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SCIENTIFIC AMERICAN SUPPLEMENT

No. 864.

For the Week Ending July 23, 1892.

Price 10 cents. For sale by all newsdealers.

INVENTORS AT THE WORLD'S FAIR.

The invitation to inventors, by the Commissioner of Patents, published below, is taken from the *Official Gazette*, and is self-explanatory.

This invitation should be generally accepted by inventors, as it enables them to contribute to the success of the fair, and at the same time gives them an opportunity to advertise such as occurs but once in a lifetime. Many inventors cannot afford to make individual exhibits at the fair, but this arrangement for exhibiting models gives them practically the same chance to show their inventions that they would have if exhibiting individually, as each model will be labeled and catalogued. The fair will be visited by millions of people capable of taking in the good points of an invention, and a nice working model can scarcely fail to attract the attention of possible buyers. If the patent for the invention has expired, the exhibitor will perhaps have to be satisfied with the knowledge that he has contributed to the success of the world's greatest fair and with whatever fame may be derived from the exhibit; but if the patent is unexpired, the splendid advertisement will quite likely result in the sale of the patent or an increased demand for the invention. It will be noticed that the exhibit is under the auspices of the Patent Office.

"*To the inventors and manufacturers of the United States:*

"It is the intention of the Patent Office to make at the World's Columbian Exposition at Chicago, in 1893, an exhibit which will show that great advance in the several arts which is due, in large measure, to the encouragement and support afforded by our patent system. This exhibit is to consist of models of patented inventions, which will be carefully selected, to show as far as is possible the inception of each art, the stages through which the art has advanced, and the final development reached at the present time. This display of typical inventions, embodied in concrete form and properly arranged, will, it is believed, constitute a grand historical exhibit of the progress of the useful arts and one which will be of great interest not only to inventors and manufacturers, but to the public generally.

"The Office collection of models has been seriously impaired by fire, and is further incomplete by reason of the fact that models have not generally been required or received during the last ten years. The Office is not, therefore, in possession of the models of many valuable inventions which might properly be included in such an exhibit, and without which, indeed, the exhibit would be incomplete. The limited appropriation for this exhibit will not permit the Office to make such models. An urgent appeal is therefore made to all inventors and manufacturers to come to the assistance of the Office in this matter, either by loans of models already built or by the construction of such models not in the possession of the Office as should properly be placed in such a collection. Of course, where models are loaned to the Office all proper credit will be given both in labels and catalogues to the parties by whom the loans are made, and such disposition will be made of the models after the close of the exhibit as the owners shall direct. Many inventors and manufacturers have already indicated a willingness to co-operate with the Office in this matter, and it is confidently expected that such a response will be made to this general appeal as will assure the unparalleled success of this attempt to graphically and concretely show the development of American invention. W. E. SIMONDS, Commissioner."

DEFECTIVE BOILERS AND INCOMPETENT ENGINEERS.

The official quarterly report of William S. Powers, Superintendent of Steam Boilers, to Police Commissioner Hayden, of Brooklyn, N. Y., shows that from April 1 to June 30, 667 steam boilers were examined in that city, of which 11 were condemned, removed, and good boilers substituted. It states further that 612 engineers were examined, and of these 51 found incompetent. The report does not state that the incompetent engineers were removed, and able ones substituted; we trust they were, but we cannot help calling attention to the fact that 11 boilers out of 667 is a ratio of only 16 bad boilers per thousand, while 51 incompetent engineers out of 612 is a ratio of 33 incompetent engineers out of a thousand, so that the number of incompetent engineers is more than five times larger than the number of defective boilers.

The comparison of these figures shows that the boiler makers take five times more care in the manufacture and repair of their boilers than do the engineers in trying to learn their trade, who, when once having obtained employment, need looking after, as well as the boilers, in fact, five times more so, according to discovered ratio of capability for duty. In addition to this it must be remembered that boilers, being inanimate objects, are in themselves not subject to blunders, to carelessness, to strikes nor to drunkenness, in fact, possess in this regard reliability equivalent to infallibility compared with the weaknesses and incidental shortcomings of human beings, of which the futility has become proverbial.

