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(Illustrated articles are marked with an asterisk.)

THE HUDSON RIVER RAILROAD DISASTER.

To be just and candid under strong excitement is hardly to be expected of the public at large. On the occurrence of such a horrible disaster as the New Hamburgh tragedy, it is to be anticipated that charges of blame willl be made indiscriminately, and without that careful weighing of both sides of the question, by which only can a correct judgment be formed.

Weighing both sides as carefully as we can, however, and desiring, if possible, to see in this accident one of those purely fortuitous events against which no human provision or foresight avails, we are reluctantly forced to conclude that there was neglect of duty on the oil train, and a want of provision against accidents at the drawbridge, which is clearly chargeable to the company, and for which it ought to be held responsible.

Whether, in this particular case, if the brakemen had been at their several posts on the oil train, and a proper signal cord had been attached to the bell of the locomotive, the breakage of the axle would have been discovered, and the engineer notified in time to have stopped the train before it entered the bridge, is a question upon which opposite opinions have been expressed at the inquest. Our opinion is, that had these regulations been strictly observed, there would have been no accident. If our opinion is sound on this point, the employés were either to blame in disobeying orders, or blameless in neglecting habitually what the lax discipline of the road had virtually countermanded. If the latter, then to the company must be transferred whatever blame would otherwise rest upon the persons in charge of the oil train.

Looking candidly at the evidence taken at the inquest, our opinion is, that there was not that laxity of discipline in regard to the regulations referred to, as would warrant the employés in regarding the regulations as virtually set aside, and therefore they must take their share of the blame.

On the part of the company, there is undeniably responsibility for neglect at the bridge. The signal man, working under orders that required his presence a quarter of a mile or thereabouts from the signal light, was thus prevented from changing the signal in time for the express train to stop. Had he been at the bridge, and changed the light from white to red, with even ordinary celerity, we have not the slightest doubt that so faithful and vigilant a man as Simmons, the unfortunate engineer of the express train, would have instantly seen it, and stopped his train before it reached the disabled oil train.

Now, while we think the men on the oil train were blamable for neglecting their duty, even on a night when the inclemency of the weather rendered the temptation to cuddle together in the caboose a strong one, what shall we say of the company which habitually requires a signal man to leave his signal to go a quarter of a mile away, in order to do double service, thus making the supervision of a point of danger only partial and fitful. Whether from parsimony, or want of judgment and foresight, there is for this neglect no even tolerable excuse.

The public has a right to demand foresight from railroad officials, and a proper expenditure for guards and watchmen to render traveling reasonably safe. The public pays for this, and if it be not given, the public is defrauded. Such frauds are, however, not to be classed with such as merely affect our pockets, or our personal comfort. They endanger and destroy valuable lives, scatter mourning and desolation over the land, and shock the moral sense of the entire civilized world. Therefore, we say, let the Hudson River Railroad Company be taught that an accident of this kind is something that even a soulless corporation can be made to feel, and that the public is firmly resolved it shall answer for to the fullest extent.

We are not prepared to say that the company is blamable for any known defect in the rolling stock. If that of the freight trains be kept in as good order as that of the passenger trains, which on this road have always been considered first-class, there is nothing to be said on this point. But if, on the contrary, the rude character of the freight trains had induced the company to supply them with inferior axles, or if the particular car in question had knowingly been permitted to run over the road while in an unsafe condition, then the responsibility for the consequences of such neglect, however unexpected, lies at the door of the corporation. No charge that the broken axle was known to be of inferior quality has yet been made, and hence we are willing to believe the company innocent in this respect.

The accident, however, teaches the important lesson that inferior stock in freight cars *may* result in the destruction of passenger trains. Axles will break, no matter what care be used, but inferior axles will break more frequently than good ones; and if the best stock in a freight car may give out, and so endanger passenger trains, poor stock will certainly increase the risk.

