WINTER WORK FOR INVENTORS.

Men of all trades, callings, and professions usually experience during the year what are termed "slack times." A few months of activity are followed by periods when there is not much doing. It is at such times that inventors can make profitable use of their leisure. This has reference especially to that class of mechanics and others who win bread for themselves and families by daily labor, and who cannot afford to devote time to the perfection of new inventions when they can be otherwise profitably employed.

The winter months are the most favorable for the labors of the average inventor; and they who improve the opportunities afforded them by the closing of mills and shops may be reasonably sure of success. During the summer months, when machinery of all kinds is in active operation, is the time to note defects in general design and details of construction to be remedied when the "slack time" comes. During summer the agriculturist discovers faults in his seed planters, mowers and reapers, soil pulverizers, and so on through the entire range of machinery that has been produced for his benefit. Let the inventor now visit him with his note book and pencil, and make sketches and memoranda of what is needed to bring the farmer's machinery nearer perfection. By the next season may be he will be able to make glad the hearts of thousands of farmers by the results of his winter efforts, and while they reap the golden grain with his improved machinery he also will reap a golden harvest.

But it is not agricultural machinery alone that should be overhauled for improvement during the winter months. Let the inventor go forth into the mines, which are usually active in winter, and he will not fail to discover defects in mining machinery that it would pay him well to remedy. Or let him visit some of the lumber camps where thousands of men are employed in cutting and manufacturing lumber, which operation requires a vast amount of machinery. Some of the finest machinery on this continent is employed in the manufacture of lumber in its various stages from the stump to the palace car; but there is yet room for improvements, especially in machinery for more rapid handling during the process from the sled to the loaded car and through the mills to the pile.

It is astonishing what a vast number of operatives in these lumber-cutting establishments are maimed and crippled for life or killed outright by the treacherous saws and flying slabs and edgings. If inventors can provide these saws with shields or guards that would prevent operatives and others falling on the murderous teeth, they will certainly be rewarded. It is not expected that the expenditure of any amount of ingenuity will produce anything that will render these mills absolutely safe; but these horrible accidents can be notably reduced in number, and inventors will do well to labor to that end.

It is not only the novice in mill work that needs protection of the kind in question. The veteran who has long been noted for his skill and care in handling machinery, and who has always been on his guard against accident, may, in an unguarded moment, forget himself and lose a limb or his life or endanger the lives of others. Indeed, the operative of limited experience, knowing his liability to blunder, and having a just appreciation of the dangers of his occupation, usually exercises a greater care than he whose long familiarity with danger has bred a contempt for it. And there is yet another class of unfortunates who need protection by the inventor, to wit: those who visit manufacturing establishments for no particular purpose save to pass an idle hour in wandering aimlessly about among the machinery. The stupidity of these people, who manage to gain an entrance notwithstanding the notice over the doors, "Positively no admittance except to employes," is something remarkable. They have no realizing sense of their danger, and are a constant source of anxiety on the part of the workmen, who may at any moment see their mangled remains scattered about the premises. It is true that in many instances belts and gearing have been boxed for safety; but the weekly list of casualties of this class is a long one, and is conclusive evidence that inventors may profitably turn their attention still further in this direction.

It is in winter that railroad men and others who use iron and steel extensively for tools, machinery, and other purposes are subjected to much trouble and expense by excessive breakages, supposed to be caused by low temperatures, but probably due to something else. The expense to American railways for repairs and renewals of tools and fixtures, rolling stock, and machinery claimed to be due to the effects of severe cold and frost aggregate an immense sum per annum. Track men complain of failures of cold chisels, punches, hammers, mauls, crow-bars, claw-bars, wrenches, etc., and broken frogs and switch fixtures are frequently met with in cold weather. Rails, wheels and axles, and the iron or steel members of bridges and roofs are said to fail at extreme low temperatures; and distressing railway slaughters have been due, it is alleged, to the effect of frost on iron and steel, but this, we suspect, is rarely the real cause of the trouble. Jack Frost is too often charged with crimes that belong elsewhere. A wide and inviting field of labor is open to the inventor in studying out true causes of evils such as we have indicated and in devising the proper means for prevention.

