

In the experiment at the Pacific Rolling Mills, the other day, this girder was loaded with 117 tons and 1,741 lbs. of railroad iron, the length between the supports. Under the weight it deflected at the joints a quarter of an inch below the true arc. The foundation on which the girder rested settled seven inches, so that loading had to be stopped. I have no doubt it would have carried 225 tons, or until the rods broke. At each of the abutting ends a lamina of lead was used to fill in between the castings, which were not nicely fitted, as the strength at this place was so much in excess of requirements. This was to make up for the irregular surfaces, the draft of the pattern making it fuller in the middle in each piece. To make up for the closing up part of the lead when the compressive force was exerted, as well as to straighten the tie rods, when loaded, the arch was cambered three-quarters of an inch at the joints above the true arc. The same rule applies to each one of these three sections as that of a continuous arch in one piece of its length; that is, they are subject to a bending moment and a thrust force, and both compression and tension are brought into play, as that of a straight girder, but less of tension than compression, being of arch form, as mentioned in a previous part of this article. But it must be borne in mind that the compressive force exerted on each of these three short arches or sections of the long arch, equivalent to three small girders, each 7 ft. 9 inches long, is equal to the compressive force of the whole length, 23 ft. 3 inches.

While the compressive and tensile force transversely exerted is only due to the load on a length of 7 ft. 9 inches, therefore the compressive force to resist the tie exerted on a single section of 18 ft. 9 inches, consisting of 8 bays, making the entire length of girder 150 ft., is eight times more than it would be if the girder was only 18 ft. 9 inches, so by a proper number of bays suitable to the length, this may be so regulated as may best suit any desired end.

Fig. 1, 2, 3, 4 and 5 are for a railroad bridge which may be made 500 ft. in length, and of a suitable number of bays. It will be seen that the top of strut is round and the ends of arch are socketed to meet the round of the strut. Provision is made to prevent the girder raising by being loaded only on one end with a tendency to raise at the other, as that of a railroad train on the one end. This is effected by the bottom edges of casting pressing together. It will be seen that the ends of arch on outside enclose the strut. Provision against lateral deflection is made for long spans by widening the ends where they abut and enclose the strut. To sustain the bridge floor wrought iron rods, or suspenders, may run inside or on outside of the cast iron strut, or a wall on top and floor beams laid on it.

This construction weighed in all its bearings Mr. Jackson thinks will be found to be much cheaper for equal strength, than any now in use. Girders of long spans for a bridge can be made as it were in a day, and taken to the place of destination and readily put together. By this mode of construction Mr. Jackson is convinced he has found a means to apply for the world's use the heretofore universally condemned cast iron, when used for long spans and subject to cross strain, as well as overcoming the inherent fault caused by the unequal distribution of the metal causing weakness if not positive rupture unobservable, made to exist by contraction of the metal in cooling. The 25 ft. girder is in front of premises, 231 First street, where it can be examined. Mr. Jackson respectfully invites discussion of the engineering world respecting the merits of the device described.

—*Mining and Scientific Press.*

SECOND-HAND BOILERS.

F. B. ALLEN.

It will, of course, be conceded that occasionally great bargains may be obtained in buying second-hand material. Such cases sometimes occur through the bankruptcy of large manufacturing companies, or from other business causes. In cases of this kind it is easy to find out who furnished the plant, the length of time it has been in service, and the manner in which it has been used, with perhaps satisfactory assurances of its present condition. Opportunities of this kind are few and far between.

Ordinarily, he who buys second-hand goods, realizes when it is too late, he has made a bad investment, but consoles himself in the thought of having obtained a valuable experience, in some cases, dearly bought. The purchaser of a second-hand boiler is peculiarly liable to be victimized, and is not only in danger of losing his money—but in most cases runs an additional risk of losing his life.

Engaged in the business of buying and selling second-hand machinery, are many honourable men who, understanding their business, are careful to buy only fit and salable articles, and thus they avoid the necessity for misrepresentation in selling again. The dealer is not alone to blame for the gross misrepresentations sometimes made. The average buyer of second-hand machinery is not content to buy the article for what it really is, and his evident desire to be humbugged stimulates unscrupulous men, who in the trade are largely in the majority, to make a shrewd calculation as to the manner of man with whom they are dealing, and cook up a story most likely to serve their purpose. Many tricks are resorted to by the latter class of dealers to sell their second-hand boilers. It is doubtful if they ever handled anything that had been used over a year, and was not built by days' work, if we may believe their story. One of these worthies sold from his stock for several years, each customer being assured that particular boiler was one of a number made by him for a large and well-known manufacturing company in a distant part of the State, who when the boilers were nearly finished changed their plans, had him build larger boilers, and retain those first ordered. Tubular, fine, upright and locomotive boilers were alike sold from that order, and for aught I know to the contrary, he may be filling orders yet from the same mythical stock.

One of our assured who had just bought a new boiler under some such representation, notified us to make an inspection before he began using it. In the report of inspection after describing the location of certain defects there was a further recommendation from the inspector as to the best means to be employed in cleaning the boiler of scale. Our friend did not understand how a new boiler could have so many defects, and his astonishment and indignation were further increased when he read that part of the report concerning the removal of scale. He returned the report to our office with what was meant to be some very caustic comments, ironically suggesting that he must have, by some mistake, received somebody else's report. It could not refer to his boiler, for it had never been used before. He was sure of that. It had to be finished after he bought it.

On investigation it transpired the alleged new boiler had not only been used for a number of years, but it had been grossly abused by firing up on it without any water, and burned so badly it was thought unprofitable to repair it by the boiler-maker, who sold a new boiler in its stead. The burned boiler next passed into the hands of a second-hand dealer for about the price of old iron. He had it repaired, shortening it up by cutting off the worst ring of plates. In setting it up again in the brick work, it was thought advisable to turn the boiler end for end. This, of course, left new holes to be drilled and tapped in the boiler head for gauge cocks, water gauge, etc. This was the proof relied upon by our friend to convince us, as it did him, that the boiler was a new and unfinished one at the time he purchased it. He now realizes the truth of the old adage which teaches "appearances are sometimes deceptive," and feels it has a special application to that class of boilers.

In second hand boilers the accumulation of sediment and scale on some inaccessible part during a period of years, greatly reduces the value of its heating surface. Therefore such boilers are necessarily more expensive in fuel than new ones. In some localities where fuel is abundant and cheap, the matter of economy is of little importance. As a rule, boilers are only removed for some sufficient cause affecting the safety or economy, and they will be found on examination, when this is the case, fatally defective in some important particular. It may not be an easy job to make a careful examination of a boiler after it has been scraped and heavily painted. The most careful, painstaking examination under such circumstances, may be very unsatisfactory in failing to detect incipient fractures in the sheets, the first external evidences of crystallization. The paint pot imparts a freshness and bloom of youth to the jaded boiler of twenty years' service, that is well calculated to stagger one's belief in "wear and tear," and doubt if there is any such thing as "fatigue in metals."

The poorest (?) specimens of second-hand boilers in this market are bought up and shipped to Mexico and Cuba; at least, the buyers report that as their destination. In view of recent disclosures it's not beyond the range of possibilities that the patriots who disburse (if they ever do) the "Irish Skirmishing Fund," may be surreptitiously buying these deadly instruments for shipment to England, Canada or Australia. The attention of the proper authorities is most respectfully called to this view of the case as entirely worthy their consideration.—*The St. Louis Miller.*