With regard to the carrying of petroleum oils over roads used for the transportation of passengers, it has been urged that it never ought to be permitted. We cannot see, however, in what way this can be well avoided. The demand for these oils is universal, and consumers must be supplied in some way. Special railways cannot be constructed for their transport, except in exceptional cases, and, if their carriage be confined to water conveyance, vessels collide as well as railway trains, and fire on water is even a worse disaster than fire on land.

It is folly, also, to attempt by legislation (a bill has already been introduced into the New York legislature for this purpose) to compel companies to use iron-hooped casks, instead of the tanks now used, for the carriage of oils. The more packages are multiplied the greater, in our opinion, is the risk. Had the train which broke at the New Hamburgh station been freighted with small casks, the probability is that the horrors which attended the disaster would have been hightened by a series of explosions, which would have prevented any immediate approach to the fated train by those anxious to aid the sufferers.

TOUGHENING AND REFINING GOLD.

Mr. Francis Bowyer Miller, brother of the late Professor William Allen Miller, of London, is now in this country, engaged in setting up his apparatus in the Philadelphia mint, for the purpose of toughening and refining gold on a large scale. Mr. Miller is now melter and refiner of the mints at Sydney and Victoria, Australia, and has had, in his official capacity, abundant opportunity to test the accuracy and economy of his invention. The process devised by Mr. Miller consists in passing a stream of chlorine gas through the melted gold, covered with a layer of borax. In a few hours the whole of the silver present is converted into chloride, which floats on the gold. The borax prevents the loss of silver by absorption or volatilization. As soon as the gold has become solid, the still liquid chloride of silver is poured off, and the gold is now found to have a fineness of 993 parts in 1,000. The loss of gold is less than in the ordinary processes. It is necessary very carefully to dry and heat the molds, into which the chloride of silver is poured, as the slightest moisture causes the latter to be violently dispersed, while red hot, to the great risk of the bystanders. To avoid the risk of splitting the pots by the wedging of the ingots at their contracted bottoms, the gold for refining is cast in molds of a peculiar form, yielding slipper-shaped ingots, two of which, placed face to face, fit conveniently into the pot. The chlorine is conveyed to the bottom of the melted gold, through clay pipes, which are well heated before immersion, and the gas can be heard bubbling up through the fused metal quietly, and without projecting globules from the pot.

Mr. Miller's method has been adopted at the London mint for toughening gold previous to coining; and upwards of 200,000 ounces of gold have been refined by it in Australia.

By the erection of a a new reverberatory furnace for silver refining, and by the adoption of Mr. Miller's process, it is believed that a very considerable reduction in the rates for refining bullion can be attained in this country, while the quality of the precious metals will be greatly improved.

ELECTRO-METALLURGY.

Many of our readers are of course conversant with this subject, but to those who are not, we offer these few remarks, on a most interesting and useful art. It is the art of copying any surface upon which any cut or raised figure exists, or of covering or plating any smooth or other article, by depositing on it, copper in the metallic form by galvanic agency. Let one of our readers attempt this beautiful art, and he will find no difficulty in producing a fac simile of his coin or other article upon the first trial. Suppose, for instance, a copy of the face of a coin or medal is desired. Let him proceed thus:

Dissolve in a quart of cold water as much common blue vitriol (sulphate of copper) as the water will take up, and let it stand until it clears; then pour off the clear solution, and add about one fourth more water, as the solution is better when not quite saturated; pour the diluted solution into a vessel of earthenware or glass, with a wide mouth, and suspend in it a piece of copper plate two or three inches square, turned over the top of the jar to hold it up—the copperplate should be nearly all immersed. Then suspend, opposite to the plate, and parallel with it, the coin to be copied, by a piece of wire, having previously covered that portion of the coin not requiring to be copied with wax, which will prevent copper being deposited, the wax being a non-conductor. Let an electric current, from any species of battery, be now passed through a wire connected with the copper plate, which is the positive pole, to the negative pole, the coin, and thence to the battery, completing the circuit. The vitriol in solution is thus decomposed, the electro-positive element or the copper going to the coin, and forming a uniform and solid coating upon it, while the sulphuric acid set free attacks the copper plate, and renews in the solution the sulphate which is decomposed by the current.

