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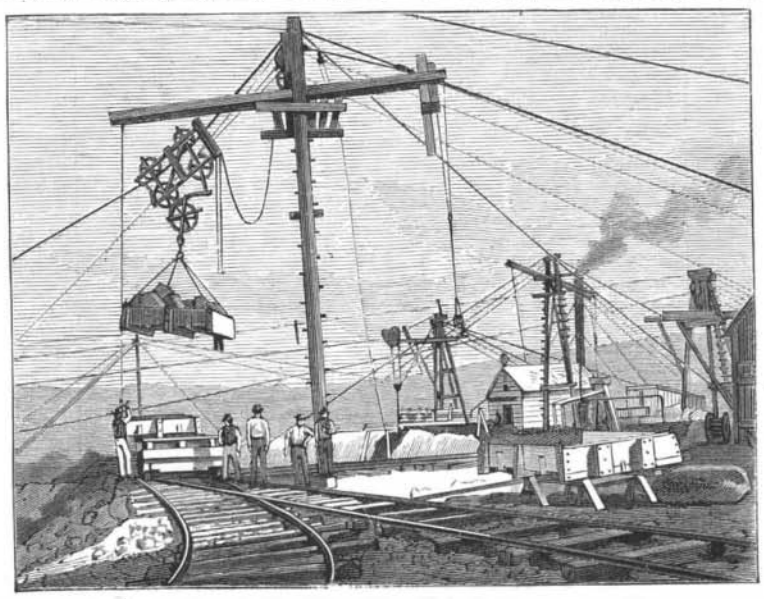
THE TILLY FOSTER MINE.

For nearly two years past a most interesting piece of engineering work has been progressing in the reopening of the Tilly Foster iron mine, near Brewster's Station, Putnam County, about fifty miles from New York City, on the line of the New York and Harlem Railroad. The mine is owned by the Lackawanna Iron and Coal Company, and its ores have long been considered very valuable, having been principally used at Scranton and Bethlehem, Pa., in the production of Bessemer pig. The expense of getting out the ore, however, has been great, owing to the irregular and nearly vertical overlying strata, and the production has steadily declined, the stratification necessitating the leaving of large quantities of ore in position in the pillars and roofs. An attempt was made to use concrete pillars, but these artificial supports were found to be too liable to crush and their use was abandoned. All other plans having failed, it was finally determined to adopt the bold scheme represented in our illustration, which is nothing less than the entire removal of the whole of the overhanging rock, thus making the mine an open cut.



ENGINES, AIR COMPRESSORS, AND HOISTING PLANT.

The work was commenced in June, 1887, and up to March of this year 230,000 cubic yards of material had been removed. The excavation is now about 450 feet long, 300 feet wide at the widest part on top, and 170 feet deep. Of the material thus far taken out, there have been some 15,000 cubic yards of rock in which ore was mixed. The total contemplated rock excavation amounts to 350,000 cubic yards, in order to secure an estimated quantity of 1,000,000 tons of ore. The contract price for the rock excavation was $1.15 per cubic yard, the taking out of the ore and separating it from the rock being paid for at a higher figure. One thousand tons of material are handled every ten hours, through the aid of a series of wire cables stretched across the pit.

REOPENING THE TILLY FOSTER MINE, NEAR BREWSTERS, N. Y.

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Two methods of working the cables are employed. In the first the main cable is stretched entirely across the pit, and is supported by derricks at each end. On this cable a trolley runs, its motion being controlled by an endless cable driven in either direction by a reversible engine. The hoisting is done by an independent rope driven by a drum of its own, which can be run independent of or in conjunction with the traversing drum. With this construction hoisting can be done from any part of the main cable, and delivery made at either end, the rock being delivered at one end of the cable, from which it is sent to the rock pile, while the ore is delivered at the other end into the cars for shipment. By the other system of working the cable is inclined, its lower end being secured in the pit, while the hoisting and traversing are both done by a single rope and drum. The point of the cable from which the hoisting is done can be regulated at will by changing the position of a stop block on the main cable. The trolley runs down the cable until it strikes the block, when the trolley stops and the load is lowered directly, the position of the stop block being controlled by an independent rope which winds around a drum of its own. The empty car bodies are lifted directly from the trucks and lowered into the pit, where they are loaded and hoisted back again. One load is equal to one and one-fifth yards of rock, measured as it lies in the bed.

It is said that this excavation is to be carried down to a total depth of some 600 feet, but it is estimated that there will be but slight increase in the cost of the work on account of the increased depth. Ten Rand drills are in use, and rackarock is employed as an explosive. The cost of explosives is said to have been about ten cents per cubic yard, and the cost of lifting and disposing of the rock about five cents per cubic yard. Mr. F. H. McDowell is the engineer under whose direction this work has been carried on.

The Paris Exhibition.

The Machinery Hall, which occupies nearly the whole width of the Champ de Mars, is the largest building covered by one roof in the world. Its central nave measures 375 ft. in width and 1,380 ft. in length, and is roofed in by one span. On either side are galleries 57 ft. 6 in. wide, and these have a ground and first floor.

The cost is given in an official return as $1,502,785, made up as follows:

Earth work and masonry	$118,485
Iron work	1,079,660
Wood work	88,750
Covering, lead and zinc	47,335
Flooring	15,715
Joiners' work	6,865
Glazing	36,445
Decoration	51,220
Painting	31,705
Miscellaneous	38,025
Engineers	38,590

Three-quarters of the space of the Machinery Hall is occupied by France, and the remaining quarter is divided between Great Britain, the United States, Belgium, and Switzerland.

Rolling Liquid Metal.