Many lives and much property are destroyed by the cause under consideration. It is difficult to conceive of a wider and more inviting field of labor for the inventor than to search for some new process of manufacture of iron and steel that would render these metals more capable of withstanding the weakening effect of severe cold. At first thought this may seem a doubtful undertaking; but when it is remembered that articles of iron and steel resist the action of frost according to the quality of the material and the processes employed in their manufacture, the mountain becomes a small hill that may in all probability be removed by methods well known to American inventors. Of course, elaborate experiments will be required; and the coldest weather is the time for experimental and practical tests of this nature or for the purpose indicated. Winter is also a favorable time to "prospect" for faulty car heaters and ventilators, and inventors who have labored in this direction will do well to improve the winter by giving practical tests of their devices.

WM. S. HUNTINGTON.

Yazoo Bridge.

For several weeks past we have made frequent mention of the progress of construction of the piers for the great iron bridge now building over the Yazoo River at Anthony's Ferry, twelve miles above this city, for the Memphis, Vicksburg, and New Orleans, or what is better known as the Wilson line of railroads. The cost of the entire structure will be between $225,000 and $250,000, and when completed will be second to none in the South. The contractors have now about 150 experienced men at the work, which is progressing as rapidly as possible. Captain John A. Grant is chief engineer, R. H. Elliott, chief assistant engineer, and Colonel C. J. Graves resident engineer.

The construction of a bridge at the point of crossing of the new road is for several reasons unusually difficult and expensive. There is no bed rock or other impregnable material within reach for the foundations to rest upon. The river at low water, even, is nearly 40 feet deep, while at high water it is 80 to 90 feet. During the summer and early autumn the unhealthiness of the region would entirely unfit men for the trying labor required of them, so that the period during which the work has to be performed is limited to three or four months, and hedged in between fever and floods, the utmost energy must be exerted to accomplish the work.

The bridge will consist of three spans about 300 feet long each; two of them "fixed" spans, and the third a "draw span," located in the middle of the channel. These will be some six feet above the level of extreme high water and slightly above the elevation of the banks on either side. There will be five piers, one at each end on the bank and three in the river. To obtain the requisite supporting capacity, piles—100 in the pivot, and 72 in each of the other two channel piers—are driven to a depth of 40 feet into the river bottom. The outfit to drive these piles consists of a regular pile driver engine, with a 4,000 pound hammer, a Skinner steam hammer, weighing 7,000 pounds, and a large duplex Worthington pump to supply a water jet, when this can be used in place of driving, or to assist the latter. When the jet can be used to advantage, pipes are so arranged that one or more powerful jets, such as fire engines would supply, is brought into play at the point of the pile, excavating a hole for this latter to sink into. The Skinner steam hammer is simply a steam hammer similar to those seen in large machine works, which is held over the pile in such a manner that it may pound the pile down by hitting it successive blows with great rapidity. The piles for one pier have now all been driven and have reached such a firm bearing that an excellent foundation for the piers is assured. One visiting the bridge site now would see the left bank occupied by a number of buildings, the apartments and boarding house of the men engaged on the work, storehouse, offices, etc., which have sprung up in a few days, and huge piles of sand, stone, and cement in readiness for use. In the river is a floating saw mill preparing timber to be used in the caissons. In the river is one of the latter just launched, and on the bank is another almost completed. These are nothing more nor less than huge wooden diving bells. The one for the first pier is 50 feet in diameter with sides two feet thick and six feet high. Its roof will be seven feet thick of solid timber. A "pneumatic caisson" may be described as an immense box with no bottom, but otherwise air-tight. After the piles are driven, they are sawed off under the water surface. A caisson is then floated over the piles. The construction of the pier proper, which will consist entirely of concrete, is then commenced on the roof of the caisson while this is still afloat. As it sinks it is held in the proper position, and when it touches the piles, air will be blown into the caisson by means of large air compressors run by steam. Men descend into the caisson through a shaft provided for the purpose. This shaft has two air-tight doors in it, one at the top, above water, and one at the bottom, which is in the caisson roof. When the men enter, the lower door is closed. After entering the shaft, the upper door is closed and a small valve from the air chamber of the caisson is opened into the shaft where the men are, allowing the compressed air from below to enter gradually. When the pressure in the shaft becomes equal to that in the caisson below, the lower door is opened and the men descend into the caisson provided with saws. They saw off the piles as low as can be, that is, even with the bottom of the caisson, and the caisson is then sunk still lower. This sawing off and sinking is continued until the caisson is settled even with the bottom of the river. While this sinking has been going on, the concrete has been built upward, and when the caisson is settled firmly on the piles for the last time, the pier is built up to the proper height to receive the coping, which will be of stone two feet thick. On this the iron bridge spans will rest. These piers when complete will consist of piles sawed off level with the bottom of the river. Surmounting these is a solid platform (the roof of the caisson) of timber seven feet thick on which will rest the piers proper, which will be one continuous mass of concrete, a tremendous monolith. Some idea of the enormous quantity of material in the piers may be formed from the quantity of cement to be used, which will be in the neighborhood of 10,000 barrels. The piers are being built by Wm. Sooy Smith & Son, of Chicago, who have been either engineers or contractors for several of the largest works in the country. The design is thought to be peculiarly well adapted to the character of the crossing, and surmounted, as the piers will be, by a correspondingly excellent superstructure, the Yazoo River bridge will be a prominent feature of the great new road.—*Vicksburg Commercial.*

