

of the Commissioners, but to stir up the engineers in this country to similar activity, and to make known the character of these experiments, and create an interest in them that we give the following outline of what has been accomplished, during the last month.

A small vertical boiler, tested by hydraulic pressure to 182 lb., was fitted with a safety valve, loaded at 50 lb. pressure. It was intended to destroy this boiler if possible, by allowing the water to become so low as to permit the crown sheet to be overheated, and when the temperature of the steam had increased to 1000 deg to inject water. Unfortunately, the fire was urged too much, and one of the vertical tubes collapsed before the water was injected, and when the pyrometer showed only 750 deg. The pressure at the moment of rupture was 54 lb. The contents of the boiler were discharged without disturbing the position of the boiler.

The next experiment was made upon a large marine boiler, the shell about 8 ft. in diameter, the plates .26 in thick. This boiler had been six years in use, and was tested to 44 lb. hydraulic the day before the experiment. There was a safety valve on the boiler, set to blow at 55 lb., but it did not open until the pressure was about 72 lb.; it had struck in its seat. A little before the safety valve opened, the pressure being then 70 lb., two of the longitudinal seams opened. There had been a crack there in some places one-third of the thickness of the plate, and a soft patch had been put on the inside, a plate about 6 in wide, held by thirteen bolts on each side of the seam. The rupture followed the edge of the lap until it came to the cross-seams. The plates were 32 in. wide, and the edges opened 1½ in. at the middle, and yet the boiler did not burst. There was only the width of one plate between these two ruptures, so that over 10 ft. of the length of the boiler there was only 32 in of plate and the soft patches remaining. The patches could not count for much after the plates had parted 1½ in. at the middle.

The ruptured plates will be removed and the boiler repaired, and it will then be submitted to a bursting pressure. These experiments were conducted at Sandyhook; the weather had become so cold that the pipes were freezing; the Commissioners, therefore, remove to Pittsburg. Three boilers, the ordinary two-flue boilers of the Western steamboats, were there in place for experiments.

These boilers were all 25 ft long, 50 in. diameter, with two flues 14 in diameter. One of these boilers, registered as No. 3, had its shell 36 in., and the flue 3 in. thick; it was single-riveted. Four attempts were made to burst it, but when the pressure reached about 225 lb. per square inch, the seams leaked sufficient steam to prevent the pressure increasing. The strength of the boiler was its circular shell, and in no trial have they yet succeeded in bursting a circular shell by a gradually increasing pressure of steam. This is an important fact, for the circular boiler is being everywhere adopted in our steamers. The working pressure allowed on such a boiler in our passage steamers would be about 25 lb. per square inch; but, it must be remembered, that the American iron is generally better than ours.

No. 1 boiler was of the same dimensions as the last, but the shell and the flues were the same thickness, .26 in. The shell was double-riveted, the rivets zig-zag. At the first experiment with this boiler the pressure reached 360 lb. on the square inch, but with no other effect than simply to cause the seams to leak. On the 12nd ult., the flues were collapsed by sheer pressure, one of them vertically, the other horizontally, showing that it was not from being short of water. The flues tore from both the ends of the boilers, discharging the contents from both ends, not disturbing the boiler shell in the slightest degree. The effect is described as terrifying; report not allowed, but the whole atmosphere darkened by the cloud of steam; the water driven to a distance of over 350 ft., and the greatest width of its path, or "swath," over 150 ft., the chimney, flue ends, timber, &c., sent to various distances from 80 to 200 ft. and what height is not known. The condensed steam fell in the faces of the spectators at a distance of from 60 to 110 yards at right angles to the line of discharge. The report was not loud or sharp; the appearance of the expulsion of water and steam was very much like that of a piece of ordnance when fired. The concussion of the atmosphere was felt 200 yards away, and before the report was heard. Fortunately no one was seriously injured, but one man was scalded, and his and another's narrow escape is a caution.

The boiler was situated in a sort of ravine, between two banks about 150 ft. in height. There was a bomb-proof erection three feet from the back end of the boiler. The steam gauges were placed in the bomb-proof. The spectators were down in the ravine, scattered about, at from 80 to 110 yards from the boiler, at right angles to the boiler, the boiler lying across the ravine. They had a longitudinal view of the boiler, with its chimney and firing space to the right, and the bomb-proof to the left; the door of the bomb-proof was at the right-hand corner, towards them, but hidden by a projecting bank of earth, the bank of earth being continued all round the base of the bomb-proof. These two men had been at the back of this bank waiting for the explosion; they had waited so long that they thought it was another miss, and so left that position and coolly walked round to the boiler and examined it, and then they tried the water-gauge valves. They found the pressure was so great that they could not open them. They then hurried into the bomb-proof and read three gauges there—one at 400 lb., one at 450 lb., and one at 500 lb. Seeing a number of the spectators following their example, one of the men stood in the door of the bomb-proof, and made gestures to them not to approach. All the spectators were drawing nearer, believing the experiment had failed. While he was in this position, he having just turned to shut the door, the collapse took place. He was driven back by the concussion of the atmosphere to the wall of the bomb-proof, and, by the recoil, was thrown out of it entirely. He was scalded about the face, arms, and legs, but not severely. The other man, who was within the bomb-proof, was not injured.

It is a fair conclusion, from these experiments, that no circular boiler was ever burst, or can ever be burst, by a gradually increasing pressure without "complaining," or giving notice of over-pressure to the engineer or those in attendance. It is not the circular shells that are dangerous, but the stayed flat surfaces, and the high-pressure circular boilers, now coming into general use, are much safer than the low-pressure boilers which preceded them.

According to Fairbairn's rule, the flues of these boilers, if perfectly circular and without rings, should have collapsed at 241 lb. pressure. An average of the recording gauges, read after the experiment, showed only 350 lb., but, according to statement of the two men who were within the bomb-proof, it must have been much higher. The report of the Commissioners will no doubt explain this.

This is the first exposure of a boiler at such a high pressure that has been witnessed by spectators watching the experiment. The explosion described in the first part of this article was at only 53 lb. pressure.

The boiler experiments have been stopped until the spring of next year. During the winter the Commission will conduct experiments on safety valves. These are of the same character as those now being carried out by the editor of this magazine. In a special circular, sent out by the President of the Commission, D. D. Smith, Esq., the object of the safety valve experiments is thus set forth: "To determine the best form, construction, and dimensions of safety valves, so that they may be what their name denotes, and open to automatically, so to relieve the boiler that it will be impossible, so long as the valve remains unobstructed, to explode or burst a boiler by gradual accumulation of steam when in ordinary use."

BIRDS NEST IN A RAILROAD CAR.—A German paper gives the following:—Even the little members of the feathered creation, generally so shy, are becoming familiar with our noisy industries. Indeed, they begin to take rides upon the railroads. A pair of red-breasts recently made their home, built their nest, brooded and fed their young, under a gravel-car, constantly plying between Duren and Capellen Gilverath. The little creatures were regularly taken back and forth, and by this their range for food was considerably enlarged. Notwithstanding all the busy noise over and around them, they were much safer than in the most peaceful inclosure within the reach of wicked boys. A nest of young wagtails have recently left their nest, where they had been raised, under the plate of a switch here. Twenty-five regular trains, besides extra trains, went daily back and forth over them, yet the shy little family did not seem to be in the least disturbed.