Observations on Hardening.

Too many of the so-called steel articles sold in the market are either made from steel incapable of being hardened, or are not hardened at all. Good cast steel can be hardened and tempered so as to receive and retain an edge. This is not required of table cutlery generally—only of the carving knife—but it is required of the hand saw and the buck saw, of the spade and the manure fork, of the scissors and the pocket knife. Saw blades (so far as the writer has tried them) are not hardened; they will not retain "set" nor hold edge. They are gummed, as they come from the rolls and the slitting machine, with no pretense at hardening or tempering. But they are stamped "cast steel," and that probably satisfies the public; but there are mechanics who would pay something extra to get good hardened and tempered saw blades, even at a much higher cost than that of the soft plates, the teeth of which can be bent by thumb and finger, and the set of which is removed by sawing through an inch thick spruce board.

A spade is only an enlarged chisel; it should be capable of retaining an edge sufficient to cut through tough turf and dead grass. But most of the "cast steel" spades in the market can be sharpened as readily by drawing the edge cold under the hammer as by the grindstone. The edge never breaks, but batters and bends.

The trouble with almost all the cast steel tools put ready made on the market is, that they have never been hardened. Cast steel unhardened is as soft as wrought iron uncasehardened. A cast steel hammer became so indented on its face by driving nails during one season in jobbing that it had to be reground and polished. Yet the hammer was of steel capable of being hardened, as was proved by its being subsequently hardened and drawn to temper. It is quite possible that the reason why many of these articles prove to be soft is not that the material is not good, but that they have never been hardened. Brightened steel that has not received a hardening may respond in after-heating to several of the tempering colors, and this is probably one reason why common steel articles are not thoroughly hardened.

It is not uncommon to see a forger or temperer heat a piece of cast steel to a very low red—a red that shows only in the shadow—and then brighten and draw the temper to color, when the after-trial proved that the steel had never been hardened. Indeed, the dull red that some smiths use for hardening such tools as cold chisels and other low grade tools is that at which a red annealing may take place—the piece being heated to a dull red and plunged into water.

The first requisite in making a cast steel tool into a working tool is to harden it. After its hardness is proved, then it may be tempered to the condition required. There is no intermediate process of properly tempering between absolute hardening and subsequent drawing.

The Lead Bath.

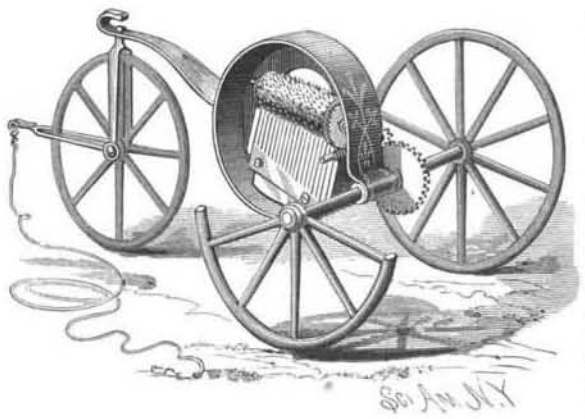
Users of the lead bath for heating for hardening make frequent mistakes in allowing something besides lead to form a portion of the bath, and also in allowing the bath to be kept below its proper temperature. Only pure lead should be used to obtain the full heat for hardening good tool steel. A mixture of lead and tin—a melted mass composed of pewter, type metal, and soft solder—is not a lead bath. The melting and heat holding qualities of metals are not alike. With clean, pure lead, either pig or bar, good cast steel can be heated to its proper intensity to obtain a good hardening, and then be drawn to color in sand or blazed in oil. But the lead must be kept at a limpid fluid heat, hot enough to make its covering of charcoal powder glow, else the steel will not receive sufficient heat to harden.

Anti-Induction Telephone Circuit.

Recent and very satisfactory trials have, we understand, been made by the National Telephone Company on their trunk line between Greenock and Glasgow, of a telephone circuit devised by Mr. Smillie. The telephone instruments at each end are each connected in circuit with a flat circular coil of wire, without a core, and the earth. These coils are confronted by equal and parallel coils of wire, also without cores, and in circuit with the main line wire and a loop line, thus forming a continuous going and coming circuit. The message is induced into the line by these coils, which, not having soft iron cores, exercise little retarding influence on the currents

MUSICAL WAGON.

