SCIENTIFIC AMERICAN

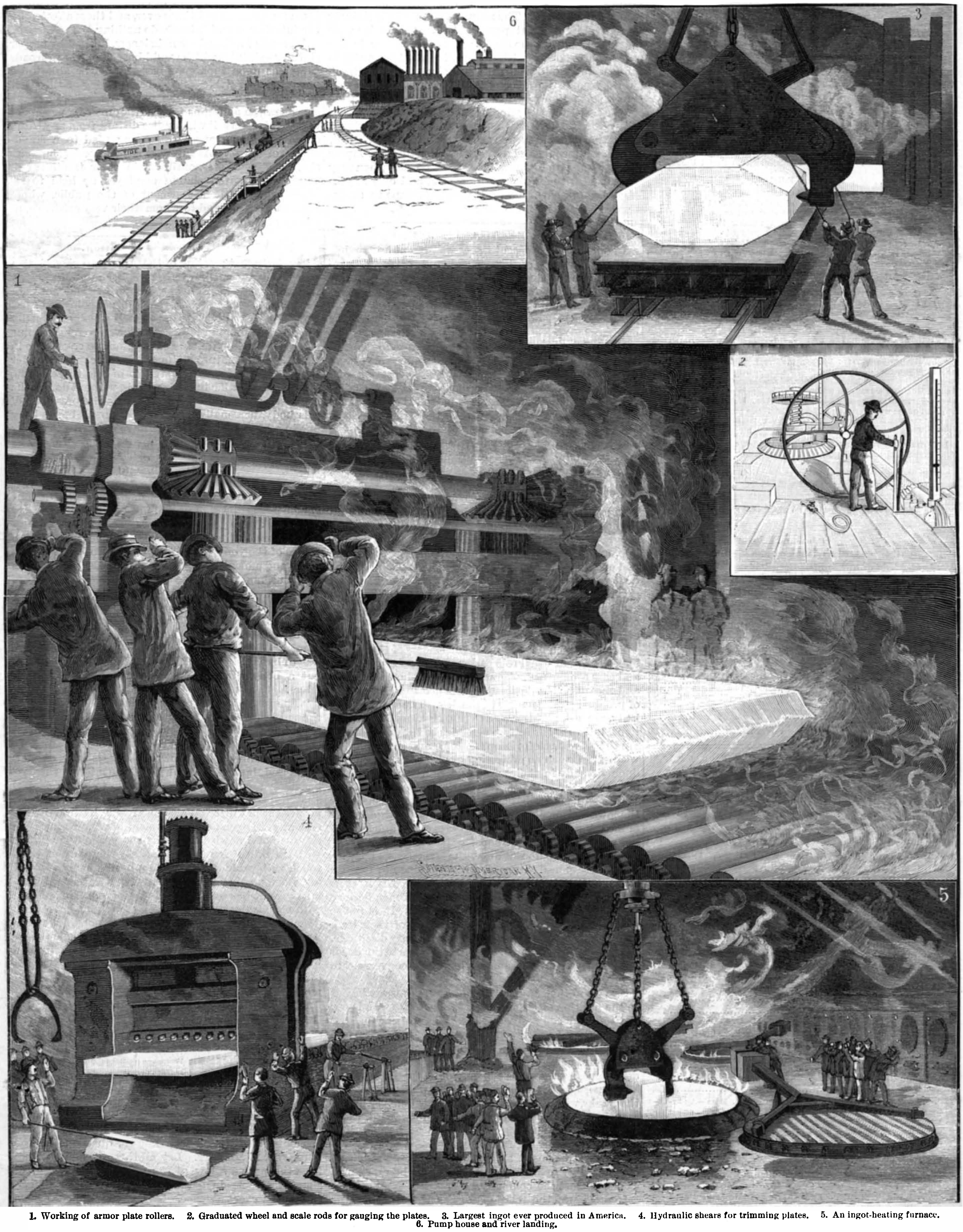
[Entered at the Post Office of New York, N. Y., as Second Class matter. Copyrighted, 1892, by Munn & Co.

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY, AND MANUFACTURES.

Vol. LXVII.—No. 9.]
ESTABLISHED 1845.

NEW YORK, AUGUST 27, 1892.

[$3.00 A YEAR.
WEEKLY.



1. Working of armor plate rollers. 2. Graduated wheel and scale rods for gauging the plates. 3. Largest ingot ever produced in America. 4. Hydraulic shears for trimming plates. 5. An ingot-heating furnace. 6. Pump house and river landing.

THE CARNEGIE WORKS, HOMESTEAD, PA.—ROLLING THE GREAT STEEL ARMOR PLATES.—[See page 132.]

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

NEW YORK, SATURDAY, AUGUST 27, 1892.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 869.

For the Week Ending August 27, 1892.

Price 10 cents. For sale by all newsdealers.

EXPLOSION IN A GREAT SEWER.

The main sewer of the drainage system of St. Louis, Mo., was destroyed July 26 by the explosion of vapor of petroleum and naphtha mixed with air, the vapors being derived from the drainage of oils set loose by the late fire at the oil works of the Waters-Pierce Oil Company. The high water in the river caused a blocking of the mouth of the sewer, and in consequence of the lighter gravity of the oil it was retained in the sewer, floating upon the water, thus generating the vapors and mixed air that was by some unknown cause ignited, with most disastrous effect, blowing up a building with about 1,000 feet of the street and the tracks in the Iron Mountain Railway yard. Six persons were killed and many injured. The narrow escapes are thrillingly described in the local papers. The water mains were broken, requiring the shutting off of the water in the entire neighborhood. The fact that oil naphtha and gasoline were escaping into the sewer since the fire in the oil works seems to have been known to the city authorities, but no attention was given to the dangerous condition of the sewer until the final catastrophe has stirred the city of St. Louis as to the responsibility of allowing a magazine of explosives to accumulate under their feet. When will people and authorities learn that the vapors of petroleum and its products are as powder when they are mixed with air in confined places, and only requiring a light or a match at any point of escape to evolve an earthquake?

THE RAILROAD STRIKES.

In our last and present issues we present our readers with some views of Homestead and of scenes connected with the steel works, where the recent strike of the steelworkers took place. Much comment was excited throughout the country by the events at Homestead, the attack on the Pinkerton watchmen, and the encampment of the State troops near the town. The actions of the strikers on this occasion rose to violence and murder, and those who to all appearance were peaceful workmen, when incited by the occasion of a strike appeared in the guise of open rioters. Claims were made that the works were patrolled and that the property therein was guarded by the strikers. Some of their leaders appeared as suppressors of violence. But the fact remains that violence was done, lives were lost, and the steel company was excluded from its own works by the strikers.

