BOILER EXPLOSIONS FROM FAULTY CONSTRUCTION.

One of the clearest cases of a boiler explosion where the cause can be traced directly to faulty construction, and which affords an instructive lesson to would be improvers of the steam generator where they are tempted to depart from generally accepted rules of construction, is described and illustrated in what follows

The boiler referred to was a patent boiler, concerning which the most extravagant claims were made before half a dozen of them had been actually put in service. An explosion which occurred shortly after the first introduction of these boilers, while it justified the opinion of the inspectors of the Hartford Steam Boiler Inspection and Insurance Co., who have steadily refused to pass them, on the ground that they were unsafe, did not interfere with the pertinacity with which the makers affirmed their excellence.

The particular boiler whose history is about to be narrated, exploded at Holyoke, Mass., November 11, 1879. Its dimen-sions were as follows : Shell, 6 feet long; upper part, 22 inches diameter; lower part, 30 inches. In this there were 38 tubes, 6 feet long by 3 inches diameter; shell plates, 4 inch thick, tubes, 5-16 inch thick. The four braces—the ends of which are visible at A A. Fig. 1-were 9 inches wide and of 5-16ths iron. The mode of fastening these braces is seen in Fig. 2, where they are shown attached below the small reverse curve of the waist, by means of four of the seam rivets, to each side of the boiler. The back tube plate was stiffened by short bars of angle iron, riveted on transversely above the tubes. The shell, as will be seen by consulting Fig. 3, was composed of three plates, two of which formed the cover of the upper part, and the third that of the lower part, a continuous seam on each side joining the upper plates to the lower one.

The plan of construction, therefore, shows a departure from the rules hitherto made use of, the idea of the inventor being apparently to construct a boiler similar to the Union boiler, with a continuous connection or leg. The execution of this idea, however, involves a fatal weakness of construction, which will shortly appear, and which the event has shown, justifies the Hartford company in their refusal to insure them. By reference to Fig. 1, it will be seen that the outline of the end plates, which gives general outline of the boiler shell, is that of two parallel, incomplete and intersecting cylinders. The tendancy

of an internal pressure upon such a form as this must manifestly be to distend this compound form into that of a simple cylinder and this must necessarily bring a powerful strain upon the angles of the braces (Fig. 2), tending to straighten them out. The of the braces (Fig. 2), tending to straighten them out. effect of this strain upon the rivets fastening the braces to the seam, will be to pry them downward as the angle of the brace yields to the straightening effect of the strain-something like the effect of a "claw bar" on a spike in drawing it from the fastenings. The correctness of this criticism will be obvious to any mechanical mind that studies the engravings, and furthe details of the settling of the boiler and its fittings are superflous The boiler was considered safe at 75 pounds working pressure but at the time of the explosion the pressure was supposed to be from 40 to 50 pounds.

The theory of this explosion advanced by the Hartford company, seems to be so perfectly justified by the acts, that we entire ly coincide with it, and give it without further comment : of the middle braces, the second or third from the end. became so weakened by frequent motions, caused by the straightening tendency of the internal pressure, that it gave way at the angle (where it will be seen from the drawing, Fig. 1, and three di-them are broken off). The rest of them, a little less weakened, perhaps, by the same cause, gave way in turn immediately, have ing received a sudden succession to their load, and the shell yielded and broke at the middle of the long seam, which may also have been weakened along the margin of the inner lap, as indicated by the leak on the left side. The shell being now fairly open, the steam and water rushed towards the place of least resistance, which was outward and upward, carrying the shell plates before them and tearing them from the end plates. The bending of the upper tubes indicates the direction which the water about them took in escaping, as does also the tearing out of the entire upper row of tubes which, it will be seen from the one in sight on top of the cluster, were so much bent as to draw them from their setting in the tube plate. The four brackets which supported the boiler being below the opening, constituted the over-balancing resistance in the downward direction. Had the brackets been above the opening, the boiler would doubtles have gone high in the air, instead of tumbling over and over to the left, as observed by the attendant, who caught sight of it just before the whole scene was enveloped in steam and dust. The hypothesis seems to be so well supported by the facts that the word is almost a misnomer.