This action may be continued, until a thick coating forms on the surface of the coin, the deposition of which will be fast or slow, according to the strength of the battery.

To prevent the copper adhering to the face of the coin, moisten the latter with sweet oil, and rub it with silk, till it appears dry.

To coat objects which are non-conductors, a fine powder of graphite or black lead may be laid thinly over the surface with a brush. Even glass or porcelain may be covered, by first etching the surface to make it rough. This, of course, will give an inverted copy of the coin, so that to get a copy "right side up" an exact impression must be taken in wax, plaster of Paris, or gutta percha, and the metal precipitated on the cast.

Brass can be deposited when the solution is composed of 1 part sulphate of copper in 4 parts of hot water, 8 parts sulphate of zinc in 16 parts of hot water, 18 parts cyanide of potassium in 36 parts of hot water. These are mixed, and 250 parts of water added. Instead of a copper plate, one of brass is necessary; the solution is required to be kept nearly boiling, and a powerful battery to be used.

To the lover of natural history, the electrotype offers two processes of great beauty and value. By a simple adaptation of the principles above detailed, the most accurate copies may be made of any vegetable or animal substance that will remain undecomposed in the solution for a few hours. Thus the most delicate hairs, and tendrils of plants, and the smallest insects may be coated with metal and preserved.

The second process, called "nature printing," is generally used for impressions of plants. The plant is pressed with great force upon a plate of lead, to make a delicate impression. Then, by means of electrical action, these lead plates have copper deposited on them heavy enough to print from. Some of the finest plates in the best botanical works, are prepared in this manner.

Printing and engraving are much indebted to its agency. A hard copper plating is thrown down on the face of common type, increasing its durability, and entire stereotype plates are made by taking the cast of the type in gutta percha, or plaster of Paris, and depositing a thick plate of copper upon the reverse mold. Elaborately engraved plates are also by this means reproduced. Usually copper plates after passing through the press about one thousand times, become worn, so as to give indistinct impressions, and by electro-metallurgy these plates can be multiplied indefinitely. Other metals and alloys can be precipitated, of which process we will speak another time.

THE LARGEST GUN IN THE WORLD.

The latest born offspring of the art of destruction is a thirty-five tun gun, just completed at the Royal Arsenal, in England. This monstrous creation was made upon the coil principle, with two strips of wrought iron, which, before they were wrapped round the core, were about 150 feet in length. On its way to the practice ground, it crushed its own carriage and the tramway upon which it was traveling, but it was coaxed into moving again, and the sponsors of the interesting infant fired it with half a proof charge, and its own shot weighing 700 lbs., and measuring a foot in diameter and two and a half feet in length. With this load, the monster recoiled nearly nine feet up an inclined trail of seven degrees, but was otherwise unaffected. When it has cut its teeth with larger charges, it is to burn, as a regular dose, 120 lbs. of pebble powder, the shot being the 700-pounder mentioned, with brass studs to fit the rifling of the bore. In firing it, a wire was attached to the vent, the bell was rung, and all present hastened under cover. In one of the proof houses a gunner in a canvas suit stood before a magnetic battery, and at the word "fire," touched a stud, when there was a loud report, and the gun was seen smoking prodigiously. It will be tested with a charge of 150 lbs. powder, the regular service charge being 120 lbs.

It is the largest piece of ordnance in the world, not excepting those ancient Titans—the Beejapore gun, called the "King of the Plain," the huge stone-ball cannon of the Dardanelles, and "Mons. Meg." If an invading enemy will only be kind enough to come near enough to this triumph of belligerent art, we think there might be a chance of slaughter on both sides. But what a telescope might have been made for the money, and what different sort of "victories" might have been obtained with that sort of weapon! The reflection is, we know, ridiculous: "Guns, drums, and wounds" absorb the world.

DESIGN PATENTS.—Many letters reach us, complaining of the dilatory conduct of the Patent Office, in disposing of applications for design and trade-mark patents. Cannot Acting Commissioner Duncan do something to hurry up this branch?