GIGANTIC PASSENGER ELEVATOR OF THE NORTH HUDSON COUNTY RAILWAY.

A passenger on one of the ferryboats leading to or from the upper portion of New York, or upon one of the numerous vessels passing up and down the Hudson, will notice on the Jersey shore, adjoining the West Shore Railroad station at Weehawken, a tall tower, communicating by a viaduct with the bluff, a few hundred feet distant. The tower is the passenger elevator of the North Hudson County Railway, and this, together with the viaduct communicating with the railway, will save the people living in Weehawken, Guttenberg, the town of Union, and the residents of the northern portion of Hudson County generally, the laborious ascent of the bluff by stage or on foot. The regular trains of the railway are to run out on the viaduct to the elevator landing so that there will be a direct transfer of passengers from the elevator cars to the trains. This great work adjoins the grounds of El Dorado—the magnificent spectacular summer show--and affords accommodation to the thousands who flock to this place of amusement in the summer season. Our view, by the way, shows the situation of the Roman amphitheater described and illustrated on another page.

The wrought iron work for the tower and viaduct is furnished by the Passaic Rolling Mills, and the elevator machinery and cars are supplied by Otis Brothers, of elevator fame, from designs furnished by Thomas E. Brown, Jr., engineer, under the specifications furnished by Mr. Edward A. Trapp, engineer of the North Hudson County Railroad Company.

The tower has a base of 45 feet 6 inches by 60 feet, measuring from the center of the columns; the top of the tower is 45 feet by 61. In the construction of the viaduct and tower, 2,000 tons of steel were used. The tower reaches to a height of 197 feet above the water level, and the lift of the elevators is 148 feet. There are three independent elevator cars, each 21 feet 6 inches, 12 feet 6 inches, and 10 feet high. Each car is suspended in a steel frame formed of angle and channel iron; the cables, eight in number, are attached to these frames, as are also the safety devices. Each car is provided with eight seven-eighths inch crucible steel cables, six of which are attached to the hoisting machinery and two to the counterbalance weights.

The hydraulic elevator cylinders are 38 inches in diameter and 2 inches thick, provided with flanges 50 inches in diameter, and made in sections of 9 feet in length. The pistons of the hydraulic cylinders are each provided with 2 steel rods 4¼ inches in diameter and 35 feet long. The pistons are geared by means of cables and sheaves in such a manner as to cause the car to move six feet for every foot of the travel of the piston. Each piston is provided with an automatic stopping device, which arrests the motion of the car independently of the conductor when the car has reached the end of its travel.

The car slides on wooden guide strips 6 x 8 inches, formed of three sections of yellow pine, and each car carries a safety device consisting of three pairs of cutters upon each side of the car, arranged to bite into the wooden guide when the car attains a speed above the normal. The arrangement of these cutters is shown in the annexed diagram. The lower cutters are serrated, producing grooves in the wood, and the upper cutters, which are straight, cut off the grooved surface as the car descends, the resistance of these two sets of cutters being sufficient to arrest the car very quickly, but not so suddenly as to cause any shock.

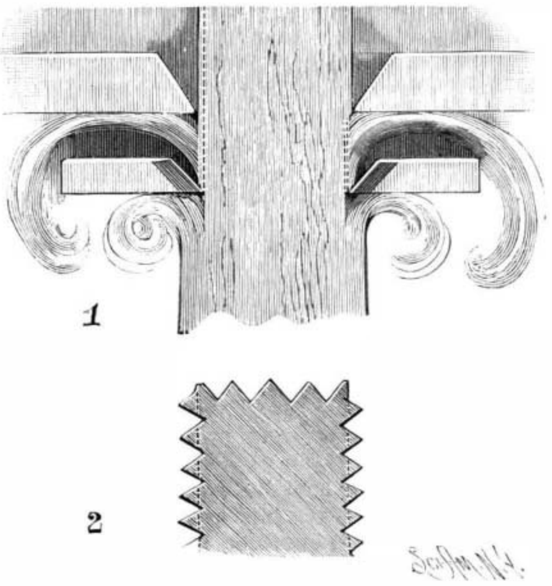
In the test of this safety device a car with a load of 36,000 pounds was released. The safety device arrested the motion of the car during a descent of 2⅞ inches. In another test, where the car was given a 12 inch headway, it was arrested by the safety device before it had fallen 19 inches.

The hydraulic pistons are operated by the combined action of the gravity of water and pressure exerted upon the column of water by an air cushion in the tank at the top of the tower. This tank is cylindrical in form, 78 inches in diameter and 40 feet long. It is made of half inch steel, and has a capacity of 10,000 gallons.

