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RAILROAD BUILDING ON THE BANK OF THE HUDSON.

The west shore of the Hudson River is bordered, at intervals for a great part of its length, by high, rocky bluffs which descend abruptly into the water. In many places there is no shore, the rocks extending far beneath the water and at so great an inclination that it is impossible to construct a shore either by filling in or by the use of crib work. This formation taxed the skill and ingennity of the engineers of the New York, West Shore, and Buffalo Railway, whose line, in many places, skirts these bills at the water's edge, and to successfully overcome these obstacles was a work of great magnitude, and necessarily incurred heavy expense. The engravings show four points on the line of the road, each of which presented difficulties peculiarly its own, and called for treatment specially adapted to its own circumstances.

Emerging from the West Point tunnel the road passes through Target Hill, a large gravel knoll used by the cadets for target practice, and then around the base of Storm King mountain. The filling shown in the foreground was taken from the Target Hill tunnel. The telegraph pole shown in the picture, taken as having a length of thirty feet, is a good scale by which to judge of the height of the vertical cut at the inside of the track.

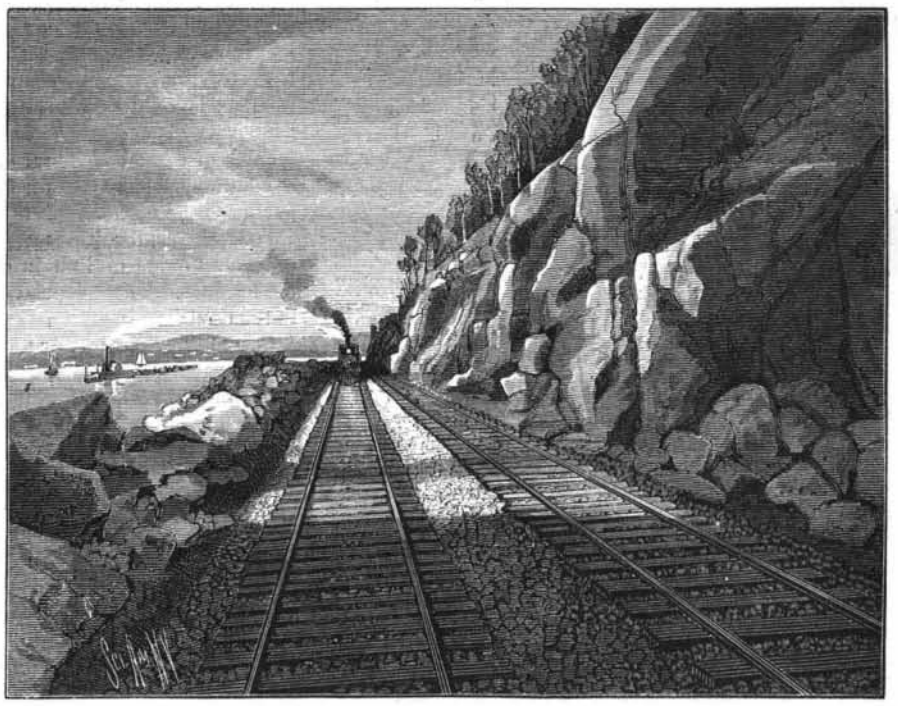
Dunderberg mountain is just north of Caldwell's Landing, and dips into the river in a nearly perpendicular line. Both here and at Storm King the engineers, when running their lines, were compelled to lower themselves by ropes fastened to the trees above, and in many places holes had to be cut in the rock to receive the legs of the transit, the smooth face of the cliff offering no resting place even large enough for that purpose. Men suspended in the same way drilled holes in the rock, and from the pockets thus blasted out in the side of the mountain the excavation was carried forward in either direction and downward until the grade of the road was reached. Along Dunderberg mountain the depth cut out varied from fifty to seventy five feet, according to the line of the road and the inclination of the slope.

The third engraving shows a small cove located at the base of the hill upon whose summit is Cozzens' hotel. This cove, or, more properly speaking, indentation in the face of the bluff, has a steep rock bottom sloping toward the river channel and presenting no ledge near the shore that would securely hold filling. To have made the line of the road pass along the inner side of this would have necessitated the removal of great quantities of rock on each side, and rather than do this a bridge having a span of two hundred and ten feet was built.

Just below Fort Montgomery the hill falls back, making a little bay, the bottom of which is precisely similar to the one just described. The road, after passing through an open cut in a rocky nose projecting into the river—shown in the foreground of the fourth engraving—crosses this bay and enters upon a ledge excavated in the manner already described. An attempt was made to make a roadbed by filling in and also by crib work loaded with stone, but the labor was lost, as the material slid off into deep water. The bridge spanning the bay is a through truss double intersection, having a length of two hundred and ninety feet and a width of thirty feet between centers. To erect this bridge in its place in the line of the road was next to impossible, since there was no foundation for the false work. It was therefore decided to erect the bridge on a line fifteen feet back from the road line. The piers upon which the ends of the bridge were to rest were extended this distance and covered with iron plates. The bridge was then erected, there being no difficulty in finding places for the frame work across the bay. After the bridge had been finished it was moved fifteen feet into position by means of hydraulic jacks.