All this affected a private corporation, the Carnegie Steel Co. Within a few days a new strike has been inaugurated which affects what is to all intents and purposes a public service—the railroad. A strike is in progress among the employes in the car yards at Buffalo, and now it is an open question how far this strike will extend, and what damage it may inflict upon the transportation interests of the country. The railroad, upon which all depend for their most urgent and everyday interests, a factor which enters into the life of the humblest as well as of the richest, is the pivot of action.

The workmen have struck; the leaders of the unions appear in their usual role as deprecators of all violence; and cars are burned, obstacles are placed on the track, and threatened and executed violence and destruction of property are the order of the day. The strikers, as a body, are not, perhaps, active participators in these actions, but they are fully accessories to the crime. They are the witnesses of riotous actions, and stand idly by without so much as protesting or objecting to what is done virtually in their name. If railroad property is destroyed, the destruction is attributed to the strikers. It is possible or probable that it is directly executed by the lowest elements always to be found in large bodies of men, but in doing nothing to prevent it, and in making necessary military troops to be transported hundreds of miles to do riot duty, the strikers as a body assume a responsibility which will do much to deprive them of any semblance of public sympathy in their struggle. It seems as if when a body of men become strikers, they part with their manhood. It is not so much in the submission to the dictation of their leaders, for this has in it the elements of military discipline, but it is in being silent or active accessories to the deeds of violence which the same leaders find it convenient to deprecate.

Service in the employment of a railroad is analogous to the position of a soldier or sailor. The employer, the railroad company, is the ostensible one against whom the strike is directed, but the public is the real party attacked, and the actions of the railroad employes in their strikes have much of the aspect of a desertion in face of the enemy or of a mutiny at sea. When perishable freight is left to go to destruction on the tracks, when goods whose immediate delivery means a business success or failure are not forwarded, those responsible for it are enemies of the public. The desertion of a train, full of passengers, midway between two stations is an offense against the public, of incomparably greater extent than it is when reckoned as one against the company.

In some way the relations of the three parties, the public, the railroad, and its employes, should be so regulated that strikes would be impossible. It is an absolute certainty that in a strike riotous proceedings will be indulged in. But, irrespective of such aspect, the public has most explicit rights to the services of railroads. But for the franchises and extraordinary privileges awarded them, the employes would be engaged in other pursuits. Their very places are the creation of the public, and they are its servants. Their offenses and desertions from duty in face of the public requirements have a special element of ill. The law, in some way, should be invoked to make the punishment of strikers, active agents in destruction of property and in the impeding of traffic, very severe. As it now stands, the privilege is accorded them of interfering with the rights of citizens that outnumber them many thousand times over, and those affected by the interference with traffic do nothing.

A board of railroad commissioners, backed by proper statutes—statutes which would bear upon the railroads as well as upon their employes—should be able to do much to make strikes on railroads a thing of the past. The deserting soldier, the mutinous sailor, deserve consideration almost as fully as the crew of a passenger train that desert it when miles distant from any town, or who bring all transportation on a road to a standstill by open riot. As surely as the railroad companies should be held to responsibility in their treatment of employes, so surely should employes be held to responsibility in their treatment of the public, whose servants they are and to whom their very existence, as a body of employes, is due.

The American Association.

The forty-first meeting of the American Association for the Advancement of Science began at Rochester, N. Y., August 17. Professor Joseph Le Conte, of California, the president-elect, said in his opening remarks: There are three divisions of research which are worthy the efforts of human intellect. They are religion, fine art, and science—three sisters destined to co-operate in elevating the nature of man. What can be greater than to be reckoned as a student of the three? The pursuit of scientific investigation is, without doubt, the greatest honor of the time, and I, as the president of this body, personally have been honored beyond my due in receiving this office. I have met with the body since 1851. You remember the great names that were registered at these meetings. There we saw Dana, Guyot, Peirie, Agassiz, Hall, and many industrious men. But let us not cling to the past and honor it solely. We must not underestimate the present. The golden age is ahead of us and not behind us. The last time I met with you was in 1860. Then came the war and my removal to California. I lost the stimulating effects of the young men. We are apt to think that we teach and educate the young, my friends, but they react on us, and we educate only in proportion as we are educated. Last of all, let me say I will require your constant forbearance. The qualities that I possess do not permit me to preside at meetings of bodies. I have lived in the world of thought and not in the world of men. If this were a political meeting in which there was to be any strife I would have resigned immediately, but a body of scientific men are a law unto themselves.

"The Immediate Work in Chemical Science" was the subject of the address by Albert B. Prescott, the retiring president, who said, in part: The realm of chemical action, the world within the molecules of matter, the abode of chemical atoms, is indeed a new world and but little known. "The atomic theory" has more and more plainly appeared to be the central and vital truth of chemical science. As a working hypothesis it has directed abstruse research through difficult ways to open accomplishment in vivid reality. As a system of knowledge, it has more than kept pace with the rate of invention. As a philosophy, it is in touch with profound truth in physics, in the mineral kingdom, and in the functions of living bodies. As a language, it has been a necessity of man in dealing with chemical events. Something might have been done, no doubt, without it had it been possible to keep it out of the chemical mind. But the atomic theory has come to be more than facile language, more than lucid classification, more than working hypothesis, it is the definition of the known truth in the existence of matter.

The stimulating truth of the atomic constitution of the molecule, a great truth in elastic touch with all science, excites numerous hypotheses, which, however profitable they may be, are to be stoutly held at a distance from the truth itself. Such are the hypotheses of molecular aggregation into crystals and other mineral forms. Such are the biological theories molecules polymerizing into cells, and of vitality as a chemical property of the molecule. Such are the questions of the nature of atoms, and the genesis of the elements as they are now known, questions on the border of metaphysics. Let all these be held distinct from the primary law of the atomic constitution of simple molecules in gaseous bodies, an essential principle in an exact science. The chemist should have the comfortable assurance, every day, as he plies his balance of precision, that the atom-made molecules are there, in their several ratios of quantity, however many unsettled questions may lie around about them. Knowledge of molecular structure makes chemistry a science, nourishing to the reason, giving dominion over matter, for beneficence to life.