There is an auxiliary tank at the base of the tower, having a capacity of 1,200 gallons, which is 42 inches in diameter and 15 feet long. The auxiliary tank is little more than a huge air chamber. The riser which conveys the water to and from the tank above is 15 inches in diameter. Two Worthington compound pumping engines supply water under pressure to these tanks. The high and low pressure steam cylinders are respectively 16 and 29 inches in diameter; the water cylinders are 12 inches in diameter, and the stroke is 18 inches. These pumping engines each have a capacity of 1,000 gallons a minute. As there is generally a leakage of air from tanks and pipes, an air-pumping attachment is provided for each pump to maintain the air required for the cushion in the tanks. The boilers which supply these pumps are three in number, of the type known as the "Scotch" boiler. They are, in fact, like the boilers used on the ocean steamships, except as to size. They are each 9 feet in diameter and 12 feet long, made of $\frac{11}{16}$ inch steel, with 36 inch corrugated steel furnaces. Of the three boilers mentioned, one is a reserve.

The pressure maintained in the upper tank is 100 pounds per square inch; this, added to the pressure due to the height of the column of water, makes a total of about 186 pounds of pressure per square inch exerted on the hydraulic pistons.

Each elevator has a capacity of 20,000 pounds raised 200 feet per minute; each car will carry 135 passengers, or a total of 400 passengers for each trip of the three cars. The average is 100 passengers per minute,



SAFETY DEVICE OF THE ELEVATOR.

or of 60,000 per day of ten hours, almost 150,000 in twenty-four hours.

These elevators are the largest in the world. The Mersey Tunnel passenger elevators are next in size. They have a lift of 70 to 80 feet, and carry about half the number of passengers.

A HORSE SHOE TO BE CLAMPED ON THE HOOF.

A simple form of shoe, which can be quickly clamped upon the hoof of a horse and as quickly removed, without the use of nails, is shown in the accompanying illustration. It has been patented by Mr. Joseph Broonett, No. 369 Nineteenth Street, Brooklyn, N. Y. The shoe is composed of two similar parts each shaped substantially like one-half of a common shoe, the parts being hinged together at the front. Secured to the upper edges of the parts are thin metallic shields, their shape approximating that of a horse's hoof, and formed at their front edges into interlocking knuckles through which a pintle is thrust to form the hinge, the shoe being thus made in two hinged parts which may be easily opened when it is to be placed on the horse's hoof. Extending around the upper edges of the shields are bands, doubled inward at the rear to project behind the heel of a horse, and terminating in flanges adapted to receive a clamping bolt. One of the flanges is screw-threaded, and in attaching the shoe the bolt is passed through one flange and screwed into the opposite flange, the shoe being firmly clamped upon the hoof by tightening the bolt. The hoof should be pared in the ordinary way to bring it to the desired shape before clamping on the shoe, which cannot become accidentally detached.

BROONETT'S HORSE SHOE.

Military Shields.

A committee of the French war office have reported in favor of a buckler of aluminum and copper. They think that a shield could be made out of this combination light enough to be carried without serious difficulty, and strong enough to stop even the modern rifle bullet, except at very close quarters. From a shield to a coat of mail would be but a short step, but it is not likely to be taken just yet. However light the new shield or armor might be, it would either increase the soldier's burden or necessitate the omission of some other part of his equipment, already reduced to the narrowest limits compatible with sustenance and a proper supply of ammunition. Extra weight would result in slower marching, an alternative not to be thought of in these days of rapid evolutions.

Preserving Autumn Leaves.

A few absolutely perfect leaves are better than the scores of common ones that we are tempted to collect. The leaves of the hard maple are always gorgeous in hue and delicate in outline. Those that wear the deepest tints of crimson or yellow are best for our purpose. Oak leaves are shiny and firm, and easily preserved. Nature has always been prodigal to the beech tree, scattering on her boughs the richest, brightest colors. The sumac glows with vivid crimson, and a clear amber shines through the dainty larch and chestnut leaves. Then there are the dull chocolate and mottled red of the blackberry vines, while the poplar and aspen shine out with a silvery white, all speckled over with touches of green. Gather these wild wood beauties, says *Good Housekeeping*, with as much care as would be bestowed upon a bouquet of garden blossoms, and hasten home with them before they begin to dry and curl. Upon reaching home let the first care be to have two hot irons ready. Cover the kitchen table with three or four layers of newspapers, over which fasten smoothly a soft cotton cloth. Have at hand a lump of beeswax, tied in a small bag, and a similar package of resin. Now smooth out a leaf with the hand, rub the beeswax lightly over the iron, letting the hot, smooth surface glide quickly over the leaf, first on the upper and then on the lower side, pressing a little more firmly a third and fourth time, until the leaf is thoroughly dry. The glowing colors will be firmly fixed, and will never fade, unless exposed to the sunshine. Having treated all the leaves in a similar manner, they are ready for the resin, or "the finishing process." With a moderately hot iron, which must be lightly and rapidly rubbed over the bag of resin, go over every leaf, first on the upper and then on the lower side. This gives them a brilliant, hard, glossy finish that makes them almost indestructible. Many persons complain that the glossy appearance is unnatural. While this is true, to some extent, yet the protection given by the coat of resin could be obtained in no other way. To preserve small branches, and boughs with leaves, one must proceed in the same manner, pressing the limbs and twigs with the iron until dry, being careful to avoid the point where the leaf is attached, as too much heat just there will cause it to drop off instantly. To achieve perfect success, be sure to take the leaves when freshly gathered. When the work has been finished, spread a number of newspapers upon the floor of some unused room, and there place the treasures. Give them plenty of space, so that they will not touch, or stick to each other. Cover them entirely with more papers, and let them remain in this cool, dark seclusion until ready to decorate the rooms, or otherwise use them as things of beauty and joy. Reserve a few of the brightest and more perfect specimens for the holiday times, when they will come out of their darkness so beautiful that they who see them will have no longing for summer flowers, but will revel in the unfading glories of the autumn leaves.—*Popular Gardening.*

