6. To obtain a greater amount of power from belts, the pulleys may be covered with leather ; this will allow the belts to be run very slack, and give 25 per cent. more durability.

7. Leather belts should be well protected against water and even loose steam or other moisture.

8. Belts working in very wet places should be ordered to be water-proof.

9. A careful workman will see that his belts are re-dressed about every four months, by sponging the dirt from them with warm soap and water ; then drying with a cloth, and, while still damp, rubbing in castor oil or currier's grease, which will be readily absorbed, the leather being moist from washing. Castor oil has the additional advantage of preventing rats attacking the leather.

10. In putting on a belt be sure that the joints run with the pulleys, and not against them.

11. In punching a belt for lacing, it is desirable to use an oval punch ; the larger diameter of the punch being parallel with the belt so as to cut out as little of the effective section of the leather as possible.

12. Begin to lace in the centre of the belt, and take care to keep the ends exactly in line and to lace both sides with equal tightness. The lacing should not be crossed on the side of the belt that runs next the pulley. Thin but strong laces only should be used.

13. It is desirable to locate the shafting and machinery so that belts should run off from each other in opposite directions, as this arrangement will relieve the bearings from the friction that would result where the belts all pull one way on the shaft.

14. If possible, the machinery should be so planned that the direction of the belt motion shall be from the top of the driving, to the top of the driven pulley.

15. Never overload a belt.

16. A careful attendant will make a belt last many years, which through neglect might not last one.

## HEATING STEEL IN THE BLACKSMITH'S FIRE.

In heating steel, two faults are especially to be guarded against. First, overheating ; secondly, unequal heating of the parts to be operated on (whether by forging or tempering). Referring to the first, many blacksmiths do not recognize that steel is burned unless it falls to pieces under the hammer blows, whereas that condition is only an advanced stage of the condition designated as *burnt*. This is the secret of their partial failure, or, that is to say, of the inferiority of their work. Others recognize that from the time a piece of steel is *overheated*, to its arrival at the stage commonly recognized as *burnt*, a constant deterioration is taking place.

In the practice of some, this excessive heating may be carried to so small a degree as not to be discernible, except the tool be placed in the hands of an operator whose superior knowledge or skill enables him to put it to a maximum of duty, less skilful manipulators being satisfied with a less amount of duty.

But in the case of stone-cutting tools especially, and of iron-cutting tools when placed in the hands of very rapid and expert workmen, the least overheating of the tool will diminish its cutting value as well as its endurance. A piece of steel that is burnt sufficiently to break under the forging hammer, or to be as weak as cast iron, will show, on fracture, a coarse, sparkling, granulated structure, and this is the test by which working mechanics, generally judge whether steel is burned or not. But it is totally inadequate as a test to determine whether the steel has not suffered to some extent from overheating. Indeed, although the grain becomes granulated and coarse in proportion as it is overheated, yet it may be so little overheated as to make no visible difference in the grain of the fracture, although very plainly perceptible in the working of the tool, if placed in the hand of a thoroughly good workman. When the results attained are inferior, it is usual to place the blame on the steel, but in the case of well-known brands of steel, the fault lies, in ninety-nine cases in a hundred, in overheating, either for the forging or for the tempering.

In determining from the duty required of it, whether a tool comes up to the highest standard of excellence, the best practice must be taken as that standard. Thus, if it is a metal-cutting tool, as, say a lathe tool, let the depth of a four-inch wrought-iron shaft down to 3¼ inches diameter, the lathe making, say, 16 revolutions, while the tool travels an inch, and making from 25 to 30 revolutions per minute. Under these conditions, which are vastly in excess of the duty usually assigned in books to lathe tools, the tool should carry the cut at least four feet along the shaft without requiring grinding.

If the tool is for stone work, let it be tested by the most expert and expeditious workman. These instructions are necessary because of the great difference in the quantity of the work turned out by very expert workmen.

At what particular degree of temperature steel begins to suffer from overheating cannot be defined, because it varies with the quality of the steel. The proper degree of heat sufficient to render the steel soft enough to forge properly and not deteriorate in the fire is usually given as a *cherry red*, but this is entirely too vague for successful manipulation, and, in practice, covers a wide range of temperature.

The formation of a scale is a much better test, for when the scales form and fall off of themselves, the steel, in fine grades of cast steel, is overheated, and has suffered to some extent, though the common grades of spring or machine steel may permit sufficient heat to have the scale fall off without the steel being worked. As a rule the heat for tempering should be less than that for forging, and should not exceed a blood red. There are special kinds of steel, however, as for example, chrome steel, which require peculiar heating, and in using them strict attention should be paid to all instructions given by the manufacturers.

Steel should be heated for forging as quickly as compatible with securing an even degree of heat all through the part to be forged, and heated as little as possible elsewhere. If this is not done the edges or thin parts become heated first, and the forging blows unduly stretch the hottest parts, while the cooler parts refuse to compress ; hence a sort of tearing action takes place instead of the metal moving or stretching uniformly.

The steel should be turned over and over in the fire, and taken frequently from the fire, not only to guard against overheating, but because it will cool the edges and tend to keep the heat uniform.

The fire may be given a full blast until the steel begins to assume redness at the edges or in the thin parts, when the blast must be reduced. If the thin part is heating too rapidly it may be pushed through the fire into the cooler coals or taken out and cooled in the air or in water, but this latter should be avoided as much as possible.

When the steel is properly heated, it should be forged as quickly as possible. Every second of time is of the utmost importance.

There must be no hesitation or examining while the steel is red-hot. nor should it be hammered after it has last its redness. There is, it is true, a common impression that by lightly hammering steel while black-hot it becomes impacted, but this only serves to make the steel more brittle, without increasing its hardness when hardened.—*Blacksmith and Wheelwright.*

## A PREVALENT POPULAR ERROR.

By the burning of a Chinese wash-house in San Francisco a short time since, eleven of the occupants who were asleep in bed lost their lives. The account published in the newspapers described them as exhibiting, by the positions in which their bodies were found, the agony they suffered from the fire. As editors and reporters are considered to possess more than an average amount of intelligence and information, it appears singular that they should propagate or perpetuate such an error. It may be safely asserted as a general rule that persons who lose their lives while sleeping in burning buildings, are suffocated and die painlessly without waking, and before the flames had reached their bodies. The merest tyro knows what would be the effect of going to bed with a pan of burning charcoal in the room, or the effect of blowing out the gas instead of turning it off. An individual going to sleep under such circumstances inhales the impure air, which acts as an anæsthetic and rapidly converts the natural sleep into stupor and coma, from which there is no waking. Persons sleeping in a house which takes fire are smothered in this way by the carboniferous gas long before the fire reaches them. Their bodies or remains are found—not in the halls or stairways where they would have been had they been awakened and attempted to escape—but in bed, or in the spot which the bed had occupied, and in the very position in which they had been lying asleep. The exceptions are mostly noticeable, as when persons are seen to make attempts to escape. There is something so horrible in the idea of being burned to death that it were well for the community not to suffer needlessly from sympathy for the victims. To the relatives of persons who lose their lives in burning houses, particularly to parents whose children may die in this way, it may save a life-time of grief to know that death entered the chamber quietly and performed his task without so much as disturbing the slumbers of his victim.—*Pacific Medical and Surgical Journal.*