Our illustration represents a musical wagon of novel construction recently patented by Mr. Hiram J. D. Miner, of Dunkirk, N. Y. Mounted in any suitable way upon an approved kind of wagon is the case of a musical instrument consisting of a pin barrel and comb, the former being provided with the usual toothed wheel and worm for turning it. But instead of being geared with the train of a driving spring, the worm is geared with the axle of the main wheels of the wagon by a pinion and wheel, so that, when the wagon



MINER'S MUSICAL WAGON.

is drawn along, the barrel will be revolved and music made the same as if the barrel were driven in the ordinary way. The driving wheel and pinion can be readily taken off, to substitute others of different proportions, for varying the time of motion to render the music in quick or slow time as may be desired.

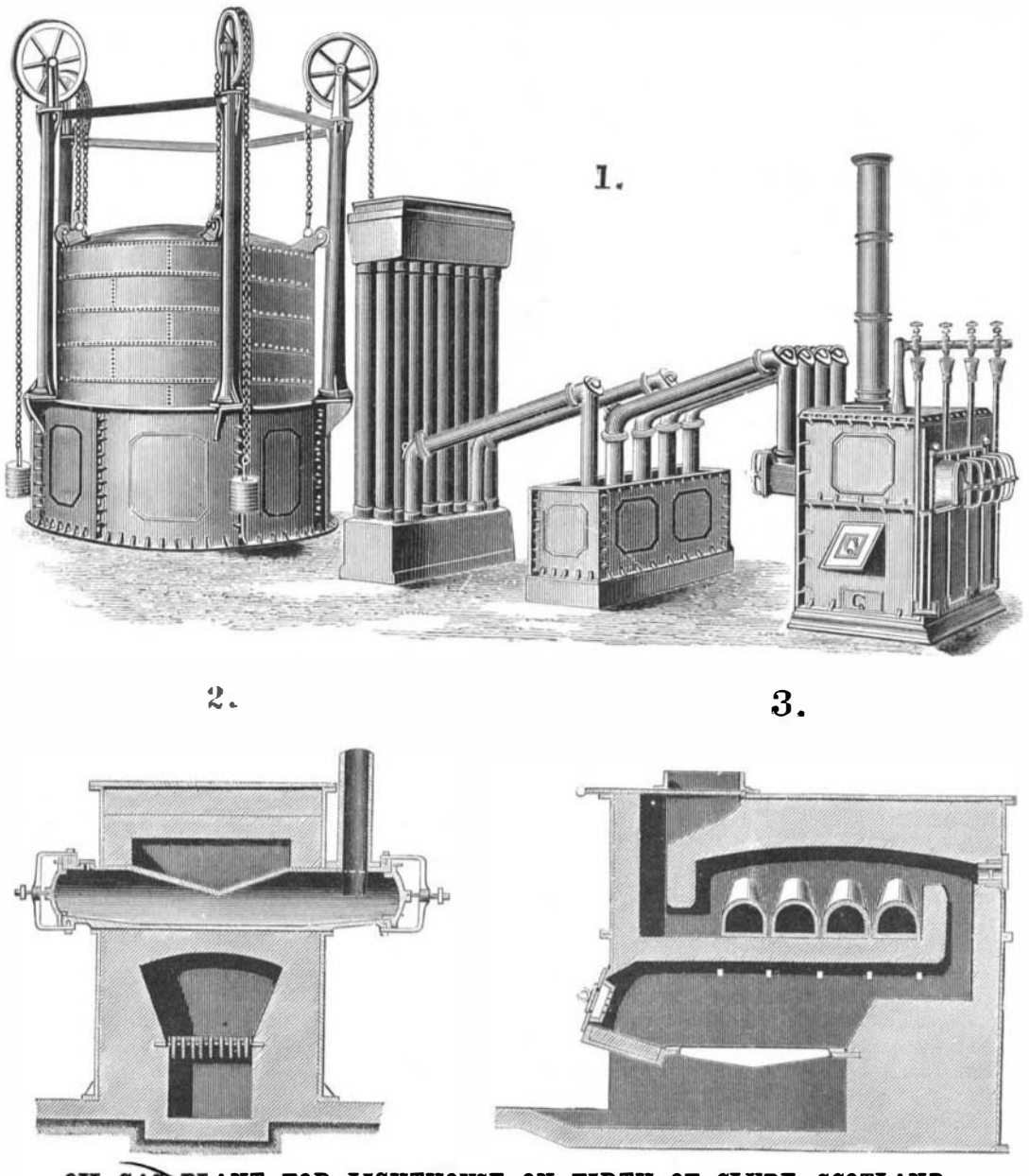
Wood Preserving Works at Las Vegas, N. M.

