Turning Bessemer Steel.

A job in a machine shop of Bessemer steel worked in the lathe with the ordinary turning tool would not come out right; the material appeared to lack tenacity; it crumbled when brought up by the turning tool to an edge. As an instance, some axles for cars on an elevated railroad were scored circumferentially. They were made of excellent Bessemer steel. The scores, somewhat more than a quarter of an inch deep, were turned in the usual way, but before the vees could be finished to a depth of about five-sixteenths of an inch, the metal crumbled at the top of the vee, and the entire job had a ragged look. It was found that the only way to do a good job on this material was to make a collection of toothed mills, and mill the scores instead of turning them. If the axles had been made of tenacious material like Norway or Low mooriron, there would have been no difficulty in cutting clean vee scores possessing all the toughness of the solid material.

Safety of Railroad Traveling.

According to published statements, not a single individual riding on a passenger train in Massachusetts was killed the past year, unless the cause was directly traceable to the carelessness of the person killed. Over 61,000,000 passengers were carried, at an average distance of fifteen miles each. According to this statement, it is safer to be on a passenger train in Massachusetts than to be almost anywhere else. It is a remarkable fact that fewer accidents causing death occur on suburban tains, or those running through thickly settled districts, than in the open and sparsely settled country. The *Northwestern Lumberman* concludes that the reason for this is that more care is taken with such trains; that the shocking railroad accidents that are continually happening are the result of gross and criminal carelessness on the part of both managers and employes.

ROCK CUTTING MACHINE.

The rock extracting industry seems to ever remain at the same point. Little progress has been made in the method of quarrying, and, nearly everywhere, use is still made of the wedge, the lever, and powder. Aside from the cost of the work and its defectiveness, there results considerable waste, while the blocks extracted are irregular in shape. We therefore believe it our duty to make known to our readers a new machine for cutting rocks, the invention of an engineer, Mr. Rapp.

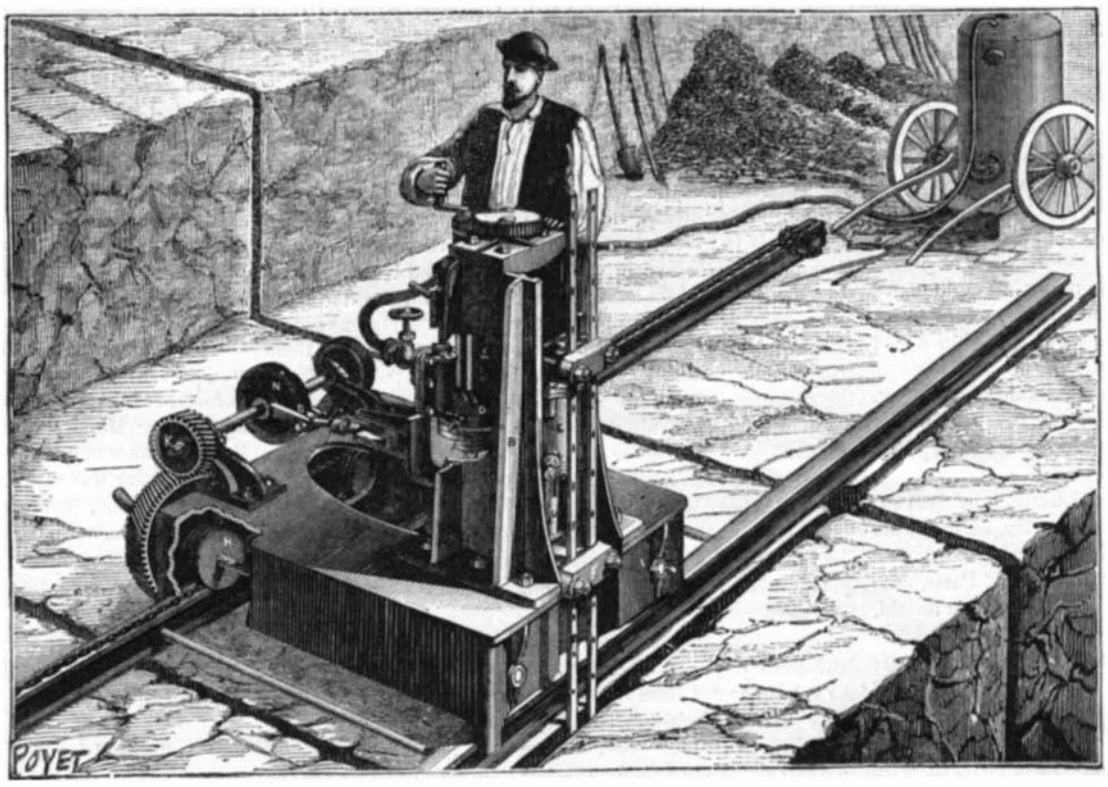
This machine, which is easy to maneuver and move about, appears to us to obviate all the inconveniences that we have just noted. It may be briefly described as follows: Upon a platform, **A**, are fixed two uprights, B, between which there are two cylinders, C and D, that are connected with a slide, against which the cutting tools, E, are fixed by means of pivoted supports, F. The steam, which is introduced through a pipe, R, is capable of giving the piston a velocity of 300 strokes per minute.

