Elviras, and several others, and it is the proper selecting and combining of the fermented juices of these grapes, under carefully regulated conditions, that gives the high quality to the various still and sparkling wines made. The "Gold Seal" brand of champagne, prominently displayed in the company's exhibit, has been for many years a leading article of their production, and stands deservedly high in the wine trade and among connoisseurs throughout the country.

The still wines of this company are deserving of especial attention, all being made from the most careful selection of grapes, and they are vouched for as "pure," which makes them particularly desirable with those who want pure goods, and desire to avoid adulterations. All stock is well aged, and sold at a low price, considering the quality.

The Late Hayward A. Harvey.

Hayward A. Harvey, the inventor of the Harveyized steel armor plate process, passed away August 29, at his home in Orange, N. J. Mr. Harvey was born in Jamestown, N. Y., January 17, 1824. His father was General Harvey, the inventor of the gimlet-pointed screw, the cam motion, and the toggle joint. Young Harvey entered the office of the New York Screw Company as draughtsman in 1844, he took charge of a wire mill at Somerville, N. J., in 1850, and in 1852 he became connected with the Harvey Steel and Iron Company, of which his father was president. In 1865 Mr. Harvey founded the Continental Screw Company, of Jersey City. The inventions of Mr. Harvey, up to this time, had nearly all been in the direction of automatic machinery: but he afterward devoted his energies to metallurgical processes, and in 1888 he took out his first patent on a process for treating steel. This invention has now made his name familiar all over the civilized world, and has added another word to our language.

The new process is, briefly, a method of hardening steel on the surface, or carbonizing it, and raising steel NEW YORK, SATURDAY, SEPTEMBER 16, 1893. of a low grade to a higher one. The first armor plate treated by the Harvey process was made in 1890. The Harvey Steel Company was organized in 1889, and works were established at Brill's Station, near Newark, on the Pennsylvania Railroad. Various improvements were introduced in the manufacture of armor plates, and to-day Harveyized steel armor plate stands without a rival. The tests made at the Indian Head Proving Grounds, a few weeks ago, proved conclusively that Harveyized steel plates are the best in the world. In a comparative test with English compound armor plate, Creusot all steel plate, and the regular United E States nickel-steel plate, the Harveyized plate proved to be better than any of the others. The construction of battleships has been modified by the introduction of Harveyized armor, and the new process is being adopted by the principal manufacturers of Europe. Mr. Harvey, in the course of a long and eventful life, had 125 patents granted to him.

The Lantern in Scientific Stage Effects.

Some new scientific stage effects were introduced into a recent performance of Wagner's Die Walkure, at the Grand Opera House, Paris. The scene where the sons of Wotan, mounted on steeds and brandishing their lances, are seen in the clouds, is described as very realistic. The foreground is wild and rocky, and the clouds are seen to scud across the sky. This effect is produced by projecting the image of a cloudy sky by an electric lantern on a curtain of translucent blue cloth. The continuous movement of the clouds for half an hour is produced by painting them on the edge of the disk of glass twelve inches in diameter, and rotating the edge past the lens of the lantern. Three lanterns II. are employed to blend the clouds. The wild cavalcade m. of Wotan's heroes is produced by a line of mechanical horses, full sized, and carrying real performers. They are supported on a scaffolding, and drawn by means of a cable across the scene at a suitable elevation. The mounted men are strongly illuminated by the electric light, and thus rendered visible through the translucent curtain representing the heavens. The scene terminates by a conflagration, in which great flames run along the rocks, while thick fumes, reddened by Ben-

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181

185

182

183 187

188 184 180

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Contents.

