ble. The porous plates are made by maintaining melted lead almost at the point of crystallization and then casting from the semi-crystalline mass blocks forming what may be called "lead sponge." This lead sponge, when sawed into plates of suitable size, forms the most reliable material that has been used in the manufacture of accumulator plates. The plates thus made and prepared are free from most of the defects which are inherent in most paste plates. The lead salts forming the active material, instead of being artificially made and mechanically applied to the plates in the form of paste, are formed chemically as a firmly adherent deposit on the greatly extended surface of the lead crystals and are therefore dispersed throughout the spongy material. When thus formed, it is impossible for the active material to become detached or fall off to any serious degree.

It has been found from actual practice that these plates are not injured by long use, that they have a great capacity of high or low discharge rates, and that they are entirely free from buckling.

The plates now in use at the Edison station have been doing continuous service for more than eight months, having been started in the middle of January. During this time only 21 out of 7,000 plates have had to be replaced.

The watt efficiency of these accumulators is over 86 per cent and their ampere efficiency 95 to 96 per cent. These efficiencies are accurately calculated at the terminals of the battery connections on the switch board.

These cells are the largest in use in this country. We understand that the Crompton-Howell Company make a still larger cell, comprising 154 plates and having a capacity of 3,000 ampere hours.

The battery room at the 53d Street station is located on the top floor, the electrical communications are made through the switch board at the gallery, and the attendant having charge of the gallery manipulates the switches for charging and discharging the accumulators. The switch board is provided with an automatic accumulator switch, which is used with the dynamo charging the accumulators. It is arranged to break the circuit so as to prevent reversal of the current, if from any cause the E.M.F. of the dynamo falls below the prescribed limit.

Besides being provided with the usual well known indicating and recording instruments the switch board is provided with an instrument called the electric clock, the index of which turns in one direction while the accumulator is being charged and in the opposite direction while it is being discharged, thus always indicating the amount of the charge.

We are indebted to Mr. William L. Pakenham, the representative of the Crompton-Howell Company in this country, for information in regard to this new installation.

The Physical Strain Involved in High Speeds.

The exaction that modern railroad speed makes on the physical stamina of railroad men is demonstrated in the fact that seven engineers are required to take the Chicago flier out and seven back, says the *Boston Transcript*. The running time between New York and Chicago is twenty hours and the average speed is forty-eight miles an hour. Each engineer and engine runs three hours. Machine and man return with a slow train to their starting point to relieve the strain on both. Then the engineer is given forty hours' rest before he goes on the flier again. This rest is absolute, no work of any kind being required of the engineer. Though the average speed is forty-eight miles an hour, the locomotive must at some points be driven at sixty or more. The physical strain on the men in the cab at those bursts of speed is something terrible. The engineer has fifty things to look out for, and is being shaken and swayed all the time. The fireman is constantly feeding the insatiate furnace. On the run of the Empire State express three tons of coal are shoveled from the tender into the furnace between New York and Albany. It is not wonderful that the engineers of this train are given alternate days for rest and recuperation. Fast travel not only wears out rails and machines, but human creatures' lives.

A Museum of Natural History for Chicago.

The Art Palace of the Columbian Exposition will be retained as a Museum of Natural History. A process has recently been discovered by means of which the staff covering may be made permanent by the application of a soluble glass paint. The proposed Columbian Museum was made possible by a gift of one million dollars made by Marshall Field, the millionaire merchant. There is material enough in the Fair grounds to start one of the most complete museums ever organized. The ethnological department under Prof. Putnam obtained $200,000 worth of specimens gathered in all parts of the world. This magnificent collection will be presented to the museum and will form the nucleus around which the later additions will be placed. Most of the rare woods in the Forestry building will also be presented to the museum. The new museum will be within easy walking distance of the University of Chicago.

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DEATH BY GAS ASPHYXIATION AND POISONING.