An ice breakwater of striking proportions was formed in Buffalo during the recent very cold weather. On the lake shore, where the breakers run high, a train of cars was placed to protect the adjoining tracks from ice forming from the spray. The Buffalo *Express* says that "for a quarter of a mile they are a solid wall of ice. Most of the cars cannot be seen at all. On the lake side the ice is two or three feet thick. The spaces between the cars are filled solid with ice, and the space between the wheels under the entire length of the train is a miniature Mammoth Cave—a gallery of stalactites and stalagmites. Several of the cars have crushed and caved beneath the weight of the ice. It is a veritable train of ice."

STORM KING.
FOOT OF COZZENS.



DUNDERBERG MOUNTAIN.
FORT MONTGOMERY.

ROCK WORK ON NEW YORK, WEST SHORE, AND BUFFALO RAILWAY.

Scientific American.

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THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 421,

For the Week ending January 26, 1884.

Price 10 cents For sale by all newsdealers

BILLS FOR THE NULLIFICATION OF PATENTS.

We noticed last week the introduction of three bills in the House of Representatives, the direct effect of which, if they become laws, will be in any case to largely impair, and in probably the majority of instances to utterly nullify and destroy, the rights of patentees as they exist under our present laws. The bills referred to, as also two others of similar character, will be found in full in another part of this paper. One of the latter is also from an Indiana representative, thus making three proposed laws by members from that State aimed at the nullification of the patent laws. The bill of Mr. Wood goes even further than those of his colleagues, for, besides protecting the infringer who can claim a want of knowledge of the invention, it prohibits the trial of patent cases in the United States courts where the amount in controversy does not exceed $200. This would leave the investigation of all the technicalities of invention, and the construction of the almost distinct science of patent law, with local courts and juries, and when a decision had once been reached it would not be worth anything except in a very limited section.

ANNEALING AND CASE HARDENING.

Many articles of cast iron are so hard when removed from the mould that it is impossible to use drill, file, or chisel on them. Even the softest of gray iron may turn out hard when cast in thin shapes, the sand mould chilling them as effectually as a designed cast iron chill. These castings may be made useful, instead of being relegated to the scrap heap, if properly treated. Those from gray iron may be annealed be being packed in coarse sand (quartz) in iron boxes and subjected to a red heat for forty-eight hours. A little common lime, unslaked, added to the sand may quicken the annealing, but is liable to "rot" the iron. If the castings are of "white" iron, they should be packed in cast iron boxes with powdered sal-ammoniac and forge scales in the proportion of one by weight of sal-ammoniac to twelve of forge scales. Usually twenty-four hours' heating will be sufficient to soften the most obdurate castings and render them amenable to tools. But the heat should be kept up to a generous red, a "soaking" heat, during the period of annealing. Where small castings, requiring after-treatment with tools, are an important part of the manufacture, proper ovens are ready to receive the castings. In fact this last method is that employed for the conversion of ordinary castings to malleable cast iron, only that the exposure to a red heat extends to seven, sometimes nine, days. Where annealing of castings is only occasionally required, no very expensive contrivance is necessary. In some cases only a protecting blanket of material is necessary to insure even heating and a continuous temperature; in others the material of the packing is an essential, as it affects the iron to an appreciable depth; as, for instance, the use of forge scales, or the progenous oxide of iron in other forms, as the tail slag of the foundry. These depend on the quality of the iron used in the castings.

Cast steel can be readily annealed by similar means. Usually an exposure of twenty-four hours to a red heat while packed in lime is sufficient to anneal any cast steel. Bars of fine cast steel used for hand engraving are so annealed, when the material cuts as soft as pure silver. Of course, none of these methods are necessary where the usual "black 'neal," or the heating and burying in the forge ashes, is sufficient to render castings tractable to tools.

Case hardening is so simple a process that it is surprising that machinists do not generally understand it. They ought to know enough of the smith's department to temper steel and to case harden iron. For small articles a section of gas pipe with cap thimbles screwed on the ends is a sufficient box, but for larger articles a cast-iron box is preferable; and in either case it is well to have the covers luted with fire clay. But if the heating is done in a charcoal fire the cover may be dispensed with. The packing should be either charcoal, with bits of horn, raw hide, and leather, or better, broken or ground bone. The ground bone makes a steel surface sooner than the charcoal. An exposure of two or three hours to a red heat is usually sufficient to case harden for general purposes. A quicker method, which gives a superficial coating, is that of heating the piece red hot and then covering it with a powder of prussiate of potash and sal-ammoniac in equal proportions. This flux melts immediately, when the piece should be plunged in cold water. Articles case harden best when most polished.