Pathological Anatomy of Insanity.

Luys (*Jour. de Med. de Paris*, March 1) calls attention to an alteration that he has found in the brains of patients who had for many years been in an excited condition, viz., the hypertrophy of certain special regions of the paracentral lobules. The paracentral lobe is, as is well known, the point of confluence of the psycho-motor convolution of the cortex and one of the special regions where the psycho-motor innervations are specially accumulated. This hypertrophy therefore indicates a focus of continued excitation, absorbing to itself the vitality of the other cerebral regions, which are found more or less notably atrophied. In the extreme cases of excitement, with dementia, in which this condition was observed, he claims the subjects are completely absorbed in the hallucination or delusion connected with this hypertrophied region of the brain. The hypertrophy is usually symmetrical in the two hemispheres, but he presented the brain of a patient in whom there was a visceral hallucination that she was inhabited by a tape worm, which completely possessed her, that it became almost her sole idea. She dwelt constantly upon the coming and going of this parasite in her internal organs. Aside from this idea, when she could be induced to speak of other matters, she was perfectly lucid in her mind. The brain of this patient exhibited very marked hypertrophy of the paracentral lobe in one hemisphere, that of the other remaining perfectly normal. M. Luys explains by this anatomical arrangement the patient's clearness of mind coexisting with the delusion—she was insane with one hemisphere of her brain and rational with the other.—*Am. Jour. of Insanity.*

The Ascent and Discoveries on Mount St. Elias.

Last year it will be remembered that Prof. Isaac C. Russell, under the auspices of the National Geographical Society, with a corps of assistants, attempted to reach the summit of Mount St. Elias, Alaska. The exploring party, after many hardships and perilous adventures, were obliged to abandon their efforts to reach the summit of the mountain, because of the approach of winter. Last spring Prof. Russell, taking with him J. H. Crumback, Thomas P. Stamy, Thomas White, Neil McCarty, and Will C. Moore—men who had done considerable exploring in Olympia—and Frank G. Warner, of Hartford, Conn., started again with the expectation of scaling the St. Elias mountain and reaching its summit. The first four had accompanied the previous expedition.

Some apprehension has been felt latterly about the safety of the exploring party, it not having been heard from for several months, but tidings of their safety and arrival at Seattle are hailed with great rejoicing by the friends of the explorers. A telegram from Seattle to our daily papers gives a synopsis of Prof. Russell's experiences and discoveries in his effort to reach the summit of St. Elias. We are indebted to the New York *Sun* for the following account:

When the party reached Icy Bay and attempted to land, they met their first mishap. It was on June 16, and the waves were so high that one boat was swamped, and Moore, with Lieut. Robinson and four members of the Bear's crew, were drowned. With the exception of this mishap, all has gone well, and every one has been in good health. Some of the provisions and instruments went down with the ill-fated boat, but most of them were washed ashore later. The surf was so high that it took three days to make a landing.

Having reached the shore, the party started for the northern side of Mount St. Elias. One day's marching brought them to the snow line. For two months following they spent their time in the snow and ice, and for at least thirty nights they slept in the snow.

The rest of the time they found beds on the rocks of glacial moraines. Their clothing was woolen, and they were often drenched to the skin and slept without change of garments. Yet, in spite of all that, they never caught cold. Their food was carried in fifty-pound cases. An oil stove was used above the line of vegetation.

