THE MORTISE AND TENON.

The mainstay of constructive woodwork is the mortise and the tenon. A piece of woodwork which can be put together without glue, nails, or screws, and serves its purpose, is an ideal work of construc tion. But this is not always possible. Another principle of construction is that every piece of wood should be so placed that it can swell or shrink without injuring itself or displacing any other piece. This is maintained in an ordinary panelled door, provided no mouldings are inserted. Still another principle is that mitre joints should be avoided, whether for moulded work or not, for the reason that shrinkage causes all mitres to open. No piece of wood should be used unless the straight grain of the wood can be seen through its full length. Inserted mouldings should be avoided as far as possible, and all mouldings for panel work should be worked on the stiles and rails. It is a general principle, observed in the best Mediæval joinery, that all mouldings on rails (which are horizontal) should butt against the stiles, and that stiles should be either plain or should have mouldings stopped before reaching the joints with the rails. In practice, all rail mouldings may be worked the length of the stuff used, and if munton (which are middle stiles) are used, the moulding may be cut away to the square wood before the mortise is cut which is to receive the tenon of the munton. Thus the mouldings will butt against the square sides of the munton. All the parts for a door thus made can now be got out by machinery, and the door will be fully constructive in every sense of the word. There is no obstacle to this in the way of cost. The dovetail is a constructive device, and the dowel is admissive in places as a substitute for the mortise and tenon. Tongue and grooving is a legitimate device, both for ends and sides of boards. Bevelling the edges of the pieces just joined is better than beading. The best way to construct large panels is to make them of narrow strips tongued and grooved, and bevelled at the joining edges. Such panels will never "draw." The shrinkage will be divided between all the joints. Solid table tops should never be fastened with glue or screws, but should be secured with buttons fastened to the under-side of the top, which travel in grooves cut in the framework to allow for expansion and shrinkage. These are but a few of the principles to be observed in doing the best woodwork.

In all kinds of timber the heart should be rejected. All boards cut out on a radius from the centre to the periphery of a tree will remain true, while all others have a tendency to warp or check. The first are called "quarter-sawed." It is a peculiarity of oak that the best grain is found in quarter-sawed boards. It is only in these that the "silver grain" is seen. This consists of a ribbon of very hard substance which grows out from the centre of the tree. It is for this reason that oak is the most enduring wood; it has a grain two ways. All woods check in the direction of a radius from the centre. Quarter-sawed oak cannot check.

RELIABILITY OF DIFFERENT PAINTS USED ON BRIDGES.

A careful investigation of the reliability of different paints used on bridges has been made by E. Gerber, of the American Society of Civil Engineers, with some important practical results. It appears that in all cases rust was found to a greater or less extent, occurring always in spots in the center of clean metal, most of this, however, being thin and as bad in new structures as in old. It was, nevertheless, found that the iron oxide paints adhered more firmly to the metal than the lead paints, only one case being found in which the latter adhered well and was tough, though much of this brittleness, it is suggested, may be due to adulteration of the oil by turpentine, benzine, or other petroleum products, there being more likelihood of such adulteration with lead paints than with iron, as they are more difficult to spread and consequently dilution of the oil is resorted to. In some cases bridges coated with iron oxide eleven or twelve years ago were found to be still in good condition without having to be repainted. Only two of the bridges examined had been painted with carbon or asphaltum paints, but the condition of things in these two cases was found to be not altogether satisfactory, as the coating was not tough or adherent. Too little attention, Gerber remarks, has been paid to thoroughly cleaning the metal before the first coat of paint is applied.

TO PREVENT PITTING OF PLASTER.

A correspondent of the Engineering Record writes as follows: In several cases where lime was used for plastering I had trouble with the surface being injured by the slacking of small particles of lime, in the wall instead of in the mortar bed, even after the mortar had been made and lain four to six weeks before being put on the walls. I then tried the expedient of making my plastering mortar by a new method, which succeeded beyond my expectation in remedying the defects and also improving the quality of the plastering.

I had all lime to be used run out of the lime box through a small sieve into a large putty box and kept well covered with water for about two weeks, then mixed with the sand and the hair. To get the ingredients well mixed the mortar had to be well tamped or you would see the streaks of lime and sand. The mason at first objected strongly to making the mortar by this method because of the increased cost of mixing, but he afterward said it was offset by the less labor required by the mason to make a good wall, and it certainly made a stronger and harder wall than by the old method on account of the increased labor or better tempering which the mortar received.

LIQUEFACTION OF CLAY BY SODA.—In Sprechsaal a practical man describes his experiments in this line which have already brought out one interesting fact. He dealt with very dilute soda solution, perhaps 0.2 per cent. of soda of the whole mass, and observed that a certain plasticity can be imparted to the clay by soda. On heating, the mass becomes more fluid, to assume its consistency again on cooling. He found no evidence of chemical action, and agrees in this and other points with Zebisch. When the soda is decomposed, by acids or calcium chloride, the mass becomes thick again. If then large quantities of water have been added to a clay for some purpose, the solid particles can easily be gathered again by admixing first a little soda and then calcium chloride, which is cheap enough, when the clay will settle; no filter press is needed. Experiments with cement have, as yet failed.

R. J. Hovenden, painter, King street West, Toronto, has assigned to S. E. Townsend.