A Medical Opinion of the Electric Light.

Before the electric light becomes, as it must soon become, the common illuminating agent of the period, says the *Lancet*, a determined effort should be made to devise some mode of mitigating its peculiarly unpleasant intensity. The vibratile impulse of the electric force is obviously stronger than the delicate terminal elements of the optic nerve in the retina can bear without injury. We are wont to apply the adjectives "hard" and "soft" to light, and their significance makes them peculiarly appropriate. The electric light is too hard; it needs to be softened. The waves of motion are too short, and the outstroke—so to say—joins the instroke at too acute an angle. This might doubtless be obviated by employing suitable material for globes and shades, but perhaps the best plan would be to break up and scatter the rays of light by reflection. If a small convex reflector were placed immediately below the light in the protecting globe, and one of larger dimensions above it, so as to secure a double reflection with ultimate divergence downward and outward, the effect would be to cause the "rays" of light to fall obliquely on all objects within the immediate area of illumination. This would, perhaps, obviate the need of colored glasses, which the promoters of the electric light seem to dislike. Certainly there is a considerable sacrifice of power in the use of the opaline globe—so much, indeed, that some of the districts lighted by electricity displayed through this medium do not present any obvious superiority over gas. We throw out the suggestion for what it is worth. Something must be done, for, as it is, the electric light is "trying to the eyes," which means that it is in danger of injuring them, and already, there is reason to believe, mischief has been wrought by its use. For true comfort there is nothing like the light given by the old-fashioned pure wax candle.—*The Electrician.*

THE STEAM STREET SUPPLY IN NEW YORK.

There still seems to be trouble in keeping the joints tight under our streets. The screw joints do not seem to hold their own, either from inadequate material to give strength to the fittings, unusual strain by expansion, or unskilled labor in screwing the threads home, as fresh outbreaks are of almost daily occurrence.

Screw fittings should be made unusually strong and suited in every particular to the magnitude of the work, for there is no economy, and at most a mere make-shift, in the resort to the use of clamps and putty. The cause that disturbs or ruptures the joint at first will soon affect the clamps.

In our comments upon the progress of the steam supply in our issue of December 9, we aimed to criticise the want of care and time in making up the rubber combination joints. We were far from intending to find fault with the rubber combination itself as a packing (the Jenkins), which is now so extensively used for steam and other purposes, and has the highest reputation for excellence. We have in mind an example where this packing is now in use with steam under a pressure of from 150 to 225 pounds to the square inch, and was tested to near 300 pounds.

The first screwing up of bolts upon the flanged joints was not final, but gradual, as the heat and pressure was increased, until a solid vulcanite was obtained between the faces of the flanges.

One More Number.

The next issue will close another volume of this paper, and with it several thousand subscriptions will expire.

It being an inflexible rule of the publishers to stop sending their publications when the time is up for which subscriptions are prepaid, present subscribers to the SCIENTIFIC AMERICAN or SCIENTIFIC AMERICAN SUPPLEMENT will oblige us by remitting for a renewal without delay.

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THE management of the Standard Theater (New York) announce that on Saturday the electric lights with the Faure accumulators will be carried for the first time by the ballet girls in "Iolanthe." Experiments have been going on for some time with the aid of the best practical electricians in the city, and the result has been most successful. This use of electricity has been very successful in London, and its introduction here will add further possibilities in the way of effective ballet grouping.