Studies of structure were never before so inviting. In this direction and in that especial opportunities appear. Moreover, the actual worker here and there breaks into unexpected paths of promise. Certainly the sugar group is preseuting to the chemist an open way from simple alcohols on through to the cell substances of the vegetable world. And nothing anywhere could be more suggestive than the extremely simple unions of nitrogen lately discovered. They are likely to elucidate linkings of this element in great classes of carbon compounds, all significant in general chemistry. Then certain comparative studies have new attractions. As halogens have been upon trial side by side with each other, so, for instance, silicon must be put through its paces with carbon, and phosphorus with nitrogen. Presently, also, the limits of molecular mass, in polymers and in unions with water, are to be nearer approached from the chemical side, as well as from the side of physics, in that attractive but perplexing border ground between affinity and the states of aggregation. . . . Various other branches of science are held back by the delay of chemistry. Many of the material resources of the world wait upon its progress. In the century just before us the demands upon the chemist are to be much greater than they have been. All the interests of life are calling for better chemical information. Men are wanting the truth. The biologist on the one hand and the geologist on the other are shaming us with interrogatories that ought to be answered. Philosophy lingers for the results of molecular inquiry. Moreover, the people are asking direct questions about the food they are to eat, or not to eat, asking more in a day than the analyst is able to answer in a month. The nutritive sources of bodily power are not safe in the midst of the reckless activity of commerce, unless a chemical safeguard be kept, a guard who must the better prepare himself for his duty.

"The Spectroheliograph of the Kenwood Astro-Physical Observatory, Chicago, and Results Obtained in the Study of the Sun," was the title of a paper read before the Astronomical section of the association by Mr. George E. Hale, of Chicago. He described the ingenious apparatus which he had invented and perfected for photographing the faculæ and protuberances of the sun. This apparatus has successfully photographed the bright spots, showing faculæ which the eye cannot detect. Means were devised for taking on the same plate at one exposure both the faculæ and the protuberances, and Prof. Hale exhibited the first complete picture of the sun ever taken. An observation of unusual interest was made on July 15, 1892. A photograph of the sun showed a large spot. A few minutes later another photograph was taken, which when developed showed that the bright band had appeared since the last exposure. Twenty-seven minutes thereafter another photograph showed that almost the entire spot was covered with brilliant faculæ, which by the end of an hour had entirely disappeared, leaving the spot as at the first exposure. This indicates an eruption proceeding with indescribable and inconceivable velocity. This disturbance seems to be connected with magnetic disturbances and the brilliant aurora noted the next day. The section with much enthusiasm passed a vote of thanks to Prof. Hale for his researches.

The results of some interesting experiments in regard to persistence of vision were given in a paper on that subject by Ervin S. Ferry, of Mount Vernon, N. Y. His conclusions entirely disagree with the old theory that the persistence of vision depends on color. "According to the old theory," said he, "when it was noticed that the image produced by the spokes of a revolving wheel was more or less persistent, according to the color of the spokes, it was reasoned that persistence of vision depended on color, and I think the experiments of the last year upset this theory and indicate that color is not the important feature, but brightness of light. The experiments were carried out by taking the normal eye and measuring the direction of that impression for different colors. It was found that these varied from 8-1000 of a second to 36-1000 of a second, depending upon the brightness of light. We next experimented upon color-blind people, and found that color made no difference in the change of the phenomena."

Robert T. Hill read papers before the Geological section on the volcanoes of North America and the geology of Mexico, giving the result of recent personal observations. He called attention to the renewed activity of volcanoes throughout the world, and pointed out the probability that some of the numerous extinct volcanoes in the western part of the United States may again become active. These craters are all in the West, and the volcanic belt extends into Mexico, where volcanoes in similar geological strata now show renewed activity.

Professor Riley read some valuable papers to the Entomological Club. Professor Fernow, before the Economic section, again sounded the note of warning so often heard, but not heeded, as to the danger which threatens the government timber lands from thieves and fires. He said: "We have only twenty to twenty-four watchmen to protect 20,000 square miles. We expend $100,000 a year and rarely succeed in receiving about that value back. We need a thoroughly organized and efficient service costing $2,000,000 or $3,000,000, which would result in saving $20,000,000 to $50,000,000 a year."

A new parasite found on the skins of cattle was the subject of an interesting discussion, during which Dr. C. U. Stiles, medical zoologist of the Bureau of Animal Industry in the Department of Agriculture at Washington, said: It is a new disease in the skins of cattle, and is caused by a minute mite, the scientific name of which is Demodex folliculorum. The parasite is common among dogs, and is also found on pigs, cats, and sometimes on man. It has been noticed once or twice before on cattle. During the last year there has been considerable complaint from manufacturers on account of the poorness of leather produced. It is called 'pimply leather.' A number of investigators examined the leather, and came to the conclusion that there was some fault in the process of preparation. Last winter specimens of this leather were sent to Secretary Rusk with a request for an expression of opinion as to the cause of this peculiarity. The material was handed to me, and I succeeded in proving that this condition of the leather was not due to any defect in the preparation, but to a minute parasite which lives in the follicles at the roots of the hair, which multiplies there, and by increasing in great numbers enlarges the hair follicles in the form of a pustule. It is this enlargement of the hair follicle that shows on the leather. The loss to the leather industry has been extensive. Leather manufacturers in the West say that they had lost on the average 50 cents on a hide. There is no known treatment for the disease, but it is recommended that herders keep a close watch on their herds, and as soon as the disease is noticed, keep the cattle infected isolated. The particular parasite found on cattle represents a separate variety from that found on dogs and man, so that there is probably no danger of infection to man from contact with the cattle.

"Hypnotism and its Antecedents" formed the subject of an address by Professor Joseph Jastrow. The career of Mesmer was sketched; the practices which he devised and the theories which he spun about them were delineated, and an analysis made of how far these involved the facts of hypnotism. While Mesmer's practices undoubtedly involved several of the phenomena of hypnotism, his work entitled him simply to be classed among the antecedents of hypnotism. The chief points of Mesmer's career were given in some detail, including an account of the commission of 1784. In 1784 the Marquis De Puysegur accidentally discovered somnambulism while following the Mesmeric practices. He appreciated the importance of his discovery, but at once involved it in much error by supposing that his subjects possessed a variety of super-normal faculties. After the close of the French revolution animal magnetism reappeared in France, and soon found its way into Germany and other countries. It was, however, the extreme and extravagant phenomena that were mainly studied.

