THE CARE OF SHOP TOOLS.

The *American Machinist* has some important suggestions concerning the advantage of care and system in the treatment of shop tools. First cost of tools seldom represents their ultimate cost, whether it becomes necessary to repair them or not. If a good mechanic makes a tool last a year in constant usage, while his careless neighbor uses up one of the same kind in six months, the cost of the latter should be accounted twice that of the former. When repairs are made their value must be added in computing the whole cost of the tool.

One primary reason why some shops can show a greater profit on a given amount of work is because they get more service out of their tools. This is just as evident when the tools are cheap as when they are dear, for the products of mechanical labor fluctuate the same as the first cost of tools; and if a large part of the income of the business goes for working tools and repairs to the same, balances on the right side of the ledger are likely to be diminutive, if indeed they appear at all. It is the first requisite that tools and machine should be adapted to the work to be performed. Fine tools should not be used on heavy, coarse work. They must also be kept in good working order, cutting edges well sharpened and bearing surfaces lubricated, shafting kept well aligned, pulleys balanced, belts kept clean and pliable and at the correct tension, rust prevented, emery wheels trued up, and dirt kept out of all wearing parts.

Machines should be mounted on stable foundations and run neither above nor below the proper speed required to do the work. Small tools require as much as large ones, and a careless or inexperienced workman will often spoil more than the amount of his wages in files, drills, chucks, reamers, taps, dies, calipers, wrenches and the like, unless closely looked after by the master mechanic. It is therefore very essential, in order to insure proper care of tools, that workmen know just how to use them. All small tools should be laid away systematically in a dry place, when not in use. In large shops a room should be set apart for this purpose, and a man detailed to take charge of it and keep the tools in good working order. There is no part of a large machine shop from which an outsider can form a better judgment of the general management than by an observation of the tool room. The best economy is secured by securing none but the best tools at the outset, for in the long run they will be found the cheapest.

SOLIDITY IN IRON CASTING.

Great difficulty is experienced in the ordinary way of casting to get a uniformity in the mass and any near approach to perfect solidity. For some years past the difficulty has been obviated to a more or less extent by mechanical pressure. The possibility of doing this was very fully shown at the recent Paris Exposition, by Mr. Whitworth, of Manchester, England, whose exhibit comprised an excellent collection of compact pressed castings, which, when compared with the unpressed ingots shown alongside, gave striking tendency of the utility and effect of mechanical compression in iron casting.

Since the introduction of mechanical pressure in casting, however, it has been discovered that a much better result in the same direction may be more readily obtained by chemical action. This chemical action consists in the deoxidizing action of manganese, silicon, &c., in the mass of the iron while in its molten state. This new process has quite recently been brought to an astonishing degree of perfection. This was fully shown, at the Paris Exposition, by the French Terrenoire Company, and by other exhibits, both French and English. These exhibits proved most conclusively that compact castings, containing but small amounts of carbon, can be produced on a scale and to a degree of perfection hitherto unthought of, simply by a skilful use of deoxidants. Not only manganese and silicon can be successfully used, but tungsten and chromium can be employed to the same end.

Silicon has been found to be by far the most effective of these reagents; but it is accompanied with the disadvantage, that, when used in excess, it is more harmful to the quality of steel than that of either of the other substances used for producing the desired hardening results. For this reason manganese is preferred and used in the form of ferro-manganese, or ferro-manganous silicide. Hitherto there has been much difficulty in obtaining such alloys; but at the present time these alloys can be produced in any desirable proportion up to 87 p. c. of manganese, a thing which, two years ago, was considered an utter impossibility. In addition to the value of this process of oxidation as a means for obtaining solid, compound castings, these same alloys are also employed for the purpose of deoxidizing mild steel, which can thus be brought down to any desirable degree of poverty in carbon, say, to five one-hundredths of a per cent. As already intimated, the technical progress which has placed this process within the range of ready practicability, is the discovery by which the compounds needed may be produced at a sufficiently cheap rate.

A NEW TEST FOR STEEL.

Although the mechanical and practical tests employed to ascertain the quality of steel undoubtedly offer the basis for a good estimate of the material, and valid conclusions may in many cases be drawn as to homogeneity from the appearance of the fracture, serious mistakes may be made in the latter course, because even close steely fracture cannot always be relied upon; nor is the fact that in manufacture the steel has passed through a liquid condition, a guarantee for its homogeneity. The question is, whether the particles of steel which in a state of rest are uniformly grouped, are so also when the material is subjected to stress. The molecular changes to which fibrous iron is subject under long continued vibrations or concussions, are well known, and it is established that similar changes of structure, caused by molecular movement, occur with steel also, though not so frequently. The result of long-continued vibration of iron and steel is a gradual decrease of cohesion. A means for ascertaining the degree of such a molecular change and its consequences, would naturally possess great practical importance.

Prof. Anton von Kerpely has recently read before the Hungarian Academy of Sciences, an important and interesting paper, in which he claims to have elaborated a simple means for attaining the desired end, a claim which he substantiates by the publication of the reproductions of a series of fractures of various grades of steel, obtained by widely differing processes of manufacture and under widely differing circumstances. His test consists of fracturing the sample when hot, and, in order to secure a uniform temperature below red, he has chosen the dark blue color as an indicator. The following is his method in carrying out this plan of fracturing when hot. The sample to be examined is placed in a bath of lead, which is kept at low temperature in a graphite crucible. After 15 to 20 minutes, according to the thickness of the rod, it assumes the temperature of the bath. If a notch has not been made at the place where the fracture is to be effected, it can be easily done when the rod is hot. With a bath of low temperature the rod cools down too much by being placed on the anvil; in such a case it must be returned to the bath.

The best way to determine whether the sample rod has reached the proper color temperature, is to polish a portion with a file and notice the color of the brightened surface. If no color appears, or the blue disappears rapidly, the rod is too hot; but if any other color but blue remains constant for some time, the rod is too cold. As soon as the proper temperature has been struck the fracture must be made. Prof. Kerpely has made a long series of tests with steels from various processes of manufacture. His general conclusions from these are the following: Good crucible steel shows a peculiar behavior. Molecular change, though plainly discernible by the fine scaly structure, is trifling only when compared to results obtained with other grades. The fracture is almost smooth, and homogeneity seems to have been impaired but little, and it is only with the softest kinds of cast steel that the structure becomes somewhat more scaly in character. Bessemer steel of middling hardness showed quite a high degree of disturbance of the molecular structure, having a coarsely and deeply furrowed fracture, bearing some resemblance to wrought iron. Although it does not follow that all Bessemer steel will exhibit such characteristics, Prof. Kerpely believes that the fracture of the steel may be relied upon, in most cases, as an indicator in tracing the origin of a steel, and often in permitting conclusions as to the treatment it has undergone. The subject is one which certainly deserves experimental inquiry at the hands of American metallurgists and steel manufacturers. —*Iron Age.*

UNSLAKED LIME FOR BLASTING PURPOSES.—Unslaked lime compressed into cartridges, or used loosely and well tamped down in the hole, using water or other liquid to saturate and expand it, is now proposed for blasting in fiery coal mines. It is claimed that the advantages to be derived from its use are economy in the production of coal; making less slack than by using ordinary blasting powder; lives of colliers are in less danger; the breaking and shattering of coal back of the charge —which is especially characteristic of the use of gunpowder—is avoided; and the quality of the atmosphere is rather improved by its use than otherwise.