The first six weeks were spent in crossing the glaciers on the mountain's northern side, which offers the only possible route for ascent. Their highest camp was pitched 8,000 feet above the sea level, and they waited twelve days, hoping for an opportunity to reach the summit. They made several attempts, but each time were driven back by the snow. On one occasion they reached a point 14,500 feet above sea level, but, after twenty hours of incessant climbing, they had to take refuge again in camp utterly exhausted. At one time a storm came down when Prof. Russell was alone on the highest point, and for four days he was cut off from the rest of the party.

From their high elevation a grand view to the north was obtained over a country upon which human eye has never rested. They could take in a sweep of 300 miles from Mount Fairweather, 150 miles southeast to a point 150 miles northeast. The country in sight was about forty or fifty miles wide.

"It is a scene of utter desolation," said Prof. Russell; "a stretch of snow fields, glaciers, and ice, broken only by ice-capped peaks. The general altitude of the snow fields is some 800 feet above the sea level, and the mountains, which are innumerable, break through to an altitude of 10,000, 12,000, or even 14,000 feet. One of them, a singular table-topped peak fifty miles to the north, was named Bear Mountain, in honor of the government cutter which took us to Icy Bay."

Prof. Russell named several other peaks, but has not yet been able definitely to locate them on map. He made surveys to ascertain the height of Mount St. Elias from a three-mile base line at Icy Bay. He took angles to all the peaks in sight, and he placed the height of St. Elias at between 18,000 and 19,000 feet. He has not yet reduced his calculations so as to give the exact figures.

Considerable time was given to the study of the glaciers, one of the main objects of the trip. Many observations were taken of the great Mataspina glacier, which covers thousands of square miles southeast of St. Elias, between Icy Bay and Yakutat Bay. The St. Elias glaciers are much larger than any in Switzerland. Indeed, this one alone is larger than all the Alpine glaciers put together. The latter flow down through gorges till they reach the snow line, where they melt. Some of the St. Elias glaciers separate into smaller ones, but the great Mataspina glacier is made up by the confluence of four big glaciers and many smaller ones. They flow into it as water into a lake. These glacial streams unite into a vast plain of ice, hard, firm, and clear as ever found in glacier. The Mataspina glacier partly melts on the plain and partly breaking through to the coast and falls into the ocean. The thickness of the ice is estimated at from 1,500 to 2,000 feet.

A belt along the coast of from five to eight miles in width is covered with the moraine of broken and decomposed rocks, and the soil is ground out by glacial action. The outer three or four miles along the coast is overgrown with dense vegetation in which are found trees three feet in diameter. Though the soil is not more than two or three feet thick, there is plenty of moisture to furnish plant life of all kinds.

The party went inland thirty or forty miles, and returned by the same route. When they reached Icy Bay again they marched east 150 miles along the shore to Disenchantment Bay. This they explored and found to run thirty miles further than it is laid down on the maps. After stretching inland it turns, and the head is very near the ocean.

The government steamer Pinta took them to Sitka, where they took the City of Topeka for this city. Prof. Russell says the region is full of interest for scientific men, and work will undoubtedly be continued there. He does not know whether he will go again. He will remain in this city for a week or two, and then start for Washington.

Action of Metals, Salts, Acids, and Oxidizing Agents on India-Rubber.

The method adopted was to take a fine sheet of India-rubber spread on paper and vulcanized by the cold process with a mixture of chloride of sulphur and carbon bisulphide, and to examine the action on this of the various substances; on breaking the paper the fine sheet of caoutchouc was left free, so that its stretching properties could be examined.

Action of Metals.—The various metals whose action was studied were used in the form of filings sprinkled on the rubber. The whole was then kept at a temperature of 60° C. for ten days. Copper was found to have by far the most injurious action. Platinum, palladium, aluminum, and lead have a very slight action, but magnesium, zinc, cadmium, cobalt, nickel, iron, chromium, tin, arsenic, antimony, bismuth, silver, and gold have none.

Action of Metallic Salts and Oxides.—Saturated solutions were made in water and painted on small pieces of the rubber, or in the case of insoluble substances pastes were made with water and painted on, the whole being then allowed to dry. The heating was subsequently carried out as before. The following compounds of copper entirely destroyed the rubber: Sulphate, chloride, nitrate, ferro-cyanide, oxide, sulphide, also arsenic iodide, silver nitrate, strontium chlorate, vanadium chloride, manganese oxides, bismuth chloride. The following had an injurious effect: Ferrous nitrate, sodium nitrate, uranium nitrate, ammonium vanadate. The following had very little action: Lead chromate, ferrous sulphate, zinc acetate, zinc chloride, tin perchloride; while the behavior of about sixty salts having no action whatever was examined.