Hypnotism was introduced into the hospitals of France, and some operations and cures were performed by its use. In 1831 a second commission on magnetism reported favorably upon the alleged supernatural powers of the subjects, but a commission of 1837 reversed this decision, and a prize of 3,000 francs was offered for any one who could read without the use of his eyes, but this was never gained. In 1840 James Braid, of Manchester, freed the subject of much of its obscurity by showing that the phenomena depended entirely upon the subject, and not at all upon the operator. Unfortunately, after Braid had discovered so much he again deepened the mystery of the subject by announcing that his subjects proved the doctrines of phrenology. From 1840 on, in spite of extravagant and false doctrines, and in spite of the indifference of the medical profession, a few earnest students kept contributing to the advancement of hypnotism, and at last the phenomena found scientific recognition about fifteen years ago, mainly through the efforts of Charcot and Richet. The last score of years had witnessed a remarkable revival of interest in these studies, and as many as one thousand contributions to the subject have been published.

The use of hypnotism in medicine for the suggestive cure of disease is an important phase of the subject, and several instances were given from the literature on this point. The legal side of hypnotism was also discussed. The phenomena of hypnotism are important to the physician, to the physiologist, and to the student of the human mind. While its history shows how readily error is mixed with truth, and the odor of charlatanism and extravagance brings the entire investigation into disrepute, the investigations of recent scientific students have separated the truth from its false surroundings and given the whole a scientific position which it will never lose. Following the lecture was a series of lantern views, illustrating the chief points in the history of the subject. Portraits of Mesmer and of the appliances used by him, as well as the satires directed against him, were shown. The various methods of inducing the state and the more important phenomena were pictured. A variety of interesting views of patients in various stages of the hypnotic sleep were shown, and some of the effects, such as a change of handwriting accompanying a suggested change of personality, the change of pulse, rigidity of the arm, burns on the flesh and the like, were also exhibited.

Brushes.

When a painter buys a poor brush, he is very much like the man who takes in counterfeit money for the genuine article, either a poor judge or too careless of his own interest or too confiding in his fellow man to look at it closely. Now, my boy, here are two propositions which I wish to impress upon your mind: First, that it is of the utmost importance to you that you buy and use the best brushes in the market; second, that nine-tenths of the brushes kept in the retail stores are not worth taking as a free gift, because, no matter how well skilled you may be, a poor, ill-shaped brush will retard your progress, and in measure spoil your work. I have no doubt but brushes are often ruined by careless and improper usage, but judging from long experience and observation, I am led to believe that more of them are spoiled in the making than by improper handling. There are two very important points to bear in mind when selecting a brush: First, is it well made? and, second, is it good material?

Here is a fine-looking brush, with long heavy bristles. Buy it for you? No, my lad, in this case beauty is only skin deep, and the name of the maker or recommendation of the salesman is neither safe to go by. Trust only to your own judgment or to the judgment of some one qualified to buy for you. Open this brush and look at the filling. What is it? Echo answers "What?" It certainly is not good honest wearing bristles. If you soak this filling in water it will no more stand alone than a wet rag. The question whether it is hair, wood filler, Florida grass, or what not, cuts no figure, because it water-soaks and works more like a mop than like a good bristle brush. It has a good fringe of good bristles on the outside, but they fail to do their own part of the work and at the same time furnish the spring for the worthless filling; and the result is, it splits and wears to a saw-tooth edge. I am speaking now of whitewash and calcimine brushes. There is not enough good stock in such a brush, ten inches wide, to make a good three inch wall brush, and yet they are sold at prices which ought to buy a fairly good brush. If there is any one poor brush which I despise more than another, it is a shedder, which, like a sick cat, keeps on shedding the year round. It is surprising to see how many bristles such a brush can shed and seem to grow no smaller. If you find a brush has many loose bristles in it, just make up your mind that there are more to follow, and don't buy it. Don't delude yourself with the idea that you can soak it up and make it hold. Such a brush will go back on you sooner or later. One of the most desirable things about a brush is a good point. To hold a good point, a brush must have good filling. Take, for instance, a flat chiseled brush, its chief value is a good edge or point; but as they are usually made with all the good bristles on the outside and the poor ones in the center, the poor stuff forms the point, except a little on the corners. The soft stuff in the center will wear down faster than the good stock on the outside, and the brush will soon become a stub, unfit for cutting in colors or for anything else.

A brush of any kind should have a good cutting edge, and to do good, durable service should have good stock in the center, because whether ground down or chiseled by wear, the center makes the point. When the point is gone the brush is a stub, and that will soon happen when a brush is filled, like this, with short, uneven, inferior bristles. Every painter should be a good judge of a brush, and exercise his judgment, and take no man's word for it. It is well to remember, my boy, that it costs you more in time to wear out a poor brush than it does to burn it up and buy a good one. If brush makers must use short, uneven stuff in their brushes, I prefer to have it on the outside, and the good bristles in a body across the center, to give me an even and good wearing point. We are using too many poorly filled and badly made brushes, which are dear to us at any price. Let us kick.—*V. B. Grinnell, Painting and Decorating.*

A Depilatory Powder.

According to the *Bulletin of Pharmacy* for February, 1892, the following is a useful depilatory powder:

R. Sulphide of barium	50 parts.
Starch,	
Oxide of zinc, of each	25 "

This is mixed with water so as to form a soft paste, and spread upon the face. In ten minutes' time it is scraped off and the skin is now found to be smooth.

How Wood Screws are Made.

However unpretentious the ordinary wood screw may be in appearance, its manufacture, as carried out at the present time, says the *Mechanical News*, has called for the exercise of no small amount of ingenuity. Passing, recently, through an extensive works where wood screws are turned out in large quantity, we had every opportunity of witnessing the successive stages of development of a finished screw, from the crude raw material in the shape of steel wire rods, and a brief account of the various processes may here be of interest. The wire rods are first cleaned and drawn into wire of desired gauge for the different sizes of screws to be turned out. This wire, on reels, is then fed into what are known as heading machines, in which the screw blanks are partly formed, the proper length of wire for a screw being cut off and a head being formed by one or more blows from a header. The rude blanks are then dumped into a form of hopper on a machine for cutting the slots in the heads and shaving off the latter so as to present a finished appearance. The necessity for this latter operation arises from the fact that the beveled heads, as formed in the heading machines, are not sufficiently smooth and uniform in shape, the metal flowing more or less irregularly.