We recently had a case of death from gas asphyxiation brought to our attention by a letter describing the occurrence. The writer first tells of the features of the occurrence. In Corning, Kansas, a well was being bored. The depth was about seventy feet. A rock in the bottom interfered with the operation of the tools. A man undertook to descend the rope. When about fifteen feet from the surface, he dropped from the rope. His companion workman at once started to rescue him and descended the well, naturally supposing that his companion's grasp had failed him. When the second workman reached about the same point, he also fell. Both were ultimately removed dead. A lantern was lowered into the well and was extinguished, also at the fifteen-foot level. The people of the vicinity attributed the accident to fire damp. The real cause was choke damp or carbonic acid gas. Under the circumstances it could not have been the other gas. Our correspondent writes, "Will the SCIENTIFIC AMERICAN explain what the so-called fire damp is and what causes it?"

As we just stated, it was not fire damp. The cause of the presence of carbonic acid gas in the well cannot be stated with certainty. We know that many mineral waters are highly charged with it, so that it may be looked for in any deep excavation. It may have been liberated from some subterranean source of mineral water.

The gas in question is nearly twice as heavy as air. It can be poured from one vessel into another almost like water. Being a gas, it must constantly diffuse through air and air through it when they come together, yet it will lie in an open receptacle for a long time before entirely leaving it. An animal immersed in it dies of suffocation, with possibly a superadded toxic or poisoning action upon the system. A lighted lamp or candle lowered into it is extinguished as if dropped into water. The gas is without odor, so that one may be overcome without the least forewarning.

On November 3, 1886, a remarkable accident in a tunnel at Perkasie, Pa., occurred which illustrates the fearful suddenness of the attack. Some fifty men were working in the interior of a railroad tunnel. A freight engine had become "stalled" near them. A fan blower was set to work to bring up the pressure. The engine then started, and it is supposed acted like a piston, forcing the gas before it, and as the gas was driven on, it reached the place where the men were working; they at once became immersed in the deadly atmosphere. They fell as if dead, some forty of them becoming totally insensible. One man, only partially overcome, succeeded in making his way to the mouth of the tunnel and reported the occurrence. A flat car was at once run in, and was loaded with the bodies, as if with so many logs. All were supposed to be dead, but with the exception of one who had fallen into a pool of water, they eventually recovered. As a curiosity and as illustrating the suddenness of the insensibility, the fact that one man was found hanging head downward to a ladder may be cited.

Carbonic acid gas is to be looked for in confined places, and in beer vats, wells, and similar impervious receptacles. Before entering a suspected locality, a test should be applied by lowering a candle or lamp into the place. If this reaches the bottom unextinguished and burns with undiminished intensity, the vessel or well can be entered without apprehension. A diminished intensity of light indicates danger; total extinction proves that the atmosphere is fatal. To remove the gas strong ventilation may be adopted, but as this is not always practicable, the chemical method may be often used. A quantity of lime is slaked, and then is stirred with water so as to produce milk of lime. This is poured down the sides of the place, is thrown in fine spray down it, and is in any way distributed as thoroughly as possible, so as to act upon the gas. The process is continued until the lamp or candle test shows pure air. If all the lime were effective, one pound would combine with and remove about five cubic feet of carbonic acid gas. The capacity of the space to be freed of gas may be calculated and some basis reached as to the quantity of lime required. Owing to waste, several times the calculated quantity will be generally needed. It is essential that the lime should be freshly slaked.

The action of the lime upon the gas is one of combination. The carbonic acid gas enters into chemical combination with the lime, producing calcium carbonate or chalk. Thus the poison is effectually removed. Air acts by simply washing it out mechanically. The action of lime is altogether chemical.

The operation of air in displacing the gas is available in resuscitating men asphyxiated as spoken of above. In a recent number of this journal a pump for producing artificial respiration and injecting fresh air into the lungs was described. In gas poisoning or asphyxiation such an appliance may be the means of bringing about a speedy return to consciousness and life. The great object is to wash out the gas from the lungs, and this can be thoroughly effected by artificial respiration.

