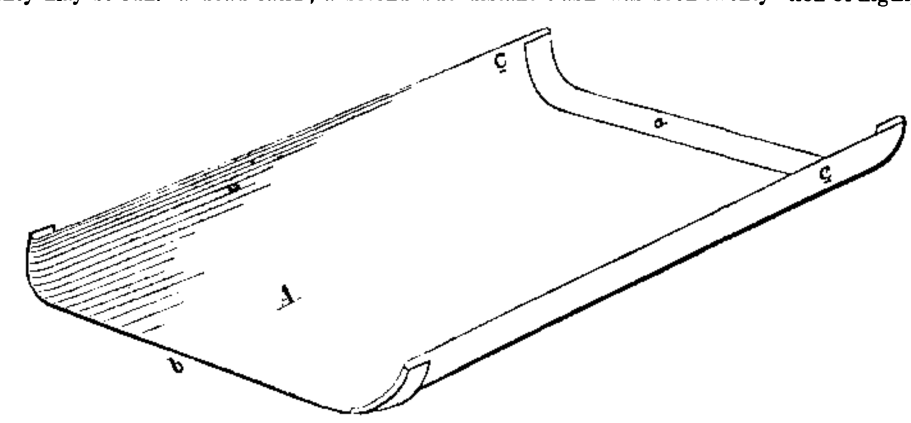
SCOTT'S PATENT SHEET IRON ROOFING.

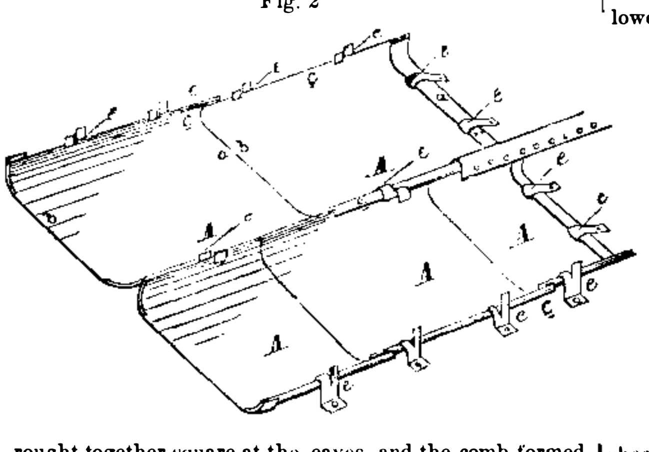
So many conflagrations have been caused by sparks from chimneys, or from adjacent burning buildings, falling upon roofs, that the safety offered by a covering entirely of iron, and consequently fireproof, is by no means unimportant. The device herewith illustrated, while securing that advantage, presents a variety of others which, in brief, render it a most efficient protection. It is portable, and is supplied in plates of eight feet in length by two in width, which are trimmed to fit with accuracy, so as not to get out of line, no matter how great the distance over which they may be run. These plates are provided with side and end connections complete, so that the work of laying them is greatly facilitated. The joints are strong and windproof, and rust or wear by weather is prevented by coatings of pure iron oxide and linseed oil. Finally, it will be noted that nails through the roofing plates are absent, and a frequent cause of leakage thus avoided, and that the peculiar arrangement of plates and seams provides fully for the contraction and expansion of the metal.

A sheet, as supplied by the makers, is represented in Fig. 1. The ends, *a* and *b*, are folded over in opposite directions, the former being uppermost when the plate is in position. The mode of locking together those ends is shown in Fig. 5, from which it will be seen that a continuous water shed is made. The device for attaching the plates to the roof is represented at *e*, in Fig. 5,and also in Fig. 2. This, at the sides of the plates, is an upright iron strip, split part way at the top to hook over the side of the sheet. To admit of this engagement the sheet is bent upward, as represented in Fig. 1, and the curve is such that the edges of adjacent sheets may be in contact and parallel for a short distance. The end cleat is also nailed to the sheathing. To finish the work, the sides are



SCOTT'S SHEET IRON ROOFING.—Fig. 1.

Fig. 2



rought together square at the eaves, and the comb formed, the same as in a standing seamed tin roof, by turning up a two inch standing seam with roofing tongs. In the engraving, Fig. 2, the cap, *f*, which surmounts the adjacent sheet edges, is drawn to the top, so that the fastenings, *e*, can be seen where the sides of the plates meet. The method of securing the parts by countersinking is represented in vertical section in Fig. 3, and Fig. 4 is a horizontal section of the same.

Fig. 3.