The steam cylinder, **D**, through a gearing formed of a wheel, S, and pinion, T, is capable of being moved vertically, thus permitting the cutting tools to work to a depth of 0·25 meter. In order to reach a greater depth, it is only necessary to unscrew the supports, F, and place the tool in the succeeding aperture.

The cylinder, C, contains air, which, through its sudden compression, forms a spring and prevents the machine from being damaged in cases where the cutting tools happen to meet with insufficient resistance. By means of an ingenious mechanism, each stroke of the piston gives the machine a to-and-fro motion, whose extent may be regulated by the operator according to the nature of the rock.

The total weight of the apparatus is 1,800 kilogrammes; the steam power required is that of from three to four horses, and the work effected per day varies between 6 square meters in marble and 20 in soft rock. One man and a boy assistant suffice to run it.

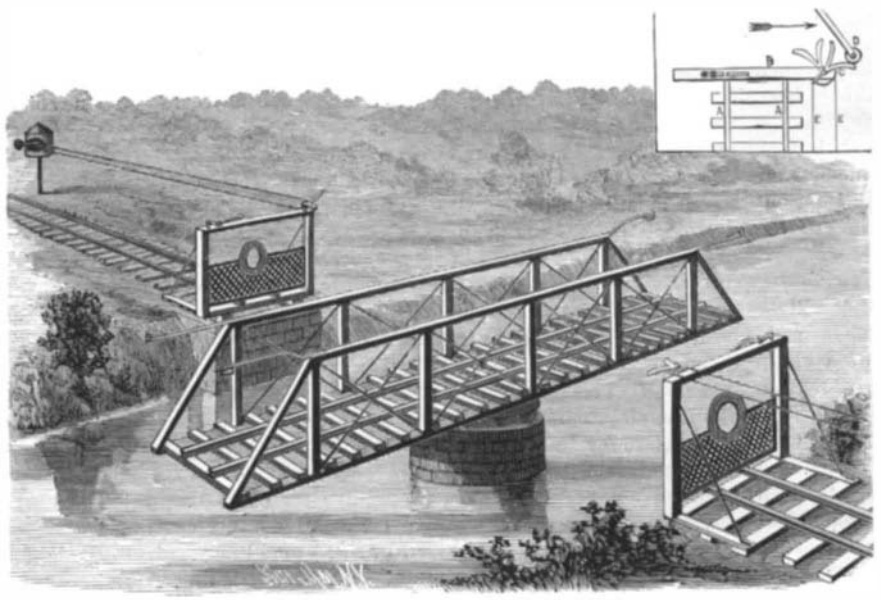
Mr. Rapp's rock cutter may be employed elsewhere than in quarries, and serves for all works of excavation, such as digging trenches, large canals, etc. For this latter purpose it offers the great advantages of permitting of the use of dynamite without any fear of lateral caving, since an absolute break will always be made between the bank and the cube to be taken out.—*La Nature.*



ROCK CUTTING MACHINE.

DRAWBRIDGE SIGNAL.

The invention herewith illustrated relates to signals for drawbridges, and aims to prevent accidents either in railroads or common roads where the drawbridge is located, by indicating to approaching trains or vehicles whether the draw is open or closed, at such a distance from the bridge that the train or vehicle may be stopped in time, should the draw be open. This object is attained by a mechanism attached to the draw and the other standing parts of the bridge, and the action of which is sure and perfect. The bridge attendant has no control whatever over the attachments or signals, which are automatic in their action. The device is easy and simple to construct, and as castings are not essential an ordinary blacksmith could place one in position in a very short time. It would add but little to the weight of the bridge, and it could be attached to any drawbridge now built.