Too great care cannot be exercised in these cases. In many instances several men have been overcome

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in succession, one or more going into the well or vat to rescue a companion whose sudden fall may not have been attributed to carbonic acid gas. It is also a mistake to suppose that the gas can be endured by one anticipating its occurrence, or that escape is certain for such a one. The loss of consciousness comes on so suddenly as to make useless any knowledge or forewarning of the presence of the gas.

The Exposition Medals and Awards.

The design for the medal has been submitted to the Secretary of the Treasury by Aug. St. Gaudens. The medal will be of bronze, three and one-half inches in diameter. On the obverse is a relief figure of Columbus and on the reverse the figure representing Youth. Director Preston, of the mint, thinks it will take three months to finish the work. This will disappoint many firms, who want a copy of it to ornament calendars for 1894.

John Boyd Thacher says the diplomas will be ready to issue in six months; the medals at the same time. The wording of the judge will only be changed as required by the rules of grammar and punctuation and for brevity. The matter to be placed on each diploma is not to exceed 300 words. Mr. Thacher says: "I will publish the names of award winners by classes as soon as possible, probably beginning within two months. The exhibitors whose names are thus published can obtain by letter or otherwise from this department the wording of their awards, although they will not be apt to receive their diplomas until several months later. The wording will be sent by mail to exhibitors or given to some person duly authorized by the exhibitors to apply in person."

Merits of Steam Boilers Used at the Exposition.

The Babcock & Wilcox Boiler Company have published a statement in which they say: "We were informed that it was the purpose of the jury at the Fair to make awards on boilers based entirely upon the written statements of the exhibitors of boilers, without tests or any personal knowledge in the possession of said jury concerning the comparative construction, operation, economy or durability of said boilers. We were asked to make such a statement, and were informed that all other exhibitors of boilers had been requested to make a like statement of their claims for the consideration of the jury of awards. Believing that an award based on such insufficient knowledge on the part of said jury could be of no practical value, and notwithstanding the expense incurred by this company in making an exhibit, we respectfully declined to make any such written statement for the purpose of receiving an award upon our boilers."

Dutch Belted Cattle for Mexico.

Mr. H. B. Richards, who received the first premium for Dutch belted cattle at the Chicago Exposition, informs us that the animal which was illustrated in the SCIENTIFIC AMERICAN a fortnight ago was, with twelve others of the same breed, sold to Senor Jos. De Teresa, a son-in-law of President Diaz, and were shipped to the city of Mexico direct from Chicago. A few days ago the same gentleman visited Mr. Richards' farm, at Easton, Pa., and selected fourteen others out of his herd, making a total of twenty-seven head of Dutch belted stock shipped to Mexico as the result of exhibiting at the Fair.

Things to Hit with a Hoe.

We credited, in our issue of October 14, the unique World's Fair Exhibit of weeds, growing over an old rail fence and labeled, "Things to hit with a hoe," to the Horticultural department. The exhibit was really prepared and entered by the Orange Judd Farmer Company, of Chicago, who spared no expense or trouble to make it a success. The exhibit has received a prize, which was certainly merited by the oddity of the design.

THE Bridgeport Wood Finishing Company has been awarded a medal and four diplomas at the Exposition for their Wheeler Patent Wood Filler and Breinig's Lithogen Silicate Paint. The Connecticut building was painted entirely on the outside with Breinig's Lithogen Silicate Paint. The interior woodwork of the West Virginia and Missouri State buildings was entirely filled with Wheeler's Patent Wood Filler, as were other fine displays of interior woodwork, and all this was in pleasing contrast with the many fine displays of hard woods finished, and on which the varnish has shrunk and pitted. The woods in the Forestry department which attracted so much attention were also filled with Wheeler's Patent Wood Filler.

THE Ingersoll-Sergeant Drill Company has received from the World's Fair judges notice of award of first prize for compound duplex Corliss air compressors, straight line air compressors, Ingersoll-Sergeant rock drills, coal cutter, stone channeling machine, bar channeler, electric battery, and other devices and improvements in machinery for mining, tunneling and quarrying.

Common Sense on Chinese and Other Immigration.