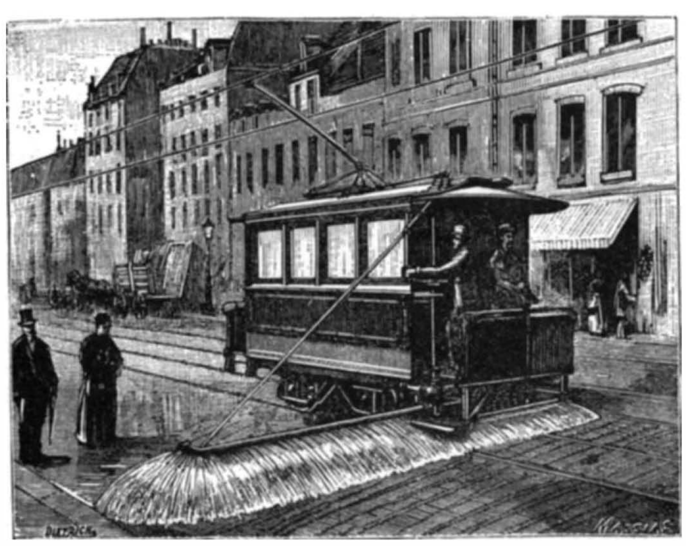
The rough screw blanks are then fed along a slide automatically, each one in turn being held firmly by suitable grips, and are presented to a milling cutter for cutting the slots in the heads and to the tool for turning the head and the beveled surface on the under side. Then the blank is released and falls into a receptacle underneath, making room for the next blank. The finished blanks, having gone through a rattler, are next taken to the threading machine. In this also the entire operation is automatic. The blanks pass along a slide, one by one, in the same way; are gripped and presented, in a horizontal position, to a cutting or threading tool secured in a reciprocating tool block. This has the necessary amount of longitudinal feed to give the desired pitch to the screw head, and has a quick return motion, several cuts being taken on each blank before a finished thread is secured. Soda water is used as a lubricant. The finished screws drop into a box underneath the machine and are then ready for packing and shipping.

One of the most recent methods of forming the threads on the screw blanks is that of cold-rolling the blanks between reciprocating dies having ridges and depressions formed on their faces.

From the nature of the operations it will be readily understood that a large number of machines can be handled by one attendant. All that is necessary for him to do is to see that the feed hoppers on the several machines are kept supplied with blanks. Everything else is done by the machinery itself.

WATERING STREETS BY ELECTRICITY.

The machine for watering streets shown in the accompanying illustration presents externally the aspect of an ordinary street car, in order that it may not frighten horses, but it consists in reality of a large iron plate reservoir filled with water. This latter is distributed over the track and at the sides by means of a horizontal pipe containing numerous apertures. This pipe is jointed at the extremity near the car, and can, through a simple maneuver, be lifted against the side of the car to allow of the passage of the few ordinary vehicles that happen to be on the street during the hours in which public sprinkling is usually done. Two men standing in front maneuver the car and the pipe. This ingenious and economical arrangement, for the illustration of which we are indebted to the *Street Railway Journal*, assures a rapid and regular sprinkling.



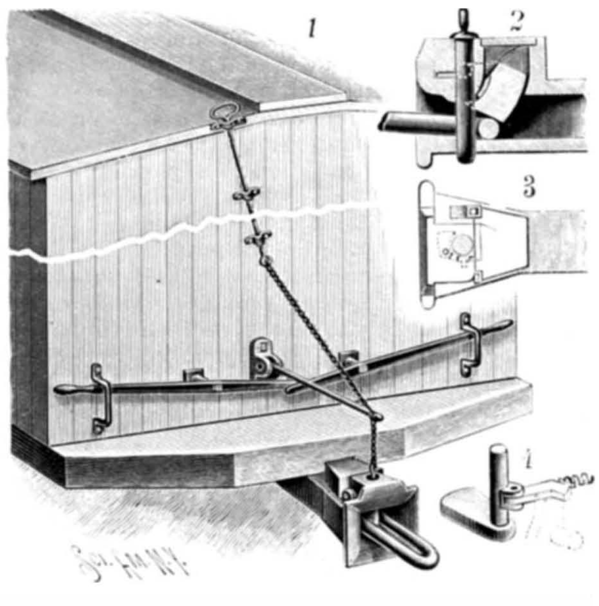
WATERING STREETS BY ELECTRICITY.

Sinking of the Marechal Canrobert.

The French ironclad Le Hoche has just given the world an object lesson in the use of the ram. On July 7, the French squadron at Marseilles was exercising, and the ironclad was crossing the roadstead at full speed, when it struck the mail steamer Marechal Canrobert (1,200 tons), then coming in from Italy, hitting her fair and full. The shock was tremendous, and the captain of the ironclad, foreseeing the consequences, ordered the steamer to be secured to his own vessel, and the passengers transferred. The fastening hawsers were then cut, twelve minutes after the collision, and the steamer instantly sank, the blow having cut her nearly in two. The ironclad remained uninjured. No weight of fire could have secured such rapidity or such completeness of destruction, nor would any strength in the steamer have preserved her from the consequences of the shock. It is by ramming that the first battles of the future will be decided, with this consequence, among others, that the mortality in a sea fight will exceed all precedent. In the old sea fights, a ship rarely lost a third of her crew, including killed and wounded, but the iron ship which goes down under the blow of a modern man-of-war will drown everybody on board.—*Spectator.*

AN IMPROVED CAR COUPLING.

The device shown in the accompanying illustration is designed to facilitate the automatic coupling of railway cars, also allowing them to be uncoupled without the brakeman going between them. It has been patented by Mr. William H. Violett, of Grand Junction, Col. A swinging pin support is pivoted by trunnions in the link mortise of the drawhead, to rest on the inner end of the link when the latter is held in position to enter an approaching drawhead, as shown in the



VIOLETT'S AUTOMATIC CAR COUPLER.

vertical section, Fig. 2. The swinging pin support also serves as a rest for the pin when the latter is raised, the support being pivoted to swing into this position by its own gravity, and being pushed back by the entering link to allow the pin to drop. An auxiliary pin support is also provided for the adjustment of the pin, so that the cars, after being bumped or pushed together, will uncouple when the engine pulls out. The trunnions of the main pin support are held in their bearings by plates, as shown in the top plan view, Fig. 3, and an extension above one of the trunnions operates the auxiliary pin-supporting devices, which do not operate except when the pin is raised without withdrawing the link. The auxiliary support, shown in Fig. 4, consists of a plate turning on the lower end of a short shaft, a link extending from which has a pivoted dog actuated in one direction by a spring to force the plate below the coupling pin, and also adapted for engagement by the extension above one of the trunnions of the main pin support. When the latter is swung back, the spring moves the parts to adjust the auxiliary support against the pin when the latter is lowered, and below it when it is raised. A shoulder on the drawbar receives the force of the jar, after the spring has been exhausted, and also affords protection to the main pin support, which also has a covering or casing to keep out snow, sleet, etc. To facilitate uncoupling from the top or either side of the car, a forwardly extending lever pivoted to the car is connected by a chain with the pin, a rod extension from this chain extending to the car, while the lever is adapted to be raised by pivoted hand levers extending to each side of the car.

