

LAMINATED STEEL PLATES.

IN the February issue, says the *Locomotive* we illustrated a laminated steel plate that came to our notice some time ago. At the time we first received the plate it was generally believed that steel was not liable to blister, since it is rolled directly from the ingot, and should, therefore, be entirely sound. Within a year or two, however, several instances have come to our notice, in which steel plates have been badly laminated. The cuts given in this issue illustrate two such cases.

Fig. 2 shows a plate that was cut out of a steel boiler that had



FIG. 1.—LAMINATED PLATE CUT FROM A STEEL BOILER.

been in use only six weeks. A blister developed on the lower side of the second fire sheet. It was raised about three inches at the highest point, and as nearly as it could be judged by the eye it covered an area of about twenty inches square. On cutting it out, however, it was found that the lamination extended in a thin line so as to separate the plates over an area about thirty inches wide and thirty-six inches long, the plate being so evenly separated as to closely resemble two plates, laid one upon the other. This appearance is represented in the cut. The outer layer, being exposed to the fire, had bulged over part of its extent, while the inner half showed no change in form and was free from any scale or deposit. The workmanship on the boiler is first-class in every respect, and the material was evidently intended to be, as the brand of one of the best mills in the country is stamped *directly on the blister*.

Some correspondence passed between this office and the makers of the plate. A few extracts from it are appended. "We are very sorry," writes the manufacturer, "to learn of the lamination having occurred. It is not the result of any attempt to weld the steel, as some people suppose, but in casting the steel ingots bubbles or blow holes will be confined in the mass sometimes, and, of course, when the ingot is rolled out, the surfaces are flattened together, leaving what appears like a blister, sometimes large, sometimes small. In the earlier days of steel making we found frequent cases of this kind, but in recent years skill and experience have enabled the steel men to largely overcome it. We watch constantly for it, however, in examining and hammering our steel plates, but in this case the surfaces were evidently so closely in contact that the hammer did not detect any flaw, either with us or with the inspector at the boiler shop; and it did not show up until the heat separated the surfaces."

The piece of plate was cut apart through the middle of the blister, as shown in Fig. 1, and one-half of it was sent to the maker for examination. He says: "The plate shows up very badly, and is certainly a very unusual specimen. In all our years of experience in the steel plate business we have not seen its parallel; but we have seen defects of the same character, though much less extensive. It was caused, no doubt, by slag

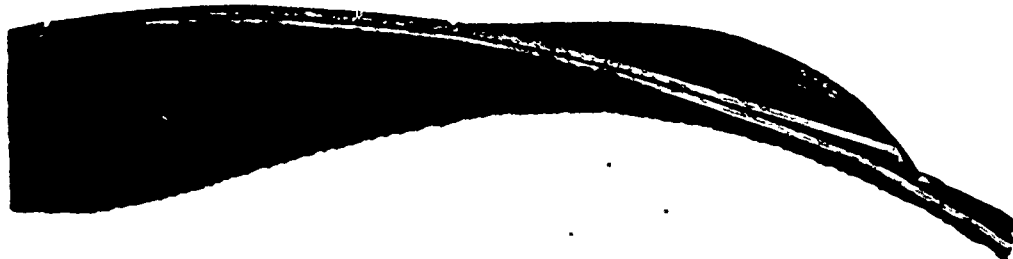


FIG. 2.—LAMINATED STEEL PLATE.

confined in the ingot. About nine years ago we bought some fire-box steel for a boiler for our own use, from a reputable manufacturer who sells a great deal of material throughout the New England States. Five plates out of the lot had to be rejected on account of blisters, and yet they were sold as the best open hearth fire-box steel. Such defects are likely to occur in the case of ingots poured from the top. It is now considered much better to pour from the bottom of the mold, through a pipe placed alongside and connected to the molds by underground channels.

Our rolls are cast in the same way. The metal flows more freely, and without splashing; and any impurities contained in it will rise to the top more readily, and remain there." Again he says: "The case, we think, is the worst one that has ever escaped our hands; and we admit that to one acquainted with the difficulties in the manufacture of steel ingots it has the appearance of an attempt to weld steel together. In any case of this kind, however, the weld would gradually weaken and not come to a definite termination. One could readily satisfy himself on this point by cutting of a portion and splitting it back to the end of the fold, and noting how suddenly the solid metal begins."

It is possible to leave too much of the top of the ingot in cutting off the crop ends of the slabs intended for plates. If the plates are sheared too close to the edge of the plates as rolled, lamination may appear on the edge of the finished product. This does not seem sufficient, however, to explain such extensive internal separation as in the present specimen.

In Fig. 3 a very curious blister is shown. It occurred some time ago on a boiler that was supposed to be constructed of steel, though at the time, not having had any such experience, we had some doubts about it being steel. The singular feature about it is the fact that it should have bulged so nearly equal in both directions. It has been suggested that a small fissure may have connected the original line of separation with the interior of the boiler, and that water penetrated the plate through this fissure, forcing the plates apart when it was afterwards turned into steam. This assumption looks reasonable, provided the fissure through which the water entered was very small, so that



FIG. 3.—CURIOUS BLISTER FROM A STEEL BOILER.

steam could not pass out of it very rapidly. Very likely, if this explanation is correct, the blister was developed gradually, by the entrance of water every time the fires were drawn, and its subsequent evaporation when the fires were again started. In the original specimen numerous small blisters could be seen on the interior surfaces of the large one.

TRADE PAPERS AS ADVERTISING MEDIUMS.

As indicating the important position which trade and technical papers occupy at the present time, says *Office*, it may be mentioned that the managers of the advertising departments of the prominent daily papers are at present instructing their canvassers to give no attention whatever to soliciting lines of business in which the general public is not interested, and in which

the services of a trade paper would be more likely to bring results than a daily paper. The rate is so closely followed by a number of the leading papers of the country that it may be accepted as the general policy of the newspapers of the day. Trade papers are constantly occupying a higher place in the estimation of the business public, and more

particularly in the estimation of the manufacturers and wholesalers who use them, and upon whose patronage they depend for support. While trade papers a short time since consisted of little more than mere advertising pages, with random clippings from various sources, they are at present the result of large corps of able and experienced writers; and, taken collectively, they exhibit more originality and more enterprise than perhaps any other class of periodicals at present published, not excepting the leading literary magazines.