Exceedingly small quantities of copper salts are injurious to rubber, and it was found that wherever the cloth used in making proofed-cloths contained even traces of copper, the rubber became gradually hardened and destroyed. With reference to the use of the various blacks the authors point out that manganese oxides should not be present, but they assert that logwood chrome blacks may be used with impunity.

Action of Acids.—Very dilute solutions of hydrochloric, sulphuric, chromic, citric, or tartaric acid are stated not to be prejudicial, but nitric acid rapidly attacks rubber. A solution of sulphuric acid containing about 10 per cent of H_2SO_4 destroys the properties of the rubber.

Action of Hydrogen Peroxide.—Since ozone rapidly attacks India-rubber, and in view of the fact that chromic acid has only slight action, samples of rubber were placed in both acid and alkaline solutions of hydrogen peroxide for a month. Such treatment has no appreciable injurious action.—*W. Thomson and F. Lewis, Proc. Manchester Lit. and Phil. Soc.*

Sewage Experiments at Frankfort-on-Main.

The experiments here recorded have been carried out during the past three years, at the Frankfort works, under the supervision of a commission consisting of Dr. Spiess, Mr. Lindley, Dr. Libbertz, and B. Lepsius. Certain of the results obtained have been already published, and an account of the work is there given. In all eight series of experiments have been conducted, with five different systems of clarification. The various processes investigated were as follows:

(*a*.) Precipitation of sulphate of alumina and lime. Series I. to III.

(*b*.) Precipitation with lime alone. Series IV.

(*c*.) Simple deposition, without chemicals. Series V.

(*d*.) Precipitation with sulphate of iron and lime. Series VI. and VII.

(*e*.) Precipitation with phosphoric acid and lime. Series VIII.

The volume of sewage dealt with was about 30,000 cubic meters (6,600,000 gallons) per diem, and upward of 1,000 complete and comprehensive analyses were carried out.

In its mean composition the Frankfort sewage, though considerable fluctuations were observed, does not differ materially from that of other towns, London Paris, Dantzig, Berlin, and Breslau, with which it is contrasted in a special table. By means of a set of graphic diagrams are shown the results of the various purification processes, as evidenced by the character of the effluent as compared with the raw sewage, and the author sums up the general effect of the different modes of treatment. In all cases the suspended matters were far more efficiently dealt with than those in solution, and the appearance of the sewage water, as tested by the eye alone, was greatly improved.

In dealing with the amount of organic matter present, special consideration is given to the phosphoric acid treatment, and a graphic diagram is appended to show the proportion of the phosphates removed at each different stage of the process, and carried off in the effluent. From this it appears that though all the added phosphoric acid is expended in enriching the sludge, the amount of phosphoric acid present in the deposit from untreated sewage is nearly twice as great as is that in the sludge from the phosphate process. The figures in milligrammes per liter are as follows:

Phosphoric Acid Originally Present.

1. In raw sewage	67·4
2. Added to secure precipitate	17·6
Total	85·0

Phosphoric Acid After Treatment.

1. In deposit in sand chamber	29·4
2. In sludge	17·4
3. In effluent	38·2
Total	85·0

Hence, instead of securing a sludge valuable for agriculture, more than twice the quantity of the phosphoric acid employed for the precipitation is carried away in the effluent, viz., 38·2 milligrammes per liter, of which about half is in suspension and half in solution. The author points out that from this point of view it would be better not to treat the sewage with phosphate of lime at all, but to clarify it by simple deposition, and then to add the phosphate to the sludge.

In conclusion, it is stated that the experiments have demonstrated that the effect of chemical precipitation is not so greatly superior to the purification obtained by simple deposition in tanks as to warrant the adoption of any of the above processes in preference to simple mechanical treatment. This, of course, does not hold good for sewage treatment generally, but it applies only to the conditions prevalent in the present works. It is proved, however, that in every case where tanks approaching the dimensions of those at Frankfort are available, more especially where the length of the tanks is equally great, it is possible to obtain, by purely mechanical means, results comparing favorably with the clarification attained elsewhere in tanks of smaller size only by means of chemical treatment, and therefore at a greater cost.

The Glacial Period.

Before the Technical Society of the Pacific Coast, San Francisco, Marsden Manson, engineer of the harbor commission, lately advanced a theory to account for the formation of the glacial period.

As a basis for his theory, he laid down this general law, as he called it: A terrestrial sphere, in passing from under the influence of interplanetary heat to the influence of solar heat, must experience a glacial period, because of the remarkable properties under different degrees of heat and cold possessed by water.