Among the interesting and successful of recent inventions is a rolling mill for producing sheet metal direct from the molten state, instead of rolling it from a billet or bar. A machine of this character has been at work for several months at the can factory in Maywood, near Chicago. It is used for making sheet solder, six or eight inches wide, and $\frac{16}{1000}$ of an inch thick, which it produces at the rate of 400 feet a minute.

The apparatus consists of hollow rolls with cold water running through them. The water is introduced through the axles, and the rolls are of sufficient size to at once change the jet of melted metal into solid form as fast as it is fed. The powerful compression exerted by rolls upon the molten metal in forcing it between the two surfaces, and at the same time changing it to a solid body, tends to give to the sheet an even and highly finished surface. The inventors of the machine believe that the principle could be successfully applied to the rolling of Bessemer steel, as well as to softer metals. Mr. O. W. Potter and other officers of the North Chicago Rolling Mill Company recently examined the machine, and expressed themselves as being favorably impressed with its work.

AT a recent meeting of the London Linnean Society, a paper was read by Mr. Lister on the Myxomycetes, or Mycetozoa, a group of organisms on the borderland between the animal and vegetable kingdoms and formerly classed with fungi. His remarks were illustrated by numerous colored drawings of representative species, and the author also exhibited under the microscope the swarm cells from the spores of *Amaurochæte* and the streaming plasmodium of *Badhamia*. Attention was especially directed to the mode of feeding of the swarm cells and observations made on those of *Stemonitis*, where large bacilli were seen to be caught by pseudopodia projected from the posterior end of the organism, and drawn into its substance and digested.

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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 702.

For the Week Ending June 15, 1889.

Price 10 cents. For sale by all newsdealers.

A German Electrical Executioner.

There are signs of reforms in the method of execution in other countries besides America, says one of our foreign contemporaries, but it is doubtful whether the German government will adopt the excessively dramatic mode which has been recommended to it by a certain Leipzig inventor. His apparatus consists of a platform nine meters square, approached by five steps. In the center of the platform is a chair for the condemned man. Behind it stands a figure of Justice holding a pair of scales in her left hand. Under the platform is a series of electrical accumulators, from which wires pass through the legs of the chair into the seat and back, and terminate in platinum plates. The patient having been seated, the executioner reads the sentence, and then, taking a wand, breaks it and deposits the pieces in one of the scales. This descends, completes the necessary connections, and so ends the matter. In Germany, indeed, reform is just now being loudly clamored for, public opinion having been greatly stirred by a tragedy which occurred a few weeks ago, when, it may be remembered, the imperial executioner, in a fit of jealous rage, kicked one of his assistants to death. It is contended with some show of reason that the crime was, to some extent, attributable to the brutalizing effects of the prisoner's occupation.

Wages in the United States in 1800.

The condition of the American wages class nearly a century ago is full of instruction. In the large cities, unskilled workmen were hired by the day, bought their own food, and found their own lodgings. But in the country, on the farms, or wherever a hand was employed on some public work, they were fed and lodged by the employer, and given a few dollars a month. On the Pennsylvania canals the diggers ate the coarsest diet, were housed in the rudest sheds, and paid $6 a month from May to November, and $5 a month from November to May. Hod carriers and mortar mixers, diggers and choppers, who from 1793 to 1800 labored on the public buildings and cut the streets and avenues of Washington, received $70 a year, or, if they wished, $60 for all the work they could perform from March 1 to December 20. The hours of work were invariably from sunrise to sunset. Wages at Albany and New York were 3s., or, as money then went, 40 cents a day; at Lancaster, $8 to $10 a month; elsewhere in Pennsylvania workmen were content with $6 in summer and $5 in winter. At Baltimore men were glad to be hired at 18d. a day. None by the month asked more than $6. At Fredericksburg the price for labor was from $5 to $7. In Virginia white men employed by the year were given £16 currency; slaves, when hired, were clothed, and their masters paid £1 a month. A pound, Virginia money, was, in Federal money, $3.33. The average rate of wages all over the country was $65 a year, with food and perhaps lodging. Out of this small sum the workman had, with his wife's help, to maintain his family.

No Oxygen in the Sun.

The Paris correspondent of the *Daily News* states that M. Janssen, of the Academy of Sciences, claims to have made a discovery which upsets the entire theory based on the analysis of celestial bodies by means of the spectroscope. On May 12 the electric lamps of the Eiffel Tower were turned on the Meudon Observatory, which is 7,800 meters (4 miles 7 furlongs) away. He reckons that the mass of air lying in a given section of that length at the height of the tower is equal to the atmospheric mass above. M. Janssen argues from this that the number of molecules of air encountered by a beam of light sent from the Eiffel Tower to the observatory is about the same as that met by sunlight on its way to the earth when the sun is near the zenith. He then shows that if the analogy holds true, the belief that the sun contains oxygen is unfounded, and that if its spectrum contains the characteristic oxygen rays, this is due to the oxygen of our atmosphere. One of the fundamental theories of spectrum analysis is that the width of the characteristic bands of a gas is proportionate to the number of molecules that intercept the light. Now in the above experiment the most important rays of the oxygen group were precisely similar to those of the solar spectrum. The conclusion M. Janssen draws is that there is no oxygen in the sun.

THE arrangements for paying the price of admission to the Paris exhibition are somewhat peculiar. All tickets issued are of the value of one franc or 20 cents each. On week days, from 8 to 10 A. M., two separate tickets must be presented to obtain the right of entrance. From 10 A. M. until 6 P. M., a single ticket is sufficient. After 6 P. M., two tickets are necessary. On Sundays the same arrangement for morning visits is adopted, but from 10 A. M. a single ticket will serve. The regulation is fairer than was anticipated, as it is possible to spend twelve hours in the exhibition and enjoy the evening fetes for 20 cents. Few will object to paying an extra franc to have the advantage of seeing the objects when the galleries are less crowded.

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