(lilustrated articles are marked with an asteriak.)	
Air cooling by underground pipe 183 Aluminum tickets	Exposition, Columbian – Pens, Esterbrook, exhibit of*
Ang-Kor, ruins of	Exposition, Columbian - Pla-
Birds and animals, intelligence of 186	tinum exhibit, a costly Exposition, Columbian – Vase,
Brake valve, Pelham's* 180 Brazing (5356)	largest turned, at* Exposition, Columbian—Wagons,
Cattle stall. Aeberly's* 181	heavy, of Chatham Mfg. Co.*
Comet, the Rordame*	Exposition, Columbian–Notes. Fair, Midwinter, at San Francisco
Diamond, a monster* 183	Fire engine, a bicycle
Diver, northern*	Flowers, cut, bow to preserve Flowers, frozen, to ship
Egg hatchings	Guns, the new 13-inch
Electric trolley wire finder, Jones'*	Gun, the Brown wire Harvey, H. A
Exposition, Columbian—Ameri- can wines shown at, by Ur-	Inventions, recently patented Lantern. the, in stage effects
bana Wine Co.*	Lemon sirup
Exposition, Columbian-Awards	Manufacturing in the U.S Metric equivalents
at the	Money of the world
marvelous, Black Hills, rep- resented at 179	Navy, French, increase of the Notes and queries
Exposition, Columbian – Drop forgings, exhibit of J. H. Wil-	Olympia, the new cruiser Painting, seaside
liams & Co.* 180	Patents granted, weekly record.
Exposition. Columbian—Filters, the McConnell, at the* 177	Plumbago as a lúbricant Printing press counter, Clayton's*
Exposition. Columbian-Grand	Pumps, well (5362)
South Canal. view on the* 185 Exposition. Columbian—Horse	Railroads, safety on Sawing, a large day's
powers, etc., of A. W. Gray's	Sugar, Manila
Sons [*] 187 Exposition, Columbian – Pens	Tempering mainsprings Valiant, the Vanderbilt yacht
and ink, Caw's exhibit of* 181	Watch, a cheap*

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT No. 924.

For the Week Ending September 16, 1893.

Price 10 cents. For sale by all newsdealers.

PAGE 14773 I,

14770

II. BOTANY -- Dragon's Blood.-- Currous instantations of the state with the state of the state o

1476 14759

14759 1476

[September 16, 1893.

A CHANCE FOR AMERICAN CONTRACTORS.

In another column will be found the advertisement of the Public Works Department of Cairo, Egypt, in which bids are called for relating to the construction of certain street railways in that city and vicinity. Here would seem to be an opportunity for some of our enterprising contractors.

The administration of the Egyptian government under the English advisory auspices has been attended with great success. The financial condition of the country is stable and reliable. In all departments of the government valuable reforms have been made, and nearly everything is now conducted on modern methods. The Public Works Department of Egypt is especially noteworthy for its successful efforts in introducing new improvements. Splendid engineering works relating to the Nile irrigation have been constructed at vast cost, whereby the productive area of highly fertile lands has been greatly extended. Railways have been introduced, telephone and telegraph lines made universal, postal facilities increased and improvements of all kinds along the lines of modern progress brought in. The present proposals for tramway lines doubtless will be found worth looking into.

SAFETY ON RAILROADS.

Within a very recent period several fatal railroad accidents have been chronicled which were of a nature as to point to one conclusion—the futility of trusting to direct human agency for protection. A railroad is assumed to be of the highest standard when equipped with a block system. But as usually interpreted, the block system is far from affording absolute protection. It displays a danger signal and perhaps also a caution signal when a train is within a certain distance of the signal station last passed by it. A following train on the same track is supposed to be arrested by these signals, and the train in advance is thus protected. The signals may be entirely visual. Semaphores by day and colored lanterns by night may be employed. A bell may also be used, which will ring as long as the block in advance is occupied, this constituting an aural signal, or one addressed to the ear. Torpedoes may also be used.

Such is the block system, by which all first-class railroads are guarded. In some cases it is applied by operatives stationed in watch towers along the line of the road. In other cases the manipulation is entirely automatic, electricity, pneumatic and hydraulic power being employed to work the signals. The locomotive itself effects the changes of signals as it leaves one block and enters another. In any case its operation consists in working a signal system for the guidance of the engineer of the locomotive. If it is the watch tower system which is employed, the vigilance of the signalmen as well as of the engineer is an absolutely necessary factor for its working. If the automatic system is employed, then the engineer is the only one who is depended on. There seems to be less chance of error in the latter case.

The block system is designed to prevent collisions. Its defect is at once apparent. It relies absolutely on human agency to prevent accident. Its functions end with the display of a warning signal. It has been proposed to add to it an apparatus which would strike a lever or valve handle on the engine, thereby throwing the brakes into action or shutting off steam if the engine passed a danger signal. This appliance has not been adopted to any extent. Even the best block and signal system has proved so ineffective that when a train stops unexpectedly from any cause, an apprehension of rear end collision may always be felt. This has gone so far that it seems as if the passengers for their own safety should be directed to leave the cars in such contingencies.