Dr. S. L. Baldwin, in a recent number of the *Independent*, makes the following cogent and sensible remarks:

The bill originally brought in by Mr. Geary from the Committee on Foreign Affairs, February 18, 1892, was properly entitled "A bill to absolutely prohibit the coming of Chinese persons into the United States." It is well known that he grafted as many of the features contained in his original bill as he could upon the bill which was finally passed, and the object of which, whatever professions are made, is to exclude as far as possible Chinese laborers from the United States. That the registration feature of the bill was intended to be oppressive to the Chinese, and was an insult to the Chinese nation in its very terms, was sufficiently manifested at the time of the passage of the bill in a speech by the Hon. R. R. Hitt, who said:

"It compels every man in this country who is a Chinese laborer to go to the Collector of Internal Revenue, prove his title to remain in the country, and apply for a certificate, a pass, a sort of ticket of leave. To obtain it he must himself prove his whole case. He is assumed to be not entitled to it. The burden of proof is all upon him. The rule of all free countries and all civil laws is reversed. He must prove residence here through a long series of years, back to the date of enactment of the whole series of stringent laws, since the treaty of 1880. He must find the witnesses in different places where he may have worked or resided, and one witness must be a white man.

"Everyone can understand how difficult, how almost impossible, it is to make out such a long and costly line of proof, especially to a laboring man. This he must prove affirmatively, or he cannot get a certificate. If he is not granted a certificate--and we can readily see how officers on the Pacific coast would be glad to refuse it—he is arrested, imprisoned six months or less, and then expelled from the country. If he obtain it, he must carry it around with him, or be liable, instantly and always, to arrest, imprisonment and deportation, like a convict. It is proposed to have a hundred thousand, or some gentlemen assert two hundred thousand, men in our country, ticketed, tagged, almost branded—the old slavery days returned. Never before in a free country was there such a system of tagging a man like a dog, to be caught by the police, and examined, and if his tag or collar is not all right, taken to the pound or drowned or shot. Never before was it applied by a free people to a human being, with the exception (which we can never refer to with pride) of the sad days of slavery, and the ticket of leave given to convicts allowed to go out a while from the penitentiary, and the convicts at Botany Bay, who had a ticket of leave. But here are more than a hundred thousand men, innocent of offense, who must obtain this certificate, this ticket of leave, and carry it around with them in a free country."

The plea made on behalf of this legislation is that it is necessary in order to prevent the illegal incoming of large numbers of Chinese; but the absurdity of this plea has been demonstrated every time a census has been taken. Every census of the United States shows that there has been no such increase in the number of Chinese in this country as there must have been if these pleas had any truth in them whatever. The fact is that the number of Chinese smuggled into the United States is so small as to be of no account in a great country like this. Besides, back of all this is the fact that there never has been any sufficient reason whatever for this legislation from the beginning until now. We have heard, over and over again, of the millions of Chinese laborers that would be pouring in upon us, of the great damage to the laboring interests of the country, especially on the Pacific coast, and much other talk of the sort. The statistics, however, show that there have never been more than one hundred and twenty thousand Chinese in the country. When the first restrictive act was passed, there had been an increase of only about ten thousand in the ten years preceding, and nearly as many were returning to China as were arriving by the steamers at that time. During the whole period there never has been any such thing as cheap labor on the Pacific coast; and during the whole time higher rates of labor have been paid on the Pacific coast than elsewhere in the country. It is pitiful to see a great nation like the United States scared over a hundred thousand Chinese, while it takes no alarm over the many hundreds of thousands of law-defying immigrants from Europe. It is time that a little common sense statemanship should be used in regard to this whole matter of immigration. It would be perfectly feasible to dismiss the Chinese question altogether by passing a just and uniform law, applicable to all people. There are various measures that might be taken for the proper and healthful restriction of immigration. I will suggest some of these:

First, let the number of immigrants which any vessel may bring to this country be strictly limited—say to one hundred, or even to fifty—for a time, if this be deemed advisable.

