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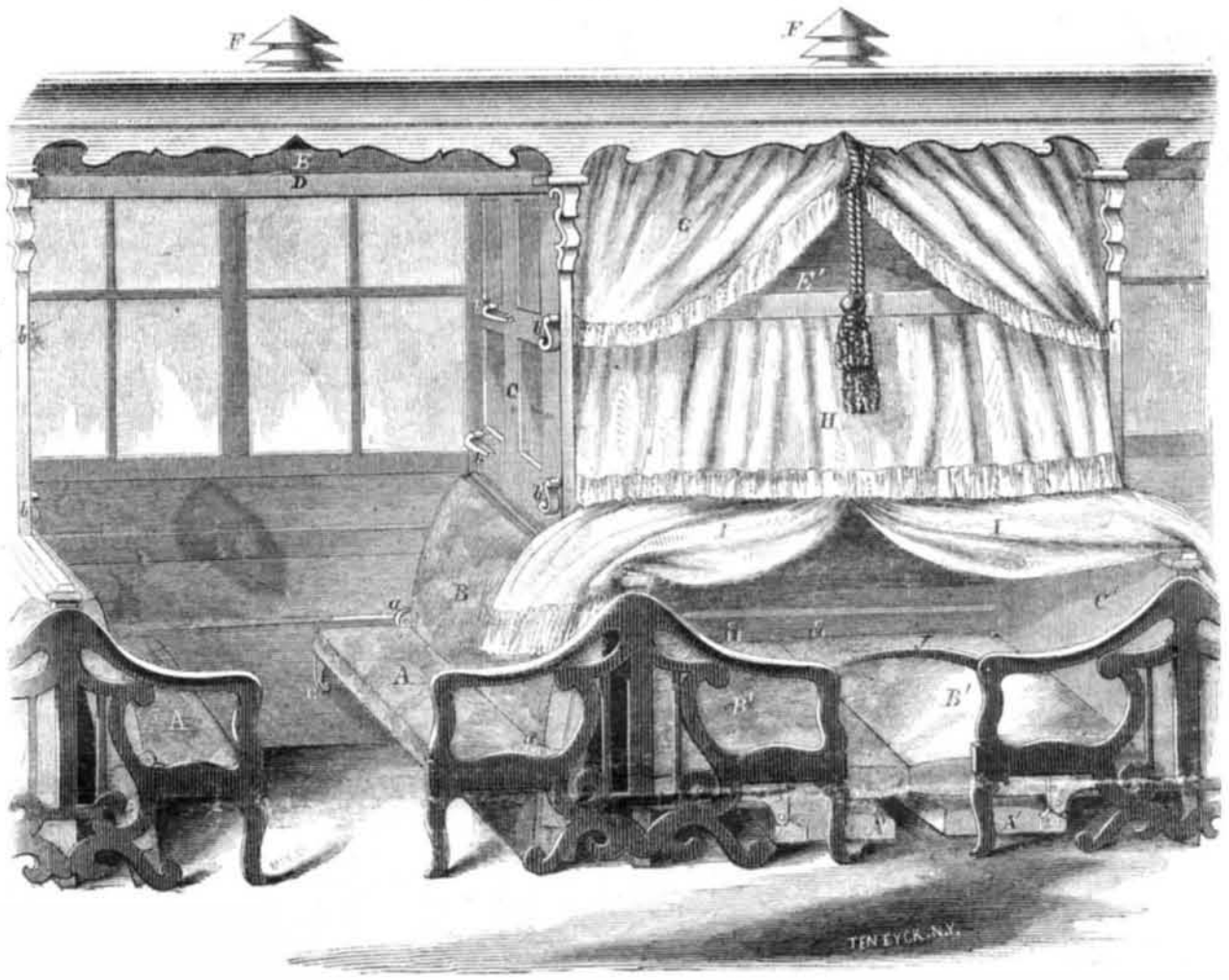
Hardening Metal.

Steel possesses the property of becoming much harder by being highly heated, and then suddenly cooled, which process is called *tempering*. Different qualities of steel are not affected precisely alike by the same process; one requires a much higher heat than another, and the degree of hardness which is finally obtained depends both upon the temperature to which it is exposed, and the coldness of the medium in which it is cooled. It requires considerable experience to become acquainted with the different qualities of steel, and the particular degree of heat to which each should be raised to give it the proper temper. One practical test is to draw a bar of steel belonging to a certain lot, or brand, to a tapered point, such as a chisel, and then temper it. The tapered point will thus be variously affected according to its thickness, and by breaking off pieces from the point inwards, the character of the grain will show the effects of the difference of temperature which has been applied, the finest grain being considered the best.