If this quarterly report is the average of every three months for the whole year, then there are 44 worthless boilers condemned per year, while the number of engineers proved to be incompetent for the performance of their duties is not less than 482, to which life and property are intrusted. It proves, also, that in regard to the causes of the many boiler explosions reported in the newspapers from time to time, at least *five* are due to incompetent engineers, against *one* by incompetence of the boiler itself, of which the practical strength is only equal to the weakest part thereof.

Matters will only grow better in this regard when owners and managers of steam power come to the conviction that it is necessary to place the compensation of steam engineers high enough to make it an object for men of a better class, that means of men having received a more liberal education, than is the case now in the great majority of instances.

We mean by a liberal education such a one as is not confined to understanding the manual treatment of a steam engine in making it go, but who understand the scientific principles which lie at the basis of their calling, such as the laws of expansion of steam at different temperatures, of latent heat, of capacity for heat or specific heat, of combustion and draught, of units of heat, of the comparative value and economy of fuel, the laws of air pressure and the vacuum, etc.

A striking illustration was offered in this respect several years ago, in the explosion of the Staten Island ferryboat Westfield, 1871, while she was lying in her slip. She was crowded with Sunday excursionists, when, a moment before starting, her very large boiler exploded, lifting up her deck, with disastrous result, many persons being killed. At the inquest it was found that the engineer, who was a colored, illiterate man, advanced from being a stoker to the responsible position he occupied, was entirely responsible for the appalling loss of life. The examination at the inquest revealed the fact that he had not the least idea of the air pressure or a vacuum, of which he had never heard, that he supposed that when he kept the boiler entirely full of water it was all right, etc.

Carpet Electricity.

The exact similarity in conditions attending the repetition of experiments is a great element of success. One should be very careful before coming to a conclusion that his premises are correct. A striking example of this was recently presented to my notice.

A dentist came into my laboratory the other day and said:

"See here, I can't, for the life of me, understand what is the matter with me. All my patients complain that when I first put an instrument into their mouths it pains them fearfully. I've thought it all over, and have come to the conclusion that my instruments must be magnetized or bewitched, or I am. I've brought over some of them to have them examined. Just let me show you what I mean. Have you got a sensitive tooth?"

I pointed to a molar then under process of repair. He unwrapped some of his instruments, and selecting one, gently inserted it into my open mouth and touched the filling in my tooth. All I felt was the instrument touching the filling. I experienced no pain.

"Good heavens, man!" said he, "what nerve you have. What fortitude. What—"

"Nonsense," I exclaimed, "I didn't feel anything."

"Well," said he, looking puzzled, "you are the first man that hasn't yelled when I touched his tooth since I moved into my new office. I can't understand it."

I told him I would come around to his office in the afternoon and see if I could find out what was the matter.

Later in the day I called to see him.

"Well, have you got it yet?" he asked, as he walked across the carpet and shook hands with me.

"I hadn't one second ago," I answered, "but I have now. Did you notice what happened when you shook hands with me?"

"Nothing but the electricity."

"That's just it. Every time you walk across the floor to your cabinet for an instrument you get a small charge of electricity in your body, and naturally, as soon as you touch the sensitive tooth of the patient, the delicate nerve received the charge through your instrument—hence the pain. The reason why I felt no shock in the laboratory was simply because there was no carpet for you to rub your feet on before you touched my tooth."

Here we see that merely the want of a carpet on the floor altered entirely the conditions for a successful repetition of an experiment that had apparently no connection with the presence of a carpet.—*Julian A. Moses, Electrical Review.*

Cart Horse Parade in Reg Park

The seventh annual parade of the Cart Horse Parade Society, London, was held recently in Regent's Park. The entries were larger this year than ever before. Five hundred and forty-two horses, including 384 singles, 56 pairs, 10 "unicorn" teams, and 4 teams of four, were present.