Further information relative to this improvement may be obtained from Messrs. De Long Bros. & Marsh, Grand Junction, Col.

Cement for Porcelain.

20·0 white lead and 12·0 pipe clay, carefully dried, are incorporated with 10·0 boiled linseed oil heated on a water bath. The cemented articles are slowly dried in a warm place.

Education and Invention.

Mark Twain, in his new novel, "The American Claimant," introduces his readers to a mechanics' club debate, the manifest object being to satirize the socialistic tendencies of the workmen of the present day. One of the speakers, a self-educated printer, delivers a long harangue to prove that we "overrate the college culture share in the production of the mighty progress" of the nation. "In looking over a list of inventors," he continues, "I find that they were not college-bred men. Of course there are exceptions, but these exceptions are few." Now it has long been a custom, and a very pleasant one no doubt, that as soon as a man has risen to great prominence, his friends have sought to add luster to his glory by making his origin more humble than it really was and representing his education as having been practically neglected. In the life of a presidential candidate, gotten up for campaign purposes, this may be all very well, for our partisanship makes us very credulous, but in the work of a standard author it is entirely different. Now the writer is well aware that Mark Twain is such a funny man that it is often difficult to know when to take him seriously. But in the present instance it is manifest that Mr. Clemens has allowed his reason to be carried away by the popular fallacy that the great inventors were men of little or no education, who started out in life with vague ideas of the alphabet and multiplication table. To say that the inventors, with very few exceptions, were not college-bred is to make a misstatement that could have been rectified at the expense of a very little research. To take only the more noted names in the field of American invention, we find that Morse was not only educated at Yale, but that he achieved success as a portrait painter long before he ever dreamed of having his name connected with the electric telegraph. While very poor in early life, Whitney was quick to see the advantages of education, and endured many hardships for the sake of working his way through Yale College. Corliss received a good academic education, and knew enough to construct a machine for sewing heavy leather before he had ever seen the inside of a machine shop. Fulton was a man of education and was a landscape painter by profession before he became interested in mechanics. The elder Roebling graduated at the Berlin Polytechnic School, and his son was educated at the Rensselaer Institute. Gatling was not only educated, but he studied medicine and took a degree. Moncure Robinson, one of our pioneer railroad constructors and the builder of the Philadelphia and Reading road, whose death was recorded last November, was designed for the law and was educated in the Gerardine Academy and William and Mary College. Dahlgren and Ericsson received a military education, the latter having the title of LL.D. Rodman, of gun and powder fame, was a graduate of West Point; and Thurston, to whom we are indebted for more than one invention, was educated at Brown University. The list could be greatly extended if we included the names of men noted for their discoveries in the sciences, who must of necessity have had the highest education. It is poor policy, at best, for self-educated men to attempt to undervalue the advantages of a liberal education. No inventor need be afraid that he will handicap himself in his work by going through college. To state that Howe and Edison received very little education in early life proves nothing in an argument on this subject. While they deserve all the more credit on that account, who can deny that their services to the world might not have been even greater than they are if they had started out in life with the advantages of a college education?—*Mechanical News.*

A New Variety of Cane.

Many new plants have been brought to light in the recent explorations by Englishmen, Frenchmen, and Germans in equatorial Africa, but one in particular has a special claim to the attention of West Indians.

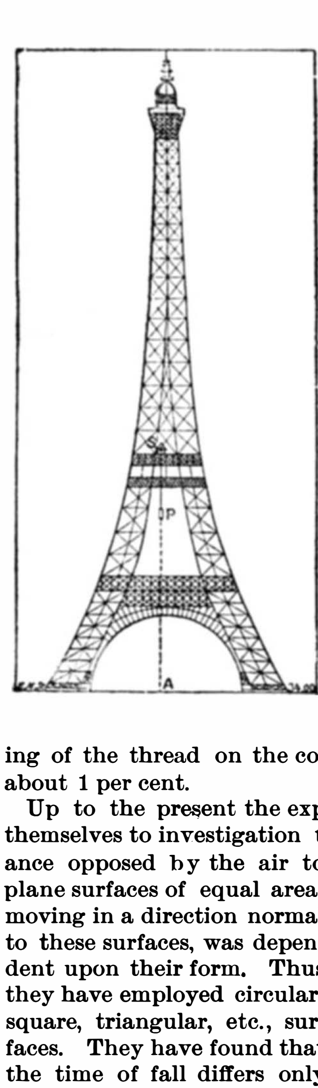
In the Upper Niger region, where great heat and moisture combine to produce luxuriance of tropical vegetation, a giant variety of sugar cane has been found, which is described as possessing great saccharine richness and being reproduced from seed, which in this variety is well developed. This is indeed news to the sugar planter, and from a botanical point of view confirms the theory that our present cultivated varieties are descended from an original perfectly flowering and seeding plant, the perpetuation of which by cuttings impaired, in course of time, the original attributes of the parent variety. The agricultural board and local planters should take particular note of this reported discovery, and so also should the government botanist. Such a variety of cane introduced in the island would be worth millions of Tusser silk worms, and prove infinitely more advantageous for its prosperity. And it is to be hoped we shall soon hear something more of the Niger cane.—*Port of Spain Gazette, Trinidad.*

THE FALL OF BODIES AND THE RESISTANCE OF THE AIR.

An exceedingly interesting series of experiments is now being carried on in Paris, by MM. Cailletet and Colardeau, in which they are seeking to verify the law of falling bodies and at the same time those of the resistance of the air to the passage of bodies. Now that high-speed electric railway work is seriously contemplated, the results of these experiments cannot fail to be of the highest interest. In order to carry out their work, the investigators have installed their laboratory on the second landing of the Eiffel tower, which gives them a free fall of 120 meters, or about 370 feet.