The earth was once a ball of fire. As it began to cool, a crust formed, and the air around the earth began to be cooled. This caused the aqueous vapor in the air to form water. But the internal heat of the planet was still intense, and an immense radiation of heat and a corresponding condensation of vapor arising from the seas went on constantly. Solar heat had not yet penetrated the cold atmosphere between the sun and the earth. As the heat of the earth decreased, the condensation of vapor surrounding the earth as fog and cloud increased, until layer after layer of condensed vapor surrounded the planet. Successive ice shells were formed, and as the earth grew colder these ice shells came nearer the earth, and finally shrunk down to it. Then the glacial period was on the earth. But the heat of the planet now ceasing to affect its crust, there was no more vaporizing going on. All was ice and snow; the mists and vapors were cleared away. Then the sun had a good chance, and it was not long before his rays pierced through the ether to the ice-bound earth. The ice began to melt, and the glacial period began to decline. When it was over, the earth's crust had passed under the influence of solar heat, and the seasons began.

THE plumber who deliberately puts imperfect work in the hidden parts of a house, and thus exposes a family to disease and death, is as much a criminal as any burglar or murderer. He knows that the diffusion of poisonous gases destroys health and imperils life, and when he deliberately leaves hidden vents in plumbing for sewer gas to carry its deadly fumes into homes, he is a criminal and should be treated and punished as a criminal.—*Sanitary News.*

Iron Ore.

Census Bulletin 113, in relation to iron ore, prepared by Mr. John Birkinbine, special agent, under the supervision of Dr. David T. Day, special agent in charge of the Division of Mines and Mining of the Census Office, shows the quantity of iron ore produced in the United States during the year 1889 to be 14,518.041 long tons, valued at $33,351,978, an average of $2.30 per ton. The total product reported in 1880 was 7,120,362 long tons, valued at $23,156,957. Of the twenty-six States and two Territories producing iron ore in 1889 the four leading ones are as follows: Michigan, 5,856.169 tons; Alabama, 1,570,319 tons; Pennsylvania, 1,560,234 tons; and New York, 1,247,537 tons, aggregating 10,234,259 tons, or 70·49 per cent of the total product. The number of employes engaged in mining iron ore was 37,707, who were paid in wages $13,880,108. The capital invested was $109,766,199, distributed as follows: Land, $78,474,881; buildings, fixtures, etc., $7,673,520; tools, implements, etc., $8,045,545; cash and stock on hand, $15,572,253. The report shows a remarkable increase in production and activity. The average wages paid to laborers in 1889 was $1.29 per day; to boys, 62 cents.

In the total cost of producing iron ore Alabama is the only State which averages less than $1 per ton, viz., 82 cents. Next in order of low cost come Texas, $1.05; Tennessee, $1.08; Pennsylvania, $1.10; Georgia and North Carolina, $1.14. In Colorado, for reasons before given, the cost of producing one long ton of ore, $3.49, is greater than in any other State.

Probably in no country has the transportation of iron ore assumed such proportions as in the United States.

To get facilities for cheaply handling Lake Superior ores the railroads which penetrate the various districts have constructed expensive terminal facilities, generally consisting of one or more docks, with the railroad tracks elevated from thirty-five to forty-seven and one-half feet above the water level, the sides of the docks being fitted with pockets, into which the ore from the cars is dumped by means of drop bottoms. From these pockets the ore is loaded into vessels by iron chutes, which are let down into the vessel's hold. In this manner the ore is never handled from the time it leaves the mine until it is shoveled into buckets when the vessel is being discharged at lower lake ports, and no manual labor is necessary other than poking the ore with poles from the cars into the bin and from the bin into the chutes, and in some cases but little of this is required.

The total investment for docks especially built and equipped for handling and shipping iron ore approximated $4,000,000 in the year 1889.

The largest of the receiving ore docks is at Fairport, Ohio, which has a frontage one mile in length, with room for stocking ore extending back 180 to 350 feet in width. The two docks at Cleveland are one-half mile in length, with a storage capacity of 350 feet wide. The capacity of the three docks named will reach from 1,000,000 to 1,500,000 long tons each, as the ore is stored from 25 to 50 feet in height.