The Great Tin Mines of Dakota.

During the last four years a small company of gentlemen have privately contributed means to secure and occupy all the available claims for tin mining in the vicinity of Harney Peak, Dakota. They have studiously avoided publicity in the matter until their purchases, which have been very extensive, were complete. They have been greatly aided by the outcry and claptrap of the newspapers to the effect that there were no tin mines in this country worth having. Meantime they have gone ahead with their explorations and searches, and their efforts have been crowned with success. Many rich claims have been secured. A large company has been financed. Some idea of the magnitude of this property and the abundance of the metal may be gathered from the following report of an interview with one of the officers of the company given recently in the New York *Press*.

Lord Thurlow, of London, who was paymaster-general in Gladstone's last cabinet, sailed June 13 on the City of New York. He has recently returned from a visit to the tin mine properties in South Dakota, where the Harney Peak Consolidated Tin Mining and Milling Company, with a capital of $15,000,000, of which he is an officer, owns 1,100 claims.

"This country," said Lord Thurlow, "will not need to import any tin two years hence, for our mines will produce enough tin to last for centuries. The production will save $75,000,000 a year, which this country is paying for tin plate. This enormous sum will go into the hands of the people of this country.

"The company, of which I am the chairman, and in which New York or American capitalists are equally interested, has already built two of the largest and most thoroughly equipped mills in the world. Each has a capacity to produce 500 tons of tin a day, and this will be increased to 3,000 tons daily should necessity demand it.

"Two or three other mills of similar proportions have been planned. We expect to begin to work the two mills already constructed by October 1, and to put tin on the market in commercial quantities. I have inspected tin-mining properties in various countries, but I never yet saw such resources as I found in Dakota."

The Flame of Burning Nitrogen.

BY W. CROOKES, F.R.S.

Nitrogen is a combustible gas; that is to say, a mixture of nitrogen and oxygen (atmospheric air) will under certain conditions burn with a flame, and production of nitrous and nitric acids. The reason why, when once nitrogen is set on fire, the flame does not spread throughout the whole atmosphere and deluge the world in a sea of nitric acid is that the igniting point of nitrogen is higher than the temperature produced by its combustion, and therefore the flame is not hot enough to set fire to the adjacent gas.

In the experiment shown at the *soirée* of the Royal Society on June 15, an electric current of 65 volts and 15 amperes, alternating 130 times a second, was passed through the primary of a large induction coil, when an arching flame, consisting chiefly of burning nitrogen, issued from each of the secondary poles, meeting at the center. When once started the poles can be drawn asunder till the flame bridges across 212 mm. When the terminals are more than 46 mm. apart, the flame will not strike across. When alight the flame is easily blown out by the breath, and it can then be relighted by a taper.

In the spectroscope the flame of nitrogen shows no lines, the spectrum being faint and continuous. The temperature is a little higher than that of a good blow pipe flame, easily melting fine platinum wire. The gases rising from a flame have a strong odor of nitrous acid, and when it is produced in a closed globe, the interior rapidly fills with red gases.

The flame produced by exciting an induction coil by means of an alternating current was first observed by Mr. Spottiswoode, F.R.S., who described it before the Royal Society in 1880. It has lately been exhibited on a magnificent scale at the Crystal Palace, by Messrs. Siemens Bros., and by Messrs. Swinburne & Co. It is not known, however, that any chemical explanation of the flame has before now been published.—*Chemical News.*

Effects of Lightning.

M. Boens gives an account in the Belgian medical *Bulletin* of two young women who were struck by lightning on July 27, 1891, at Nalinnes, Namur, during a violent storm. They were taken to the village doctor, who treated them continuously for two hours, when signs of returning life were seen, and at three o'clock next morning consciousness of both returned, one being soon well, but the other being left with a profound sciatica. Her tongue was also paralyzed for two months, but both eventually recovered. The moral which M. Boens justly emphasizes is that efforts to revive those struck by lightning should not too soon be given up, as continuous attempts to restore respiration during several hours may result in return of life.