In 1853, on the New Haven road, a very bad accident, resulting in the loss of 46 lives, occurred at South Norwalk. A drawbridge was open and the danger signal, announcing this fact, was properly shown. Yet the engineer of an express train ran by the signal and the train plunged into the gap. It was a fearful illustration of the point we have been making-the inefficiency of the human element in signal ing operations. The accident resulted in the passage of a law requiring every train to come to a full stop before crossing a drawbridge. This was certainly a confession of weakness. The law was next satisfied by the use of derailing switches at drawbridges. A derailing switch is one which, when opened, causes a train to leave the track and run along the surface until it stops. Such a switch connected with a drawbridge mechanism so as to be thrown into the derailing position when the bridge is open, will prevent the train from plunging through it. It eliminates completely the personal element and takes care of a danger point automatically. It represents the automatic stoppage of a train as contrasted with a simple danger signal designed to warn the engineer. Throughout the whole system of railroad signaling runs the element of uncertainty. A train is brought to a stop between stations, owing to some accident. A signalman with a lantern by night or flag by day

gal fire, spread through the atmosphere. The flames are due to fulminating cotton, placed in advance on the rocks, and lit by the machinists. Lycopodium powder is also blown through holes in the stage. Weird cloud effects are produced by steam.

THE latest use for aluminum is for street car tickets, and it must be conceded that the metal is singularly x. adapted for the purpose. A Michigan street railway has just made its first issue of these light and ornamental tokens, which are about the size of a silver quarter dollar. One is round for the ordinary fare, the other octagonal for children. The adult's ticket is sold by the railroad company to the public at the rate of six for a quarter and the child's ticket at the rate of ten for a quarter. The company does not allow its employes, either conductors or motormen, to sell the tickets to the public, but disposes of them in \$10 lots to the several storekeepers who handle them exclusively.

The Sucking Up of Dangerous Liquids by Siphon.—An appara-tus for decanting sulphuric acid and similar liquids in factories.— 1 Illustration..... 14768

SEPTEMBER 16, 1893.]

walks back to warn any approaching train. It is quite problematical how far back he may go. He may seek the shelter of a station en route, thinking all is safe. He may be but a few car lengths back when an approaching train appears, in a few seconds colliding with the other one. An engineer may follow up a long line of hundreds of block signals, and when weary with their endless recurrence, may pass the critical one. Signal tower operatives may fail in giving the proper signal.

It certainly seems as if there was room for invention in the elimination of the personal element from railroad signaling. It should be possible to devise some rational system by which a danger signal would absolutely stop a train, should the engine runner fail to do so. The electric current which is employed in the automatic block system might be made to do one of the most imposing of the numerous elegant this, thus avoiding the clumsier mechanical methods.

efficient system of warning another train approaching through pavilions, halls and galleries adorned by from the rear should be practicable. It has been pro- countless exotics. Directly under this huge dome posed to provide a little car to run upon a single rail, which car is to be driven by a rocket attached to it. It would carry a torpedo. On the stoppage of a train for an accident it would be dispatched from the rear. | boos that will bear transplanting. Amid this tropical In a few seconds it would be a thousand feet or more away. An approaching train would run over it and myriad clinging vines. explode the torpedo, thus warning the engineer. But to-day the slow-moving brakeman is the usual agent. Before he would reach a point even a thousand feet distant, an express would run several miles.

One recent invention accepts the liability to collision, and constructs cars on a principle specially designed to withstand a shock, and not to telescope. Our inventors and engineers should go a step further, and make accidents all but impossible. To-day a rear-end cave may be regarded as tentative, the ingenuity may collision should be an impossibility. But sad experience, involving many deaths and injuries, continually shows that it is a constantly menacing danger. The would be an improvement on the present plagiaristic double track road with fast and heavy traffic is now as | title, which for want of any other will have to be used dangerous as was the old-time single track with its limited number of slow trains.

The Olympia.

The Olympia, one of the finest protected cruisers ever constructed, is rapidly approaching completion at the Union Iron Works, San Francisco. The Olympia is the largest unarmored cruiser built for the navy, except the Columbia and the Minneapolis. She has a displacement of about 5,600 tons and a coal capacity of 1,300 tons, which gives her a radius, at 10 knots, of 13,000 miles. The guaranteed speed of the Olympia is 20 knots. She has already sustained a sea speed of 19 knots, which is far ahead of what is generally found in vessels of her class. The Olympia is 340 feet long, beam 53 feet, and 21½ feet draught. She has three complete decks and a large superstructure amidships. The vessel is provided with two masts with fighting tops and an electric light on each. She has a complete protective deck of 4¾ inches of steel on forward slope and 2 inches on the flat throughout. All around the ship is a belt of water-excluding substance. Coal is so stowed that the machinery will be protected as much as possible. The machinery consists of twin screw, vertical inverted, direct-acting, triple expansion, three cylinder engines, in two watertight compartments. The cylinder diameters are 42, 59, and 92 inches respectively, with a 42 inch stroke. The air and circulating pump engines are driven independently. The total horse power of the propelling and pump engines is expected to be 13,500 at 129 revolutions per minute of the screw engines.