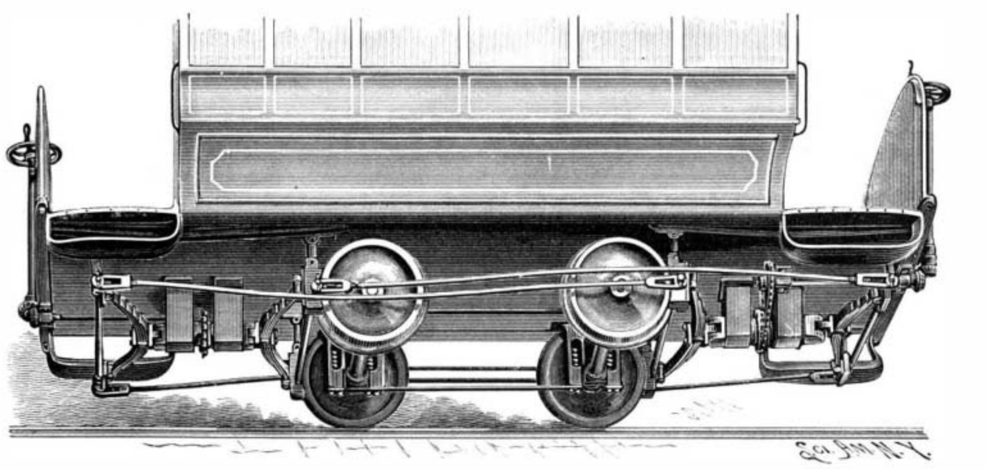
The ore from the Lake Superior region, when loaded into cars, occupies from 10 to 16 cubic feet for one long ton.

The machinery equipment of the various docks differs greatly, but five general types may be mentioned: (1) swing-boom derricks, operated either with engines placed on them or driven by wire rope from engines at a distance, the mast being either stationary or carried on trolleys; the iron buckets being lowered into the holds of vessels, where the navvies shovel the ore into them, the steam machinery raising the buckets and swinging the boom to the point where the ore is to be deposited; (2) a similar arrangement of swing-boom derricks, which discharge into hoppers and from these into tram cars, which carry the ore from the ore dock to stock piles located at a considerable distance from the water; (3) an A frame which lifts with the buckets and discharges them into tram cars, that run to the stock pile or dump into pockets and thence into cars; (4) aprons which project over the holds of vessels; the buckets traveling up the incline of this apparatus are dumped into tram cars, which run by gravity, discharge, and return automatically; (5) booms or aprons upon which the buckets are carried, and continue their journey either over cables or on trussed bridges, the buckets dumping automatically at the point desired and returning to the hold without detaching from the machinery.

These dock equipments have been put up at great expense, some of the docks costing, equipped, over $800,000, and by them it has been possible to handle quantities of ore which could not be moved in any other way, while the cost of such handling has been reduced to a minimum. The expense of shoveling the ore into buckets in the holds of vessels varies from 10 to 15 cents per long ton, while with the improved apparatus at some of the docks this ore is lifted from the vessel, carried back 350 feet, and dumped at a total cost, including the labor, wear and tear, interest, and fuel account, of from three-fourths to one and one-half cents per ton. With twenty-one men in the hold of a vessel carrying 2,000 long tons of iron ore, the entire cargo has been stocked in seventeen hours. Other instances are mentioned where with twenty-eight men 2,200 long tons were similarly handled in fifteen hours, and 2,100 long tons were handled by eighteen men in seventeen hours. In using these improved apparatus in loading from stock piles to railroad cars it is not uncommon to have a gang of men shoveling into buckets and load the ore on cars at the rate of eight or nine tons per man per hour.

AN IMPROVED SCREW SAFETY CAR BRAKE.

The accompanying illustration represents this improvement as applied to a four-wheel electric motor car, giving all the space between the wheels for motors. It is a patented invention of Messrs. A. B. Pool and J. J. Beals, of Boston, Mass., and affords a new departure from the old system of dead leverage, substituting therefor a live spring pressure. A right and left screw with traveling nuts thereon is hung to the car as shown, to which is attached two half elliptic springs at either end of the nuts, the springs having friction rolls at their ends and being pivoted to the nuts so as to conform to any position of the brake beams. Opposite the springs are placed sub-beams, to which draught rods are attached connecting with the brake beams. Sprocket wheels are placed at the center of the screws and are connected with corresponding wheels hung to the car by chain belts, the wheels having a shaft connection geared to the operating rod, by the working of which the springs are spread and a perfect equality of pressure is obtained upon all the wheels. Either end is worked independent of the other, or both together if need be, the proper application of the brake not only doing away with flat wheels, but overcoming the momentum of the car in the shortest possible time. This device is designed to be simple, durable and inexpensive, and when once adjusted will remain in position until the shoes are worn out, requiring no pawl or ratchet to hold it. It can be set at a certain pressure on a down grade, and will so remain without any attention of the motor man, and the power can be applied to or taken off the car by the same handle and at the same time that the brake is operated, but little power being required to do the work. The inventors have perfected this system for application not only to any kind of street car, but, by a simple method of air pressure, to steam trains as well. It is expected that the system will soon be given a practical demonstration on the West End Railway, Boston.



POOL & BEALS' SCREW SAFETY CAR BRAKE.

For further information relative to this improvement address the inventors, No. 16 Hanover Street, Boston, Mass.

The Uses of Peat.