In carrying out their experiments MM. Cailletet and Colardeau have employed a very ingenious electrical method of timing the fall of the variously shaped objects experimented with, and particularly with the view of knowing at every instant the position of the falling body. The laboratory itself is shown, says the *Electrical Engineer*, in the accompanying engraving, Fig. 1, taken from *La Nature*. Fig. 2 shows an enlarged view of the principal apparatus. The falling body is attached to a very fine light thread, which is divided into sections of 20 meters each. Each one of these sections is wound on a wooden cone, C^1 C^2 C^3, etc., all fixed vertically with their points facing downward, so that the thread is very easily unwound. When each of the sections of 20 meters is unrolled, an electric contact actuates a registering pen upon which an electric tuning fork chronograph indicates the instant with a precision of 1-100 of a second. Thus at the end of every 20, 40, and 60 meters, etc., a time record is automatically made.

The electric contact is accomplished as follows: In passing from one cone, C^1, to the following, C^2, the thread is looped around a contact, M N O, Fig. 2, the contacts being separated by an insulating block, I, and supported by two springs, L L′, which press the contacts together very lightly. The falling body pulls the thread through the contacts, and thus for an instant breaks the circuits and allows the pen to register. Experiments have shown that the retardation to the fall of a body weighing 1 kilogramme through 20 meters caused by the separation of the spring contacts is less than 0·2 millimeter per second; that is, less than 1 one-hundred-thousandth. The retardation due to the resistance offered to the unrolling of the thread on the cone has been shown to be about 1 per cent.



Up to the present the experimenters have confined themselves to investigation to ascertain if the resistance opposed by the air to plane surfaces of equal area, moving in a direction normal to these surfaces, was dependent upon their form. Thus they have employed circular, square, triangular, etc., surfaces. They have found that the time of fall differs only by insignificant amounts, as indicated in the record reproduced in Fig. 3. This figure is a production of the chart obtained by means of the apparatus above described. No. 1 is the theoretical record of a body falling freely in vacuum. No. 2 is an experimental record obtained of the fall of a long wooden arrow, weighted by a metallic mass at its point No. 3 is the record of the fall of a square surface (0·0225 cm. sq.) pulled by a weight of 800 grammes. No. 4 is the record of a triangular surface of the same area as the preceding, pulled by the same weight. The lowest curve in Fig. 3 is the record of the tuning fork.

Messrs. Cailletet and Colardeau have also investigated whether the resistance encountered by a flat surface moving through the air is proportional to this area.

For that purpose they employed two square surfaces the areas of which were in the ratio of 1 to 2, and pulled by weights of like proportion. The corrected time of fall was respectively 6·92 and 6·96 seconds. These figures being practically identical, confirm the strict proportionality.

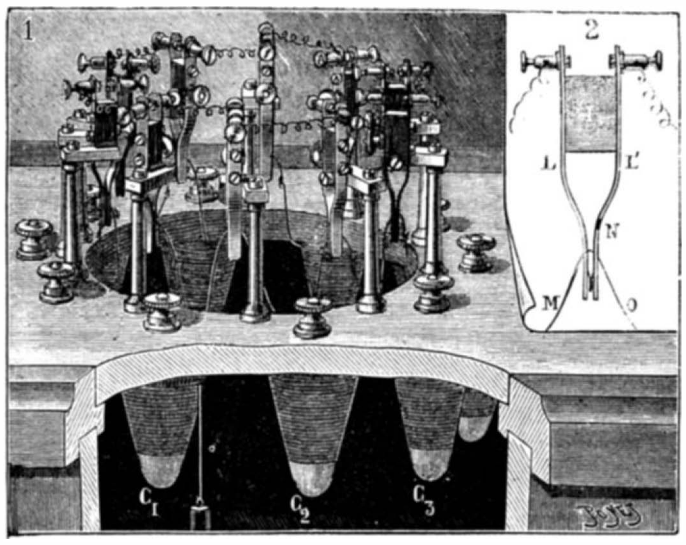


Fig. 2.—APPARATUS FOR EXPERIMENTS WITH FALLING BODIES AND AIR RESISTANCE.

Satisfactory Progress of American Armor.

The New York *Sun* makes the following remarks: The recent trials at Indian Head and at Bethlehem of two 10½ inch nickel-steel plates, treated by the Harvey process, have carried still further forward the high standard of American ship armor.

During the last two years American armor tests have surpassed in the severity of their methods and the importance of their results those of the most renowned ordnance-proving grounds of Europe. In 1890 trials at Annapolis destroyed the prestige of Sheffield compound armor, and made it evident that the ship plates of the future should be steel or nickel-steel. The next great series of experiments showed the superiority of nickel-steel plates over steel without the alloy, and also gave a forecast of the gain to be made through hardening the surface of the plate by the Harvey carbonizing process. Now we have the full demonstration of the value of this process, under certain notable improvements effected since the trials of last November.

The plate in the experiment of July 23 was of the same dimensions as those used in September, 1890, and November, 1891; but the test to which the Chief of Ordnance subjected it was far more severe. On the two former occasions he had attacked each of the competing plates with one 8 inch and four 6 inch projectiles; but on July 23 he fired five 8 inch shells, each with the velocity of the single 8 inch round of November, 1891. All the shells were made by Holtzer, which is a sufficient guarantee of their excellence; yet three of them broke up in small fragments on the Harvey face, and although the other two succeeded in getting through the Harvey crust, their points reaching the rear surface of the 10½ inch plate, not one of the five got into the wood backing behind.

The plate, therefore, came off victorious from this tremendous battering. It was only slightly cracked in the right hand upper corner, and at the conclusion of the test was in much better condition than the best plates of the November trials, some of which had shown better results than any in the world under equivalent circumstances.