The Turret Ship Miantonomoh.

The recent cruise of the United States steamer Miantonomoh to Annapolis, Md., and return, says the New York *Herald*, was a success in this, that it brought to light all the good and bad qualities of this type of vessel, and she will now serve as an object lesson in the construction of other ships of her class. One fact seems to have been clearly demonstrated to the thorough satisfaction of all on board, and that is that monitors should not be sent to sea, except so far as is necessary in going from one port to another.

There are two very good reasons for this statement—first, because of the absolute inability to fight her guns at sea, and second, because of the great discomfort and positive danger to the health of all on board.

It will be remembered from previous accounts of the ship that the muzzle of the guns when leveled are only about five feet above the water line. Now, if the ship were a steady platform, which simply rose and fell with the waves or swell, this would be all right, but such is not the case.

In an ordinary ground swell or moderate sea, such as was encountered going down along the coast, the ship rolled from 10 to 15 degrees, shipping a sea with every roll, which dashed completely over the turrets, and which would have wholly buried the muzzle of the guns if they had been trained level abeam or even at an elevation, filling the guns with water and thus preventing their being fired.

Another reason why the guns cannot be used at sea is that in order to fire them the turrets must be available, which is not the case under the present conditions.

Upon going to sea four heavy brass chocks are inserted between the turret and the deck around each turret. Then the apron over this space is screwed down tight and all the joints are calked and filled with paraffine and a wooden batten is nailed over all, thus effectually securing the turret both from revolving and from working from side to side. Besides this, heavy wooden port bucklers are put around the chase of the guns over the ports and the space between is thoroughly calked. All these things are absolutely necessary to prevent the berth deck from being flooded, and even they are not sufficient. A considerable length of time is necessary to remove these, and they must all be removed in order to use either the guns or the turrets.

The second reason why the ships of the monitor type should not be sent to sea—the discomfort of all hands—can scarcely be imagined unless it has been seen. Notwithstanding all the efforts that have been made to prevent the water from gaining access to the berth deck, sufficient water gets below to make every place damp or wet and leaves no place for the men to rest below.

Furthermore, all the hatches have to be closed and battened down immediately on leaving smooth water, and the heat from the engine and fire rooms raises the temperature of the turret chambers to from 90° to 100° Fah., making it almost impossible for any one to remain below. The artificial ventilation, although far superior to that on the old monitors, is not sufficient to carry off the hot air and supply its place with fresh cool air from above.

In the turret chambers themselves there are no exhaust ventilators, so that although fresh air is being constantly forced in, it soon becomes as heated as that already there. No one can remain on the spar deck while at sea, as every wave washes completely over the deck, several feet deep, breaking over the turrets and throwing the spray high over the forward bridge. Even while lying at anchor in Chesapeake Bay seas came aboard, washing over the high hatch combings and necessitating the closing of everything fore and aft. The only place left for the men to stay is the hurricane deck, which being small and the space largely filled up with chests, hatches, ventilators and the smokestack, is very crowded and uncomfortable when nearly 100 men get on it.

But the people of the engineer's force have a much harder time than the deck hands. The temperature of the engine room ranges from 120 to 135 degrees, while that of the fire room is generally about 145. The ventilation of the fire room is fair, while that of the engine room is almost nothing. The machinists and engineers have to stand on the hot iron platform above the engines in order to control the reversing gear and valves, and there is scarcely room enough above them to allow them to stand erect between the beams. After standing a four hour watch in such a place it is absolutely necessary for the men to have some place to go forrest and fresh air, but, as has been seen, this is very hard to find. Consequently a number of the men have been prostrated and utterly unable to continue their work.

No one questions the ability of the ship to go to sea as far as her seaworthiness is concerned, but it is certainly considered useless to subject every one on board to such discomforts, especially when she could never be of any service in a fight at sea.