WILLIAMS' DRAWBRIDGE SIGNAL.

The distant signal is located from two to six hundred feet away from the bridge, where there is a small house for the signal, which is raised about ten feet from the ground. Wires are led from the bridge to this house, where they connect with the signal arm, upon which is a red ball about two feet in diameter; this constitutes the day signal, but at night the ball is removed and a red danger lamp hung in its place. The turning of the draw causes the signal to be swung out of the house at a right angle and within two feet of the passing train.

At the same time another signal, located at the end of the bridge or pier, is displayed. This consists of a gate built of light bar iron, and having a central opening about two feet in diameter faced around with a sheet iron collar, the whole being painted red. The night danger signal is hung from a hook in the central opening, and there is a tube or shield extending through the opening for the purpose of hiding the light from the engineer when the draw is closed. When the bridge has been swung open the gates are securely fastened, and so arranged that they cannot be unfastened, except by the turning back of the bridge to its original position, when the gates, being released, swing back where they properly belong. The distant signal may be dispensed with on bridges used entirely for vehicles.

Further information concerning this invention may be obtained from the patentee, Mr. James N. Williams, Scott Street, Mobile, Alabama.

The Economy of Arc Lighting.

So much has been said by interested parties to make it appear that the arc light, as applied to street illumination, is expensive and even extravagant, that it is eminently desirable to get at figures which grow out of actual experience, and learn the lesson which they teach. Fortunately, just such figures are obtainable from the city of Hartford, in Connecticut, where the arc light has now been in use for some time, although on a limited scale up to the present time. It should be premised that the electric light was first introduced into Hartford about a year ago, and that it has stoutly held its own, notwithstanding the violent and almost virulent opposition of the gas company, which has done its best to bring it into disfavor and disrepute, and to oppose its introduction at every possible point. At last its turn seems to have come, for the authorities are loud in its favor, and in deciding to very materially increase the number of electric lights, report that each light in use actually displaces *six and one-half* street gas burners, giving, at the same ttme, at least *ten times as much light.* Now, each street gas lamp costs the city $35 per annum, the lamps burning 326 nights in the year. Six and one-half of these lamps, at $35 per year, cost the city $227.50 per annum. On the other hand, one electric light, which displaces these six and one-half gas lamps, costs the city 65 cents per night for 326 nights, or $211.90 per annum, a saving of $15.60 effected by each electric light per annum. Supposing Hartford to use one hundred arc lamps in its streets—and it is certain that the number in use will be increased to that figure within a very few months—the annual cash saving by displacing 650 gas lamps will be over $1,500, *besides the cost of lighting and extinguishing*, and the light furnished will not only be ten times as great in volume, but of a far better and pleasanter quality.

It will naturally be asked how it is that in Hartford one electric light displaces six and one-half gas-burners, while it was reported not long since that in Boston each arc light replaced but three and one-half gas burners. The answer is that in Boston many gas lights were kept burning so near the electric lights that their flames actually cast a shadow on the sidewalk, and that, in perhaps a majority of instances, the electric lights were not so placed as to render the greatest possible service. Whatever the cause may have been, it is very certain that certain influences were at work in Boston to throw disfavor on the electric light, and that it was not difficult for those in authority to so "cook" the returns as to make the worse appear the better cause.

But the reports that come from Hartford are those of persons who, at the outset, were bitterly opposed to the electric light, but who now, seeing its numerous advantages and fully convinced by their own experience of its superior economy, advocate its general introduction for street illumination.

For ourselves, we can say that we have never for a moment doubted the permanent use of the arc light for all purposes, including street lighting, where large spaces are to be illuminated. As we have already said, ten years hence we expect to see ten and perhaps twenty arc lights in use in this and every city where one now burns, and we expect to see such improvements as will render it cheaper, more simple, and far better than it is to-day. We are going to get far more electricity for the same expenditure of power, and far more power for the same expenditure of money. The incandescent light is invaluable in its place, but so, too, is the arc light in *its* place, and it has come to stay.—*Electrical Review*

ARIZONA'S total production of copper this year is expected to be nearly 50 per cent greater than last year's yield, which amounted to 17,000,000 pounds.