The main battery consists of four 8 inch and ten rapid-fire 5 inch guns, as well as a secondary battery of fourteen 6 pounder rapid-fire guns, six 1 pounders, and four Gatlings. There is a fixed torpedo tube in bow and stern, as well as two training tubes in each side. The Olympia is a fine vessel of the commerce destroyer type, and her high sea speed and her prolonged radius general expression is that of wonder and delight. of action make her a valuable ship for use in the Pacific Ocean.





THE MARVELOUS CAVERN OF THE BLACK HILLS. BY H. C. HOVEY.

The glazed dome of the Horticultural building is structures to be seen at the World's Fair. It is 180 If a train is unexpectedly forced to stop, some feet in diameter and 144 feet high and is approached arises a miniature mountain that artistically conceals the heating apparatus. Along its flanks and crest grow the largest palms, tree ferns, bananas and bam greenery bloom hundreds of gay flowers and twine a

> reproduction of one of our most recently discovered and brilliantly decorated American caverns. Perhaps without sufficient reflection the owners have styled it The Mammoth Crystal Cave," which really trenches on the name for generations appropriated to the great cavern of Kentucky. But as no map or guide book has yet been published, and all the names of the new wisely be taxed for wholly novel and suitable names. Even "Columbus Cavern," or "Colossal Cavern," in this article.

with the directors, but the cave proprietors hit on the are known to rise as much as 1,800 feet above the galbold and original conception of substituting for mere rock work a reproduction of their subterranean marvel. These gentlemen, Messrs. Keith and Allabough, who are also on the grounds to look after their interests, assured me that they began preparation two years ago by setting some seventy men at work in unfrequented parts of the cavern, collecting materials in such a manner as should not mar or rob the cave of its embellishments. The conditions forbade blasting. The crystals had to be patiently cut from the rock by pick and chisel. Thus 300,000 pounds were obtained of stalactites, stalagmites, onyx, geodic crystals, dogtooth spar and sparkling botryoidal masses; of cave pearls, flos ferri, aragonite and dripstone stained by oxidation in as many colors as the rainbow. Having gathered these materials, it was a question what to do with them. At first the directors of the Fair were inclined to regard the exhibit as a show and to relegate it to the Midway Plaisance. But this was firmly withstood by the proprietors, who finally, after a delay of five months, obtained, through the intervention of parties interested in growing plant life by electric light, the concession of the present admirable location.

When the grotto was first opened, admission was free and continued to be so for a month. But such crowds flocked to see it as to make it actually necessary to restrain them by fixing the nominal fee of five cents for admission: and even this small sum is refunded in the seven days' layers of dust on the uppers. Next case the visitor buys specimens. Although the exhibit was not intended to be remunerative, the fees Welding exhibit; then if you could see the astonished and purchases made by a million visitors have already expression, as he knows he sees a man dip a cold piece reimbursed the proprietors for their original outlay of nearly \$50,000 and met running expenses. As many hot, while under water. It is comical to watch him; as 20,000 persons explore the grotto daily, and the

The grotto as constructed is in no sense a model of the original cavern, except as displaying specimens of plays scientific and other educational apparatus, toits contents and some of the conditions under which gether with cases of stuffed birds and animals; picthey are found. It includes seven rooms with arched tures of Russian life and specimens of mineral resources. The St. Petersburg School of Design conapproaches and tasteful alcoves and ample space, At the sawmill of M. T. Jones & Co., of Lake Charles, every square foot of which is embellished by the tributes many fine specimens of lace and needle work done by girls, also samples of work done by boys in the Manual Training division. The Russian government displays in adjoining booths many sketches and diagrams of public engineering works. In the Imperial Post booth the various methods of carrying the mails is picturesquely shown. There is a model representing five men carrying the mails over the moun-The Mammoth Crystal Cave itself was discovered in tains through the snow in the Caucasus, where the South Dakota many years ago by miners for the prefooting has to be chopped out of the ice step by step. cious metals. But it has never till recently been Another model represents three horses abreast in the entered for more than 1,700 feet. In 1889 explorers beusual Russian style attached to a two-wheeled mail gan to break into new chambers, one after another, cart. Near this three horses attached to a sleigh show diameter, No. 6 gauge, with 80 teeth. The steam was the process going on gradually, until now 1,490 halls this same route in winter. There is also a model of a and rooms have been opened. Some of them are low mail cart drawn by two vokes of oxen : a special mail and muddy, while others are spacious and dry. The boat used in the Archangel district, rowed by women; largest room of all is estimated to be 600 feet long, 300 a camel that carries the mail on his back in the deserts feet wide and 100 feet high. The walls and floors of of the southeast; a mail sled drawn by reindeer as in all the rooms and passageways are composed of (Continued on page 182.)

crystals. What digging and blasting has been done only serves to bring more of this crystalline mass to view, or to break through into new apartments, or to open pockets like huge geodes.