As various cooling mediums produce different qualities of temper, cold water, oil baths, and cold soap suds are employed. Steel which is required to be very hard, such as files, are plunged into a salt brine, which is colder than pure water; most tools, however, are tempered in water, In tempering large masses of steel, such as anvils, rollers, or dies, they should be heated to a low red color, and cold water applied so as to strike their whole surface evenly, and then flow off freely, which prevents them from cracking. Any degree of hardness may be imparted to steel by first tempering, then annealing it. This latter process consists in reheating the steel after it is polished, until it assumes a peculiar color, which is an index of its hardness. The gradations of these colors are light yellow or straw, violet, blue, slate, and finally black, which latter is the softest, and about the same degree as that of the steel before it was hardened, Various tools would be too inflexible, and devoid of spring, were they not annealed. Some are annealed by a temperature at which tallow or oil burns, hence their surfaces are rubbed over with oil, and then flamed in a fire, when they become elastic.

A number of theories have been advanced respecting the changes produced in the character of steel by tempering, but none of them are satisfactory. The metal undergoes no change in its composition by the process; its molecules only assume a different arrangement. In volume XII. of the SCIENTIFIC AMERICAN, a considerable amount of useful information was presented on the tempering of mill-picks, but since that period several inquiries have been made for more general information on the subject.

CASE'S RAILROAD SLEEPING CAR.



We were much pleased the other day, while taking a trip by rail, to observe at the roadside stations, that, as an additional attraction to several Western roads, it was announced that "sleeping cars" accompanied each night train. This shows that their value and comfort are appreciated, and that they are gradually coming into general use. We have therefore no hesitation in presenting to our readers all the various inventions which have been produced to supply the railroad companies and the public with a convenient and comfortable sleeping car.

Our present illustration shows the invention of Sidney C. Case, of Detroit, Mich., with one compartment arranged for day, and the other for night use. In both of these the seats, A, are hinged to their backs, B, at *a*; the backs, B, being also hinged to the side rails or arms and sides of the car, so that they can fold down as seen at A′, B′. These folded down form berths for two. The divisions between the compartments, C, are provided with small rests or supports. *b*, so arranged that the supplemental berths, D E, in the daytime placed in the top of the car out of the way, can be readily placed in their respective positions by turning them down and can be supported in the grooves by small pins projecting from the ends of the supplemental berths. Each of these berths, D and E, hold one person, thus making a compartment hold as many persons lying down, as in a sitting position.

Ventilators, F, are placed in each compartment to keep up a proper circulation of air, so necessary when sleeping. throughout the car and berths.

Near the roof of the car the curtains, G, are attached, which completely conceal the occupant of the top berth, and this has curtains, H, attached, that in like manner conceal the occupant of the next single berth, while it has curtains, I, that pass over the hand rails or arms, and cover the occupants of the lower berths. To the bottom or underside of the top berth groove, supports are secured, in which the lower single berth can be supported, when they are placed out of the way in the top of the car, in which position the curtains fold in with them and are kept out of the way. There is room between the backs, B, and the division of the compartments, C′, for the pillows; the bedding is placed under the seats, and an arm, J, extends across the arms, to afford a support for the curtains, I, when thrown over the occupants. The seats, A, are supported by pieces, *c*, in the arms and sides, from which, however, they can be readily detached when a bed is to be formed. The change from a sitting to a sleeping car can be easily and quickly made by the passengers themselves, to accommodate either one, two, three, or four persons.

It was patented June 22, 1858, and any further particulars can be obtained by addressing the inventor of this, a most excellent arrangement, as above.

Superheated Steam and Cylinder Jackets.

In the recent address of J. Macquorn Rankine, C. E., F. R., S., delivered before the Institution of Engineers in Scotland, we find some exceedingly practical and useful information on this subject. He states that in the working of expansive condensing steam engines, in order to obtain the economy properly due to expansion, means should be taken, by the use of steam jackets, or some other mode, to prevent that condensation which always takes place in saturated steam, when it performs work by expansion, and is not supplied by heat from some external source. The water condensed in an expansive working cylinder cools the steam at the beginning of the stroke, lowers the initial pressure, and injures the vacuum so as to reduce the work of the engine below that which is properly due to expansion, and to make it approximate to that of a full pressure engine working at some pressure intermediate below that of the exhaust. By the use of a steam jacket the condensation of a certain quantity of steam is not prevented, but instead of this taking place in the cylinder, it is effected in the jacket where the condensed water does no injury. Besides the proper management of the expansive working of steam there is another means of improving the economy of power in the cylinder of the engine, namely, by using steam heated to a temperature above the boiling point at which it was generated ("superheated steam"). The efficiency of any engine is as the difference between the temperature at which the steam performs its work and that temperature at which the steam is condensed. The use of "superheated steam" enables work to be performed at a high temperature without producing a dangerous pressure.

Sugar in Louisiana.

The New Orleans (La.) *Delta* says:—Sugar is twenty thousand hogsheads and molasses twenty thousand barrels ahead of last year. We do not think it extravagant to say that the aggregate value of the receipts of the products of the valley of the Mississippi at this port, up to the present period, is double that for the same period last year.