PROPOSED AMENDMENT OF THE COPYRIGHT LAW.

The copyright law as it stands requires the author to register his work before it is actually published; and the author is thus encouraged to produce new and original matter for the benefit of the public.

House bill 62, introduced by Mr. Rosecrans, of California, reverses all this, as it permits any person who has ever written anything, at any period of his life, after it has been published in any newspaper or periodical, no matter how long ago, to take out a copyright on any portion of his old stuff. Should this bill be passed, it looks as if it would give rise to many complications. For example, a newspaper editor would not be able to republish or make quotations from articles or items in the back numbers of his own journal without the risk of violating somebody's copyright; for although the articles may have been originally written for and paid by the editor, he has under this bill no right to reproduce the same or any part thereof. In fact, the bill is so worded that it would be dangerous for an editor to reprint the back numbers or volumes of his periodical.

The bill is evidently very crude, and requires amendment. It ought to provide that no article shall be copyrighted after having been once published, unless the words "copyright intended" shall be printed over the article at the time of first publication. Furthermore, some limit of time after publication ought to be fixed, during which a published article may be copyrighted, say sixty days.

IS OUR WATER POWER FAILING?

It is quite manifest that the streams, ponds, swamps of all this part of the country, including certainly New England and the Middle States, are most remarkably destitute of water. And this deficiency has been steadily becoming more strongly marked and more troublesome for some time past, certainly as much as three years. The complaints from the large manufacturing towns where their dependence is on water power have been great, and reasonably so, and manufacturers have been discussing seriously the question whether their trust must not be placed on steam instead of water.

The records correspond with this general impression. Taking New Haven as a fair example, the rain-fall there for the past ten years has averaged 42·9 inches, while for the last four years it has been but 36 4, and of the last two it has been 31·6. The average from 1873 to 1879 inclusive was 46·9, and Mr. Schott, in the *Smithsonian Contributions*, vol. xviii., p. 93, gives it for the years from 1804 to 1867 (though the records are incomplete) as 44·43.

It becomes for us certainly a very serious question whether this is merely a phenomenon, an aberrant affair which will be temporary and transient, or whether we are to accept the belief that a change is in progress which involves a failure of precipitation, with all the evils and the desolation which it must bring. And if so, have we at command any means of arresting the difficulty even partially?

We hear much said about the injury caused by clearing the country of its forest growth and the death and desolation which must follow from it. But while it is manifest and certain that land lying open to the sun must be subject to more evaporation than that which is densely shaded, yet the laws of vegetable growth do not permit any such fearful results as have been suspected, nor does experience show that such results have occurred. The immense quantity of exhalation from the forest leaves, placed in correlation with the evaporation by solar heat when that forest land has been cleared and cultivated, is an element not to be disregarded.

It is constantly stated that springs have dried away, and streams dwindled much in size, as our lands have been stripped of their trees. In a small way and in limited areas this may be true, and doubtless is so, but not to any great extent. And that our rivers are pouring into the sea less water than they discharged two hundred years ago, we have no reason to believe. And this we say in face of the statement quoted in commencing, and in face of the fact that the water supply throughout New England is at this moment so lamentably deficient.

We cannot regard our present condition as anything more than temporary, for several reasons. In the first place, it is merely local, for while we have been suffering from want of water here, it has been necessary to go but a moderate distance to find precisely the opposite state of things. No further than merely beyond the Alleghanies their complaint has been of excessive rains and destructive floods. And still again, we are but experiencing that which has repeatedly occurred since the founding of the colonies, a cycle of drought which after a few years will have passed away. According to the best information which we can obtain, there is no good reason for believing that our average rain-fall, taking a properly extended series of years, is any less now than it was in the times of our earliest history.

And it is certainly not possible to refer the scanty rain-fall of the last two or three years to any effect of forest clearing, for no such thing has taken place. The great tree destruction of New England and the Middle States was done and its effects experienced long ago.

We must therefore look to some other cause for our present state of drought, and it may be to a great variety of causes. And in doing so we shall encounter the question whether the average precipitation throughout the world is undergoing gradual diminution, not to be measured by human life time, perhaps scarcely by that of nations, and yet capable of being traced in human history. It is a question full of interest.

The Blind.

The last English census reveals the encouraging fact that the proportion of the blind to the population has decreased with each successive enumeration since 1851, in which year account of them was taken for the first time. The decrease in the decade ending in 1881 was much greater than in either of the preceding decennial intervals, the number of cases returned on this latter occasion being 22,832, equal to one blind person in every 1,138. This decrease is fairly attributable to the progressive improvement in the surgical treatment of affections of the eye, and to the diminished prevalence among children of small-pox.

EXHIBITION programmes for 1885 are now in order. A National Hungarian Exhibition is to open May 1, 1885, and continue to October 15. In connection therewith will be an international section for tools, machines, and motors, agricultural machines, patented inventions, etc.