The actual extent of the great cavern is unknown. Mr. Allabough assured me that about one-third of it had been accurately surveyed by chain, compass and level with reference to its being possibly lighted by electricity before long. This work was done by Mr. George S. Hopkins, United States mining engineer, of Deadwood, by whom a map was also prepared, which for prudential reasons has not been published, although I had the privilege of inspecting it. The total length of measured passageways approximates twenty miles. This seems to justify the statement that the whole caveway, as far as explored, is from forty to fifty miles long. There are eight different levels, or galleries, in the cave. The upper ones are extremely dry, the lower ones damp, and the lowest of all are so very wet at all seasons as to be styled "the rainy rooms." The owners are satisfied, however, that drainage level has not yet been reached. There are numerous pools, and three running streams, one of which has a waterfall sixty feet high-not a plunging fall, but a cascade flowing down a steep incline of travertine.

The formation in which this remarkable excavation is made is the corniferous limestone, judging from the Underneath this floral wealth extends a marvelous fossils displayed. It is supposed to owe its origin to a small stream named Elk Creek, which sinks at a point seven miles above, and emerges again about four miles below, thus having eleven miles of subterranean flow. This theory gets confirmation from the fact that, in digging for the railroad along the banks of Elk Creek, crystal masses and pockets of dog-tooth spar were found like that to be seen in the cavern. Some of the specimens taken out were very fine, individual crystals of dog-tooth spar exceeding eight inches in length and of remarkable purity of material. The station of the Chicago and Northwestern Railroad being vertically 413 feet below the cave entrance, the theory given above would indicate a corresponding depth of the The idea of rock work under the dome originated cave. And this is not incredible, for at places the hills leries already explored.

> The surrounding region is densely wooded and highly picturesque. No interior vegetation of any kind has yet been noticed, nor any true cave fauna; nor have any Indian relics been found. Heaps of minute bones abound here and there, seemingly the remains of rats, mice, bats and other intruders from without. The temperature is cool, being said to be as low as 45° Fahr., which is hardly credible, as that would be 10° lower than the ascertained temperature of other great American caverns.

> By whatever name this new and splendid cavern is to be known, it certainly combines the grandeur of the Mammoth Cave with the loveliness of Luray, besides having peculiar features of its own. It is worthy to be counted among the wonders of the world.

The total number of paid admissions for August was 3,515,493, and total number to date 10,000,906.

The Fair is wonderful to the wisest, and when you see the farmer just come out of the woods, with his large lunch box, strapped up with a piece of a harness, examining a string of sleigh bells or a patent cow bell, you might hear him remark: "What the thunder is that thing for ?" for he was positive he knew something about cow bells. He cares nothing about style; he left his paper collar at home, and brought his long whiskers. He also wears the squeaky boots and carries you might see him standing in front of the Electrical of iron in a pail of water and it immediately turns red even his whiskers seem to absorb wonder, as you hear him say "Gosh !"

The Russian Government Pedagogic Museum dis-

ay's

La., recently, 191,323 feet of lumber were cut in eleven brilliant crystal masses already described, varying in hours. This is said to be the largest amount of lumber 'size from mere marbles to blocks weighing 600 pounds. ever turned out of a single circular sawmill in that, This unique assemblage was the result of repeated exnumber of hours. The saw was driven by a Corliss en- periments, as no skilled labor in the line of cave makgine, having a cylinder 22 inches in diameter by a 40 ing was to be had. Lighted as it constantly is by a inch stroke, the drive wheel being 20 feet in diameter profusion of electric lamps, the place is certainly an atwith a 30 inch face, the engine making 65 revolutions tractive and instructive feature of the Fair. per minute, with an average steam pressure of 100 pounds. The mill was provided with a steam log turner and a twin feed engine, 14×24 , and steam log trippers. The saw mandrel was 4 inches in diameter, with water-cooled journal boxes. The saw was 54 inches in generated by sawdust taken direct from the saw.

The credit of this feat is largely due to Mr. W. N. Elliott, saw filer, and Mr. Ed. Bullock, sawyer.

We are indebted for these facts to Mr. W. S. Whitman, chief engineer of the mill.