A number of changes will be recommended which, if carried out, will greatly improve the comfort of all hands. Some of these will be to increase the ventilation by adding more blowers, by cutting a large hatch over the engine room and by putting in ventilators in different parts of the ship.

A Large Projectile Wrecks a Schooner.

The schooner Henry B. Tilton was recently wrecked off the United States Army Ordnance Proving Grounds, at Sandy Hook, by a 575 pound projectile, which went astray after leaving the muzzle of a 10-in. breech-loading rifled cannon. The projectile struck the vessel on the starboard counter, crashed through her longitudinally as if she were an eggshell, and before the crew realized that the craft had been struck, the water poured in through a great splintered hole in her port bow, where the shot had emerged. Her seams are wide open everywhere, and she now lies on her beam ends a wreck. All hands were saved. The wreck of this vessel presents a novel illustration of the terribly destructive force of the gun. She was sailing along at a distance of four miles from the shore when the shot struck her. The officers in charge of the gun express ignorance of the affair. They did not see any vessel in front of the gun at the time of firing, and how the shot could have traveled off sidewise to embowel an innocent sailing vessel is more than they can understand.

Population by Color, Sex, and General Nativity, 1890.

The distribution of population by color, sex, and general nativity in 1890, by States and Territories, and for the United States as a whole, is given in Census Bulletin No. 194.

The primary results of this first detailed count of population, according to the returns made under the eleventh census, are given as follows:

Aggregate population	62,622 250
Males	32,067,880
Females	30,554,370
Native born	53,372,703
Foreign born	9,249,547
White	54,983,890
Colored	7,638,360

Of the total population returned in 1890, 51·21 per cent are males and 48·79 per cent are females.

The very large excess of males in 1890 is readily accounted for by the greatly increased number of immigrants who have come to this country since 1880, over three-fifths of the entire number of immigrants being males.

Analyzing the results of the distribution of population according to native and foreign born, it is seen that 14·77 per cent of the population in 1890 are foreign born, as against 13·32 per cent in 1880, and 9·68 per cent in 1850. The native born in 1850 represented 90·32 per cent of the whole population, while in 1890 they represented 85·23 per cent.

The colored element of our population, including Chinese, Japanese, and civilized Indians, as well as persons of African descent, represents 12·20 per cent of the population in 1890, as against 15·69 per cent in 1850. The relatively decreased per cent of colored in 1870, as compared with 1860 and also with 1880, is due to the deficient census of 1870 in the Southern States.

An Alloy Resembling Gold.

This alloy, by the Menden Works, might be substituted for gold, not only because of its color, but also by reason of certain properties that it possesses. It remains unalterable, without any modification of its color, even after having been exposed for a long time to air containing ammoniacal or acid vapors. It can be rolled and worked like gold, and has the aspect of this metal without containing the least particle of it. This new alloy is also much less costly than those that are usually employed in place of the precious metals. It consists of copper and antimony in the proportion of about 100 to 6. It is prepared by adding the desired quantity of antimony to the copper melted and heated to a certain temperature. After the antimony is melted and intimately mixed with the copper, a little charcoal, magnesium, and calcspar is added to the crucible. This flux has the effect of causing the disappearance of a porous structure which the material would not lose without that, and of furnishing a very compact cast metal. The latter can then be rolled, beaten, hammer-hardened, and soldered, like gold, and, after being polished, it has the aspect of genuine gold, while its solidity is much greater than that of the latter.—*Moniteur Scientifique, from the Metallarbeiter.*

Height of Auroras.

Experiments made at the Royal Danish Academy have demonstrated approximately the height of the aurora borealis. M. Adam Paulsen, at Godthaab, by means of two theodolites situated four miles apart, found that different aurora displays varied from one to four miles in height. Experiments near Cape Farewell showed the height of different auroras to vary from one to ten miles. At Spitzenberg the range of height was from one-third to eighteen miles. In some of the earlier experiments in this direction the observers concluded that the height of auroras varied from 90 to 500 miles.