The easiest method of heating would, in this case, be to employ a flux heated to the required temperature.

For a higher grade of temper, such as is represented in color tempering by the shades of yellow and light brown, it is probable that it would be necessary to heat the steel to the usual degree for the hardening process, but even then it would require an experiment to determine the proper temperature.—*Joshua Rose in Blacksmith and Wheelwright.*

SPEED OF LINE SHAFTS.—The tendency at the present time is to increase rather than to diminish the speed of line shafts. Good practice is to run shafts for machine shops at 120 revolutions per minute; for wood-working machinery, at 250; and for cotton and woollen mills, at from 300 to 400 revolutions. Hollow or pipe shafting has been made to run very satisfactorily at 600 revolutions per minute. This kind of shafting, however, is too costly, to be generally introduced. These speeds are not too high for successful practice. Belts can be run safely at 500 to 600 feet per minute; but on say 6-inch pulleys, lose about two-fifths of their cohesion by centrifugal force, and are a little uncertain in driving action. Ordinary cast-iron pulleys are safe also at these speeds, if well made and not too large. A 4-foot pulley should not be run over 400 revolutions per minute, according to the experience of a good engineer; but with wooden rim, properly made, a higher speed may be run with safety. We mention speeds in connection with pulleys and belts, because these are more liable to be affected by high velocities than shafts are, the belting losing pulley contact, and the pulleys losing cohesion by reason of the contrifugal force developod by high speeds.—*Mechanic and Builder.*

DO NOT BURN YOUR TIRES IN WELDING.—A correspondent of the *Wheelwright and Blacksmith* writes under the above head as follows: I would like to call the attention of carriage-smiths to a great evil that many fall into when welding tires, viz.: of allowing the tire to burn on each side of the lap while taking a heat. Many smiths fail to take into consideration the fact that it is impossible to heat a piece of iron two inches thick, especially when it is formed of two pieces of equal thickness, one placed upon the other, as quickly as one of half the thickness could be heated, and hence, having lapped their tire, the full force of the blast is thrown upon it. As a result, the tire is put into service with a weakness at each side of the weld, caused by being burnt while the weld was being brought to the required heat. That there is not a particle of need for such carelessness every smith knows, no matter how poor a workman he may be. Give your weld a gradual heat; attend to it yourself and not throw the responsibility upon your helper. Have a clean lot of coal and under all a clean fire, and you will never lose a good customer by having him discover a rotten place in his tire, causing it to break when far from a forge.

A NEW PROCESS FOR ETCHING ON COPPER.—From the London *Photographic News* we glean the following particulars of a new process for etching on copper, which has the merit of simplicity. A copper plate is first coated with bitumen on the turning-table, in the same manner as in "photo-zincography." When the coating is quite dry, an impression from a lithograph stone on transfer-paper is applied to it, which leaves behind a picture in fatty ink on the bitumen surface. The plate is then dusted with fine bronze powder, which adheres only on the inked portions, rendering them very opaque. The plate is now exposed to the light, which renders the portions of the bitumen coating not covered by the powder insoluble. Then a solvent for bitumen is applied, which removes the bitumen beneath the powdered parts, laying bare the copper surface in those parts corresponding to the picture. The copper plate can now be etched with per-chloride of iron or other etching liquid, and when sufficient depth has been reached the operation can be stopped and the whole plate cleaned. The process is said to be well adapted for line work.

EDGE-LAID BELTS.—According to Leigh, a better method of producing a broad belt than the usual American double leather belting sewed together—a method by which the article can be made with the greatest ease, of any thickness or width, perfectly equal in texture throughout, and alike on both sides—consists in cutting up the hides into strips the width of the intended thickness of the belt, and setting them on edge, these strips to have holes punched in them about one-eighth of an inch in diameter and one inch apart; nails, made of round wire, clinched up at one end for a head and flattened at the other, are used for fastening the leather strips together. Each nail is in this case half the width of the intended belt, and after the strips are all built upon the nails, the ends of the latter are turned down and driven into the leather, thus making a firm strap, without any kind of cement, splicing or similar treatment. When a strap made in accordance with this plan requires to be tightened, it is only necessary to take it asunder at the step lines of the splice, cut off from each end of the strap what is required, and piece up again with wire nails or laces, going entirely through the strap.

