the glucosides are decomposed, thus enabling the free coloring to combine with the metallic oxide. The tannin matters were referred to as including the most numerous of the Indian dyestuffs, and their utility to the color manufacturers as furnishing tannic and gallic acids, and to the dyers for the purpose of fixing the basic coal-tar colors, was fully explained and illustrated by experiment. In this latter connection cotton is first prepared with a cold decoction of the tannin matter, from which it attracts a certain amount of tannic acid; this is fixed upon the fiber as insoluble tannate of antimony by a passage through a solution of tartar-emetic, and finally combines with the color-base in the subsequent dye-bath containing the coloring matter, which is thus fixed as an insoluble lake upon the fiber.

Catechu, or cutch, was referred to as one of the most important of the Indian tannin matters, and the method of applying it in dyeing fast browns upon cotton was explained. The results of the practical examination of a considerable variety of Indian catechus supplied by the Imperial Institute were given, from which it appeared that the more soluble lustrous varieties which seemed to be rich in catechu-tannic acid, gave much better and richer colors than the less soluble earthy-looking varieties containing catechin. After pointing out that the Indian dyestuffs were now being investigated both from the practical and scientific points of view, the lecturer observed that with respect to red mordant-dyestuffs it was not likely that any new ones of importance would be discovered in India, but possibly some yellow mordant dyestuffs or some tannin matter might be found, which might prove of value to Indian if not to European commerce. His opinion was, however, that the chief interest of such investigations was more likely to be found on the scientific side, for by isolating and determining the constitution of the coloring matters of the Indian dyestuffs, it might become possible to prepare some of them by artificial means, or even to synthesize new products belonging to the same type, having all the advantages of the natural products, such as dveing direct, like safflower and turmeric, but without such defects as sensitiveness to alkalis, light, etc.

## THE MILL REPAIR SHOP.

## BY D. D. DONOVAN, PROVIDENCE, R.I.

The subject of a properly equipped repair shop for the mill is worthy of the serious attention of the mill manager. The most curious and important part of this question is, that an erroneous idea has almost always prevailed, and that is, that a repair shop is a source of constant financial drain on the factory, and furnishes no return for the money that is laid out to thoroughly equip it to do the work in the most advantageous manner, both in point of time and quality of work. How this idea originally crept in, and how the tradition has been kept up, is a mystery to a mechanic acquainted with cotton or woolen factory business. There is just as much chance for improvement in the repair shops as there is in the factories themselves. In this age of competition and

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close margins, it is not only of the utmost importance to have the mill equipped with the most modern machinery, but it is of equal importance to keep the machinery running up to its very highest efficiency. To accomplish this result, preparation must be made, so that when the inevitable accident occurs, it may be remedied in the best possible manner and in the shortest possible time, and the work of production resumed. I do not refer here to the possibility of a breakdown of the engine, or to any other accident that would cause a shut down of the mill, but to those minor accidents that interfere with the regular working of the plant, and for grappling with which, and making right as quickly as possible, a regular corps of workmen is employed. To effect the most speedy remedy for these troubles, facilities should be provided beyond what are found in many of our mills. This may mean the outlay of a few hundred dollars, from which no direct return is perceived by the management, but this outlay will show at the end of the year on the profit side of the balance sheet.

The master mechanic and the men employed in the repair shop are thoroughly conversant with its needs, but they are not always successful in impressing the managers with the fact that the proposed expenditure of a few hundred dollars for new tools will mean a great saving in the time occupied in making needed repairs, as well as in improving the quality of the work. The engine lathe, the planer, and the drill press, find places in all repair shops. If these tools are kept in good condition, they are important factors in any shop, and some years ago they would have been considered about all that was required. When we consider the rapid strides that machine-shop equipment has made in the last few years, and how necessary it is to take advantage of the latest improvements, in order to keep up with the procession that is ever moving onward and upward to a higher degree of efficiency in the construction of machine-shop tools, we must note the fact that the most successful firms are the ones that adopt the highest class of machines and the most approved methods of shop management. This will apply with equal force to the mill in all its departments, as well as to those engaged in the manufacture of machine tools. A stock room where parts of machinery that are liable to give out could be made up and kept on hand for use when required, would greatly facilitate the making of repairs, for the cost of the part is very slight as compared with the loss occasioned by the stoppage of the loom or other machinery while the repairs are being made. How much time is often consumed in ordering a casting for a gear blank from the foundry, chucking the hole, turning in the lathe, and cutting the teeth in an old rattle-trap gear-cutting machine, the only excuse for retaining which in the shop is that there is not enough work for a machine of this kind to warrant purchasing a new one, no thought being given to what it costs in loss of time to retain the old tools. The practice among all successful machine builders is to replace the old tools with new ones, as the efficiency of the old becomes impaired; and the same practice prevails in the mill so far