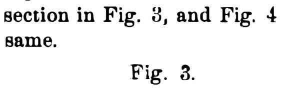
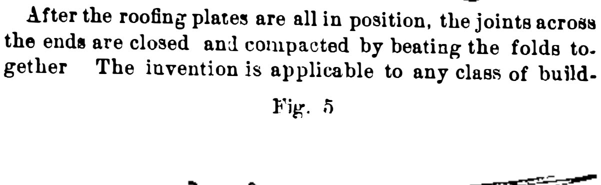


Fig 4

After the roofing plates are all in position, the joints across the ends are closed and compacted by beating the folds together The invention is applicable to any class of buildings, but particularly to large manufacturing establishments, on account of the slight pitch at which it can be laid, the cost of building being thus materially decreased.

Fig. 5



Further particulars may be obtained by addressing the manufacturers, Messrs. Scott & Co., 75 East Front street, Cincinnati, Ohio.

Struck by Lightning.

Mr. D. Pigeon gives, in *Nature*, the following interesting account of the effect of lightning upon himself and members of his family, during a recent thunderstorm: "The house, in which with my family I have spent the winter, stands in the center of Torbay and close to the sea. In the garden, which gives access to the shore, is a flagstaff, 50 feet high, with a metal vane at the top, the mast being steadied at about 25 feet from the ground in the usual way with iron wire guys. About a foot above ground, each wire rope terminates in a ½ inch chain, which is anchored a few feet in the soil.

February 25th, 1875, was a rainy day during the forenoon, with heavy wind from the southeast; but in the afternoon the sky cleared. There had been no sign of thunder all day. At 5 P.M. my wife, my son, and myself were standing under the flagstaff and within 10 feet of a mooring chain, watching the bay, when the vane was suddenly struck by lightning, which broke the mast short off in two places, tearing and splitting the wood between the vane and the iron guy ropes. Through these the discharge then passed to the ground, but three out of four mooring chains were broken.

The broken mast and vane fell to the ground close to us. Heavy hail followed the flash, the wind falling instantly to a dead calm; a second but distant flash was seen twenty minutes later, after which there was no more lightning. The discharge startled the whole village of Paignton; the coast guard officer compares the explosion to that of a 300-pound gun; and at Torquay, 3½ miles distant, a scientific friend speaks of both flash and crash as most terrific.

I must now attempt to describe the effects on ourselves and the impressions on our senses. Of the three, my wife only was "struck," and fell to the ground, my son and myself remaining erect, and all three retaining consciousness. For more than half an hour my wife lost the use of her lower limbs and left hands, both of which became rigid. From the feet to the knees she was splashed with rose-colored tree-like marks, branching upwards, while a large tree-like mark, with six principal branches diverging from a common center, thirteen inches in its largest diameter, and bright rose red, covered the body. None of us are certain of having seen the flash, and my wife is sure she saw nothing. As to the noise, my wife heard a "bellowing" sound and a "squish," recalling fireworks; my son also heard a "bellow," while I seemed conscious of a sharp explosion. My wife describes her feeling as that of "dying away gently into darkness," and being roused by a tremendous blow on the body, where the chief mark was afterwards found. My son and myself were conscious of a sudden and terrific general disturbance, and he affirms that he received a severe and distinctly electrical shock in both legs. My left arm, shoulder, and throat especially suffered violent disturbance, but I did not think it was electrical. As I turned to help my wife, who was on the ground, I shouted, as I thought, that I was unhurt, and hoped they were also, but it seems I only uttered inarticulate sounds, and my son, in his first attempt to answer, did the same. This, however, was only momentary; in an instant we both spoke plainly.

Neither of us referred the occurrence immediately to its true cause, but the idea of being fired at was present to all our minds, my wife indeed remained of opinion that she was shot through the body until she heard me speak of lightning. An infinitesimal lapse of time enabled my son and myself to recognize lightning; but I cannot say whether I did so before or after my first glimpse of the wreck on the ground. Neither of us heard or saw the mast fall, though it descended fifty feet, and fell on hard gravel close to us. My son and myself both experienced a momentary feeling of intense anger against some "person or persons unknown," further showing that we preliminary referred the shock to some conscious agency. I ought perhaps to add, that neither of us felt any sensation of fear at the time; but we were all nervous for several days after.

I have endeavoured to keep to fact throughout, but I venture to add a remark made by my wife as we raised her from the ground: "I feel quite sure that death from lightning must be absolutely painless;" and I offer it as an unconscious corroboration of views on this subject which our experience seems to strengthen.

The Use of the Hand as an Optical Instrument.

Dr. F. Thomas, of Uhrdorf,observes that, although artists are well aware of the advantages of monocular vision and the use of the hand as an impromptu stereoscope for the inspection of pictures, the public generally knows nothing of them. Any one who carefully watched the crowds that daily thronged the avenues of the late Vienna Exhibition might have seen how very, very few persons amongst them ever availed themselves of this ready resource.