A Las Vegas exchange reports that the Atchison, Topeka & Santa Fe Company have executed a contract for the erection at Las Vegas of very extensive wood preserving works. They are to use the Line-Tonnier chemical process, which is owned and operated by the St. Louis Wood Preserving Company. This process was awarded the "gold medal" at the National Exposition of Railway Appliances, held at Chicago last June, as the best process for preserving wood, cross ties, and timber. This company has been using the New Mexican pine, but until treated, it is not particularly lasting. After being subjected to this chemical process, it is said to be very superior timber. This industry, when generally adopted throughout New Mexico, will prove one of importance.

OIL GAS PLANT FOR AILSA CRAIG LIGHTHOUSE.

A considerable time ago the Commissioners of Northern Lighthouses, on the recommendation of their engineers, Messrs. D. and T. Stephenson, decided to proceed with a scheme of erecting a new lighthouse on Ailsa Craig, an immense rock lying in the channel at the entrance to the Firth of Clyde; and as there was ample space on the islet for the fitting up of gasworks, they arranged to have the great lantern lit by gas. To provide against the obscurity of the light during the dense fogs which hang over the Firth during the winter season, the Commissioners determined also to fit up a large fog horn, to be operated by compressed air, the air being compressed by means of a number of gas engines. The works contemplated being of unusual magnitude, the Commissioners submitted the scheme to the most prominent oil gas engineers throughout the country, and asked for plans and estimates for carrying out the work. After a long delay, during which trials of various kinds of apparatus have been made, the Commissioners have at length definitely adopted the plans furnished by Mr. James Keith, gas engineer, of London, Edinburgh, and Arbroath, whose apparatus has already been used for similar purposes at Langness Point, in the Isle of Man, by the Northern Lighthouse Board. At Langness the oil gas plant was laid down merely to provide gas for a pair of Otto gas engines which operate the foghorn, but at Ailsa Craig the works are on a much larger scale, and provide for the supply of gas to the great lantern in the lighthouse tower, as well as to no less than 8 Otto gas engines of 8 horse power each. The works on Ailsa Craig will comprise a commodious gas house, in which will be erected three of Keith's patent oil gas producers and washers, with four retorts in each producer. There will thus be in all 12 retorts, capable of producing in the aggregate 2,000 cubic feet of gas per hour. The retorts are of simple construction, and are so arranged that the necessary heat can be raised within two to three hours, and the manufacture of gas be thereafter continuously carried on at the rate mentioned during the longest fogs. A short distance from the gashouse will be placed two gas holders, with cast iron water tanks, columns, and mountings of an exceptionally substantial character, to withstand the furious gales to which the rock is exposed. Each gas holder will contain 10,000 cubic feet, the two holders thus providing between them a store of 20,000 cubic feet of rich oil gas. The gas holders are connected to the producers in the gashouse through 12 of Keith's patent oil gas coolers placed outside, the gas produced from the oil being extremely pure; the scrubbing apparatus is of the simplest kind, and no purifiers are required. The material employed for the generation of the gas is a partially refined shale oil, technically known as blue paraffine oil, which has the advantage of being inexplosive, and of being obtainable in any quantity at a very cheap rate, ranging, according to quality, from sixpence to ninepence per gallon. The oil produces a rich 50 candle standard gas, which is reduced, according to a method adopted by Mr. Keith, before it is consumed, by admixture with about half its volume of air by means of a meter mixer, so that the total quantity of stored gas available—of a quality equal to good Scotch standard coal gas—is 30,000 cubic feet. The meter mixer automatically and accurately measures the proper quantity of air, which it thoroughly mixes with the gas, as the gas passes through the meter, and as it is being consumed. This reduction of the quality of the gas admits of the ordinary form of gas burners being used. The cost of the gas consumed on the rock will not exceed 5s. per 1,000 cubic feet, and the gas itself—though undergoing no purification by lime, etc.—will be much purer and brighter than the best Scotch coal gas.

The gasworks, says the *Mechanical World and Steam Users' Journal*, will be situated at a considerable distance from the new lighthouse and engine house, as well as the light keepers' dwelling houses. In the engine house, in connection with the fog signaling apparatus, will be placed the gas engines, so that they may be ready to start at a moment's notice at any time during the day or night, to sound the roaring fog horn, should a fog suddenly come on and obscure the light in the lighthouse tower overhead. The engines, as we have mentioned, are eight in number and are each of 8 horse power, the engines selected being of the Otto silent type. In ordinary circum-



OIL GAS PLANT FOR LIGHTHOUSE ON FIRTH OF CLYDE, SCOTLAND.