercial aluminium, but in a blast cupola or reverberating furnace it gives off its metallic gases or vapours, which unite with the iron, for which they have great affinity, and which acts as a condensing agent, whilst all the impurities go to the liquid slag and are drawn off in the usual manner. Metal manufactured by means of this flux it is claimed, works equally well under the hammer with the most malleable wrought iron, and will harden up to the hardest steel. It is also stated that the metal will work over and over again, becoming hard or soft at the will of the operator; and tests have proved that in its soft state it will stand a tensile strain of 38.8 tons per square inch. Another point upon which stress is laid is that the use of flux causes the iron to flow in a much more liquid state, and to remain in that condition a considerable time longer than by the ordinary process, thus preventing blow holes and faulty castings. By means of this invention, the promoters affirm, iron-founders will be able to make their own steel castings, independent of steel works, by simply melting scrap steel in their own crucibles. The cupola was charged in the ordinary way with common pig iron and coke, and then the flux, which is in the form of briquettes, was added. In due course the molten metal was run off and several castings were made. Some of these were immediately chilled and examined by the experts present, who considered the experiment had been successful. It may be added that about eighty pounds of the flux is required for every ton of metal.—*Mechanical World*, London.

POOR ENGINEERS AND GOOD BOILERS.

Boiler explosions are constantly taking place which ordinary precautions would have served to prevent. If any one doubts this let him investigate the causes of such disasters. On an average, the serious ones occur about twenty times a month, at least this has been the rate for the past two years, during which time the writer has carefully noted them. One potent cause is undoubtedly to be attributed to the employment of ignorant or careless men in the engine room, and another to the parsimony of some steam users, who "cannot afford" to get new boilers, though the old ones have been rendered dangerous by ill usage; perhaps they were only cheap tank iron affairs when first set in.

A few, happily the minimum, come from causes which the most painstaking manufacture and the most skillful handling