A LOG RAILROAD.—A log tramway or railroad in use by the Richardson Bros., at their mill, south of Truckee, is a very ingenious piece of machinery. Logs, ten inches to a foot in diameter, are hewn round and smooth and their ends couple together by iron bands. These logs, laid side by side upon graded ground for a distance of perhaps three miles, from the track. Of course the road looks quite like an ordinary railroad track, except that logs are used instead of rails and the ties are at much greater intervals. The wheels of the engine and cars are concave on the outer surface, and fit the curve of the logs. The power is applied to a wheel in the middle of the forward axle on the engine. The most remarkable loads of logs are hauled upon the cars. and the affair is a decided success. It is very cheap, its construction is simple, it is not easily damaged, and its operation is all that could be desired. By means of this log railroad the Richardson Bros. are enabled to get their logs to the mill from the forest, three miles distant, at a cost far less than it is ordinarily done.—*Truckee Republican.*

DEADENING NOISES OF WORKSHOPS.—To those who carry on any operations requiring much hammering or pounding, the following, from the *Workshop Companion*, will be a great relief. 1. Rubber cushions under the legs of the work bench. *Chamber's Journal* describes a factory where the hammering of 50 coppersmiths was scarcely audible in the room below, their benches having under each leg a rubber cushion. 2. Kegs of sand or sawdust applied in the same way. A few inches of sand or sawdust is first poured into each keg; on this is laid a board or block upon which the leg rests, and around the leg and block is poured fine dry sand or sawdust. Not only all noise, but all vibration and shocks are presented; and an ordinary anvil, so mounted, may be used in a dwelling house without annoying the inhabitants. To amateurs, whose workshops are usually located in dwelling-houses, this device affords a cheap and simple relief from a very great annoyance.

THE MARINE BICYCLE.—Quite a sensation was created on the the river recently by the exhibition of what Mr. Urch, the inventor, calls the "marine bicycle." It is constructed after the catamaran style; the length of this one, which is built at an experiment only, is 25 feet; the two boats are each six inches wide and six inches in depth, and about three and a half feet apart, and held in position by wooden bars. In the centre is placed the bicycle, and from it extends aft an iron rod eight feet long, to which is attached the propellor; this is between the boats, and the present power, which will be greatly improved, gives her speed enough to beat any dory on the river. The steering gear consists of a rudder on each boat, and the machine answers the helm quickly, considering its length. One good point is that it can be stopped almost instantly, when under full speed. It will probably be one of the most popular river amusements.—*Portsmouth Gazette.*

WOOD-CENTERED car wheels, which are used in very large numbers for the passenger cars of English and Continental railways have been found unequal to the duty enforced upon them by the higher strains due to the use of continuous brakes. Mr. Cleminson, an English engineer, has sought to render them fit for service under existing circumstances by changing both the construction of the nave and bars. The latter is now made with a number of arms extending to within a short distance of the tire, which do not prevent a close fitting of the wooden segments. He has also improved the ordinary method of tire fastenings by having the tire formed with a groove for the retaining ring. The main advantages claimed for wooden-centered wheels are a decreased wear of axle and tire, claims which seem to be borne out by comparative experiments made in French and German woods.

RULE for finding the weight necessary to put on a shaft valve lever, when the area of valve, pressure, etc., are known: Multiply the area of the valve by the pressure in pounds per square inch; multiply this product by the distance of the valve from the fulcrum; multiply the weight of the lever by one-half its length; then multiply the weight of the valve and stem by their distance from the fulcrum; add these last two products together, subtract their sum from the first product, and divide the remainder by the length of the lever; the quotient will be the *weight* required.