The *Handels Museum* publishes an extract from an article by Dr. Leo Pribyl, who maintains that peat is a valuable raw material, the uses of which, except as fuel and litter, are as yet very limited. The fiber is unsurpassed as a packing material for use in the case of breakable merchandise, being much superior to straw, hay, etc., owing to its greater elasticity and dryness. In the case of consignments consisting of liquids, it possesses the advantage of being peculiarly adapted for absorbing any of the contents which may have escaped through breakage, and thus preventing damage which might result to other consignments through damp. In the shape of dust and litter it is especially adapted for preserving perishable articles. Meat when packed in it will keep fresh for weeks, and will eventually dry up, the moisture being absorbed by the peat. In this way fresh sea fish has been sent from Trieste to Copenhagen, and has reached its destination in perfect condition. Peat is also successfully used for preserving fresh fruit; even grapes may be made to retain their fresh appearance for months, and, owing to the high prices of this fruit in spring and summer, would amply repay the trifling expense incurred by the use of peat dust. Experiments have shown equally satisfactory results in the case of pears, apples, plums, etc., as also in the case of cabbage, turnips, and potatoes, peat packing having the advantage, not observable with other packing materials, of preventing the sprouting of potatoes in spring. The question as to the best method of preserving eggs for the winter months is an important one, and still remains without any satisfactory answer. Possibly the preservative qualities of peat might here again be illustrated, and a satisfactory solution of this important question be arrived at.

It has been found a drawback in the use of artificial saline manure that in wet weather it forms itself into hard lumps, which cannot be scattered by the manure-spreading machines, a difficulty which may be obviated by the use of a small quantity (2·5 percent has been found to be sufficient in the case of kainite) of peat dust with the manuring salt.

As a substitute for ashes and straw in filling up the partition walls of cellars and ice houses, broken peat is most suitable, as the effect of moisture on the ashes or straw is such as to render their immediate removal a necessary condition for the continued use of such places. Ice has been preserved for eight days in a cement barrel when covered with dry peat litter. Two pieces of ice were exposed to the sun's rays in Braunschweig; one of them was covered with wood shavings and the other with a layer of equal depth of peat litter. The former had thawed in 72 hours, when it was found that the latter was still almost entire. From this it is seen that peat is a bad conductor of heat, and is consequently well adapted for isolating purposes.

Peat dust has been recommended as an excellent ingredient for use in the manufacture of light, porous bricks, being mixed with the clay previously to baking. Bricks of this kind are much sought after in certain branches of architecture. But still further industrial uses are found for peat. The peat bogs of Northern Germany and of Sweden are being worked by joint stock companies, with a view to obtaining the elastic fiber, which, when free from dust, is used for weaving into carpets and other textile fabrics. Considerable capital is invested in these undertakings in Oldenburg and Sweden. The paper industry, too, in the manufacture of peat cellulose, has shown a decided preference for this tender and pliant fiber, so that it may be justly said that at the present time the supply of good peat is inadequate to meet the demand, considering the varied uses of this unpretentious raw material.

The chemical industry is using peat in the manufacture of charcoal, peat coke, peat gas, etc., thus converting a cheap raw material into a valuable industrial product. Boghead naphtha, tar, solar oil, paraffine, acetic acid, and gas have been produced from peat, and it has even been used in tanning. It has been for years used in Germany for absorbing waste liquids and refuse in factories, and in this way has furnished large quantities of valuable manure in certain districts.

An enumeration of the manifold uses of peat will prove that this raw material, which has hitherto been considered of little importance, and which nature has provided in such abundance, even if it be in many districts partially distributed, is destined not only to benefit agriculture by its valuable properties and chemical composition, but to lay the foundation of a flourishing and widespread industry. A new era has been entered upon in the sanitation of towns by using peat, and it is to be hoped that advantage will be taken of the undoubted benefit arising from its use, both as regards the health of urban populations and the promotion of agricultural interests by the supply of large quantities of manure. In this way extensive and unproductive tracts of bog land would be converted into valuable properties, and a flourishing industry would provide work and wages for thousands of hands.—*Jour. Soc. Chem. Industry.*

A PATENTED process for obtaining cellulose and oxalic acid from the vegetable fibers contained in wood, which is the invention of M. Liefchutz, consists in reacting on wood with dilute nitric acid, in the presence of sulphuric acid, separating the intermediate product from the acid liquor, which contains in solution the oxalic acid formed, and subjecting the intermediate product to a further treatment to remove the remaining incrusting matters from the cellulose. As to the acid liquor, it is set aside and subsequently treated in a process for recovering the oxalic acid. The oxalic acid dissolved in the weak nitric acid can be obtained direct in the crystalline form, by repeatedly using the separated acid liquors for the treatment of fresh wood. —*Bull. Fab. Papier.*