And yet, how different is the appearance of a really good picture thus seen and the same viewed in the ordinary way by binocular vision! Regarding it with a single eye through the hollow of the hand as through a stereoscope, we get a relief, a substance, which otherwise is more or less wanting; in a word, we get the third dimension, depth, which is indispensable to realistic effect. Nor is the method applicable to the contents of picture galleries alone; every photograph, every engraving and print, of correct design, may be beneficially treated in the same way. As with the stereoscope, so with its impromptu substitute, we get increased focal length, and with it the several artistic advantages thence accruing. On the other hand, defects in drawing are ruthlessly exposed by the same means. Trifling errors in perspective, which might have passed unnoticed under ordinary circumstances, stand revealed in their full deformity.

With juster perceptions of the magnitude and relative dimensions of objects, monocular vision, combined with the stereoscopic use of the hand, gives us, also,a correcter appreciation of the effects of reflected light. And this applies not only to the confused appearance occasioned by the interposition of highly reflective media between the object and the observer, but also to artificial reproductions of the same effect.

A point ignored in every treatise to which Dr. Thomas has had access is the effect of the hand, when thus used, in modifying or correcting our perceptions of color. The rays of the setting sun are flooding the landscape with golden light. Prominent in the distance stands forth a church tower lighted up with a rich orange glow. By regarding it attentively through the hollow of the hand, and opening and closing the latter suitably, the tower can be made to assume any intermediate tint between the white it really is and the orange it has assumed in the rays of the western sun. The woods, too, dark, somber, and night-like to the unaided vision in like manner can be made to resume the hues they wore in the broad light of noonday. A bright patch on the far distance shows a soft subdued white, and we notice then for the first time that to the unassisted eye it presents a bright golden color.

Indeed, our conceptions of color are mainly dependent on comparison—contrast. But these are quite inadequate to enable us, under all circumstances, to detect and discriminate between minor differences of shade by ordinary unaided binocular vision. For that purpose, we must have recourse to the hollow of the hand, looking through it at the object with one eye, and comparing the effect observed with that produced on the other and unshaded eye. Both eyes may be open.

In such cases, the chief point is not monocular vision, but the shading of the eye by the hand thus applied. As with a Nicol's prism, we thus restore the equilibrium of the blue light diffused through the atmospheric regions—which in the landscape above referred to was overpowered by its complementary color, the orange emanating from the sinking sun —and are so enabled to see objects under the hues they would present when viewed by the white light of a noontide sun.

Phosphureted Steel.

A year or two ago, it was generally admitted that a pure ore or pig iron, and especially one containing less than 0·03 to 0·05 of phosphorus, was absolutely essential to the production of a good Bessemer steel; the consequence has been that many of our richest iron ores, most cheaply mined and supplied, have been ruled out as unfit for Bessemer work. Such are most, if not all, of the limonite and fossiliferous ores of Pennsylvania, Virginia, Tennessee, Georgia, and Alabama, in which the percentage of phosphoric acid runs usually from 0·05 to 0·15 per cent, corresponding to about double these amounts in the pig iron. This small percentage of phosphorus has been a perfect bugbear to iron manufacturers, and so important was it considered that one of our large steel works imported 10,000 tuns of ore from Algiers at a cost of about $16 per tun, because it was, at that time, impossible to procure ores here sufficiently free from phosphorus for use in the manufacture of steel rails. Innumerable efforts have been made to get rid of the phosphorus in the several processes through which the iron passes in its manufacture, but these efforts have been but partially successful, and then only in the puddling process, and, consequently, of no use in the manufacture of Bessemer steel.

Investigations which have been made during the past two or three years have developed the fact that, by a kind of homeopathic treatment (*similia similibus curantur*), certain substances which themselves give hardness and brittleness to steel may be in part substituted for other ingredients having a similar tendency, to the great improvement of the resulting metal. It has thus been found that, by securing proper relative proportions of carbon, phosphorus, silicon, and manganese, a steel of great softness and strength can be obtained, while the same percentage of phosphorus in ordinary steel would have indicated very different properties.

There is no longer much doubt of the fact that manganese exerts upon steel a body-giving and toughening influence, as well as a neutralizing effect, on the hardening or cold-shortening due to phosphorus. Though these properties of manganese have been blindly suspected for some time, the mutual dependence and, to a certain extent, interchangeability of carbon and phosphorus were not fully appreciated till the success of M. Tessié Du Motay, in producing, with ferromanganese, a good rail steel containing about 0·12 carbon, 0·25 phosphorus, and 0·75 manganese, was fully established.

The secret of success appears to be in putting into the metal from three quarters to 1 per cent of manganese without bringing the percentage of carbon above 0·16, while the metal contains the ordinary amounts of phosphorus and silicon, or, say, 0·25 to 0·29 of the former and 0·03 of the latter. When the percentage of phosphorus is diminished, that of carbon should be increased, and *vice versâ*, within certain limits. Steel is undoubtedly destined to supplant iron for almost every use where the latter is now adopted. Our ironmasters should apply those improvements that will place us in a position to compete successfully in other markets than our own.—*Engineering and Mining Journal.*