Second, require of every intending immigrant that he shall go to the American consul of the port from which he proposes to take his departure, and produce evidence of his good moral character, and his purpose to become a law-abiding resident of the United States, and let no immigrant be admitted from any country without a certificate of these facts from the United States consul of the port from which he sails.

Third, if it be deemed necessary, let a head tax be imposed upon every immigrant, and let it be of a sufficient amount to give some surety that the person shall be a self-supporting inhabitant of this country.

If along all these lines a general law of immigration were adopted, every special enactment with regard to the Chinese might at once be blotted from the statutes, and further disgrace and perfidy in the violation of treaties be prevented. The Chinese would not complain of any law which was thus universally applicable. They have a just right to complain of all laws that single them out for special oppressive legislation which is not applied to the people of any other country. There certainly ought to be in both Houses of Congress some leaders who will bring the nation to a decision in this matter which common sense and humanity can indorse.

Combined Toning and Fixing Bath.

Gaedicke states that a carefully washed collodio-chloride print was dusted in one place with pure silver sulphide and in another place with precipitated sulphur, and the whole exposed to the action of air and light. The silver sulphide had no action on the image, while the sulphur ate the image right away. The two ingredients of the combined bath which are hurtful are citric acid and alum; sulphocyanides are not so easily decomposed as hypo., and as they form permanent gold salts they may be used. Lead in a combined bath has merely a physical and not a chemical action; causing rapid precipitation of the chloride of silver, they improve the tones without entering into the image. Gaedicke strongly recommends boric acid and the following particular formula:

Distilled water	1,000	parts.
Sodium hyposulphite	200	"
Boric acid	30	"
Lead nitrate (dissolved in water)	15	"
Ammonium sulphocyanide	20	"
Sol. chloride of gold (1 per cent)	60	"

Black sulphide of lead is precipitated in twenty-four hours, and the bath is then ready for use. The clear solution is absolutely without smell, and by continued use only innocuous silver sulphide is deposited. When fresh, it tones very quickly, and it is advisable to use some of the bath up and add fresh water to it. It is important that the paper, which is always acid, should be well washed and neutralized; the prints should be freed from soluble silver salts, then placed in 1 per cent solution of ammonia. Care must be taken in washing several prints that the whole of the ammonia is not neutralized; there should always be a faint smell. Sodium carbonate may be used in moderation for the same purpose; the prints can then be washed twice in water and then toned. The prints should be taken out of the bath while still rather redder than desirable, because they turn color in drying. —*Photo-Wochenbl.*

A Great French Telescope.

A great refractor is just finished and placed in position for Dr. Janssen at Meudon. It is a combined photographic and visual telescope. The two lenses were made by the celebrated Henry Brothers, of the Paris Observatory. The mounting is by Gauthier, of Paris. Both lenses will be mounted in the same tube, which is *square* and of steel. The visual objective is 82 cm. (32·3 English inches) in diameter, while the photographic objective is 63 cm. (24·8 English inches) diameter. Both lenses are of the same focal length, 17 meters (669 English inches). The large objective will be the guiding part of the instrument when used for photography. This great telescope is housed in the ruins of the old royal palace, a part of the ruins serving as the tower for the great dome, which dome is 20 meters (66 English feet) in diameter and weighs some 60 or 80 tons. The dome is to be moved by a gas engine of 12 horse power. The observing chair is attached to the dome and moves with it. All the fine circles are to be read from the eye end by means of electric lights, the electricity for which is generated by an 8 horse power engine half a mile distant, in what was formerly the royal stables.

New Process for Enameling.

Fletcher, Russell & Co., London, have introduced a new process to supersede the use of Berlin black and black lead for protecting cast iron. The casting is coated with a film of enamel, which is so thin that even the finest details on the metal are preserved. This enamel is said to be absolutely proof against rust, and preserves its qualities at any temperature up to a bright red heat. All colors are obtainable, including gold and silver, bright or dull, and as many as are wished can be produced on one casting. The process is said to offer great facilities for decorative work of all kinds.

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