The weight of each projectile was 250 pounds, and it was propelled with a striking velocity of 1,700 feet a second. The simplest statement of the difference between the trial of November, 1891, and that of Saturday, July 23, is that the aggregate energy of the five shots on the former occasion was 16,900 foot tons, while on the latter it was 25,040. The Harvey process of case-hardening, which has been so successfully applied to giving a hard surface to armor plates, is concisely described by the *Railway Review* as follows: The plate to be treated is made out of mild steel containing, say, 0·10 per cent to 0·35 per cent carbon, and after being formed to its final shape is laid flatwise on a bed of finely powdered dry clay or sand, which is deposited upon the bottom of a fire-brick cell or compartment erected within the heating chamber of a suitable furnace. The upper surface of the plate is then covered with powdered carbonaceous material, which is tightly packed. Above this is a layer of sand, and over the sand is laid a heavy covering of fire bricks. The furnace is then lighted and then raised to a temperature sufficient to melt cast iron, and this heat is maintained for a greater or lesser period according to the amount of carbonizing to be effected. About 120 hours are said to be required for a plate 10½ inches thick. On removal from the furnace such a plate is found to have had the composition of its upper surface changed. At a depth of about three inches from the surface the percentage of carbon has been raised by about 0·1 per cent, which increases progressively as the outer surface is neared, when the amount of carbon may rise to 1 per cent. It is said that this process, though, as will be seen, it resembles the ordinary cementation process, does not cause any blistering of the surface of the plate. This the inventor attributes to the high temperature at which it is carried out; but it is also suggested that the absence of blisters may be due to the homogeneity of the metal used, which, unlike the wrought iron bars used in the cementation process, is free from cinders.

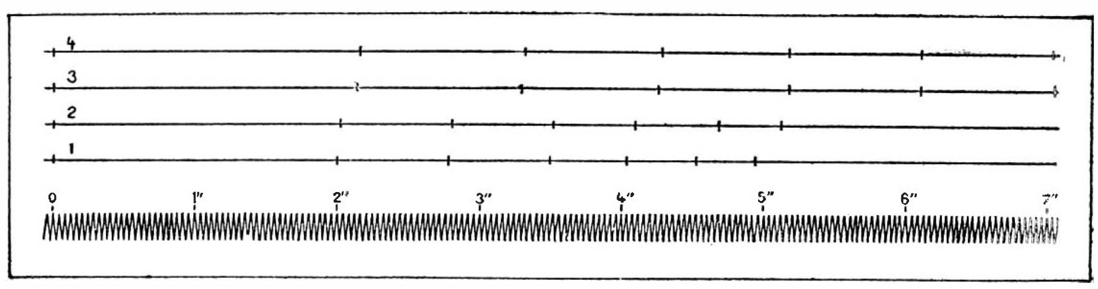


Fig. 3.—RECORD OF FALLING BODIES.

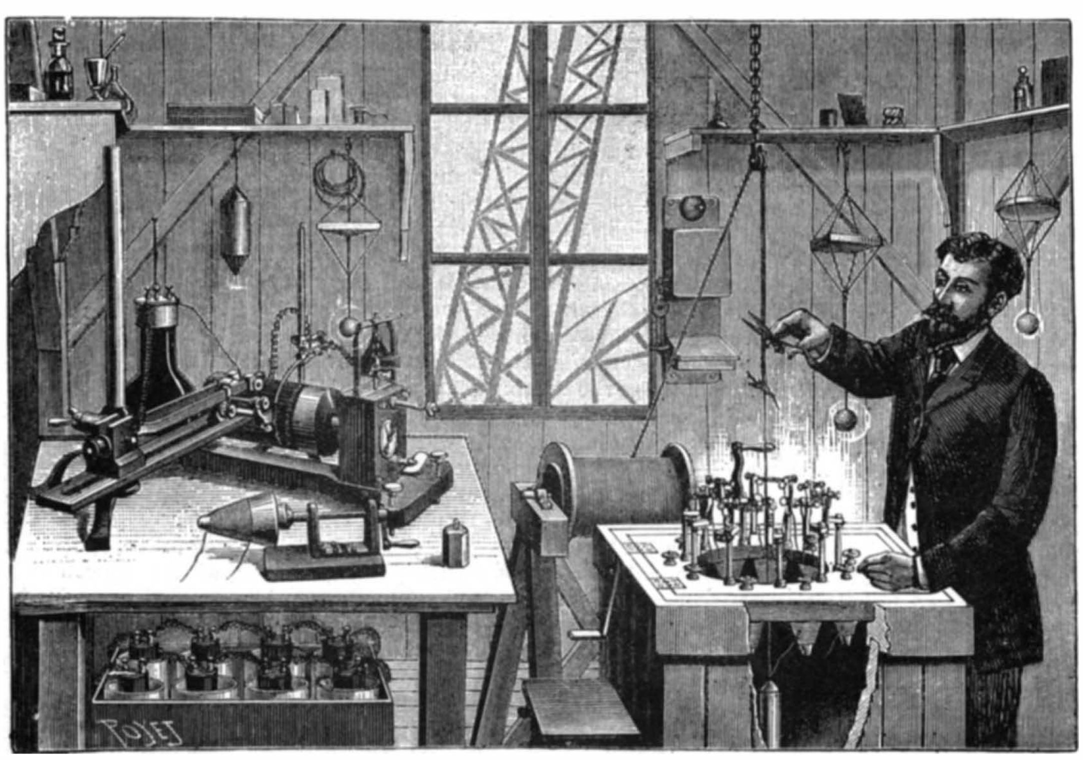


Fig. 1.—LABORATORY IN THE EIFFEL TOWER, PARIS.

FLIES have long been accused of spreading disease; but it is asserted now from Havana that mosquitoes have a use, for if they inoculate any one after biting a yellow-fever patient, the disease which follows is so mild that fatal results are rare.—*English Mechanic.*

THE CARNEGIE STEEL WORKS, HOMESTEAD.

Undoubtedly one of the principal reasons for the location of the great steel industry at Homestead, and a leading cause of the rapid development there of such an immense plant, lies in the fact that natural gas is here to be had in such abundance that no other fuel is required. There is here no handling or storage of coal, none of the thousand inconveniences attending the heating of furnaces and forges by such means, but natural gas is used exclusively throughout all the operations. And so great have been found to be the advantages of this method of heating that, should there at any time in the future be a failure in the supply of natural gas, it is expected that those now using it would manufacture gas for use in the furnaces, instead of going back to the direct employment of coal, a practice already adopted to some extent in Europe.

The great steel works of Homestead, general views of which appeared in the SCIENTIFIC AMERICAN of last week, occupy a ground space of 110 acres, on which are a dozen large and substantial buildings, and the production includes nearly every kind of structural ironwork, which is largely of Bessemer steel, up to the making of open hearth nickel-steel armor plates of the largest dimensions. In our illustrations on the first page, Fig. 1 represents the working of the great armor plate rollers, drawn by our artist a few days after the attempt of the mob to stop all operations at the works. The plate being rolled is 6 feet wide, 20 feet long, and 6 inches thick. The rollers, as will be seen, are both horizontal and vertical, the latter being set to the required width for the plate to be produced, and forming a true and uniform edge. The upper and lower rolls are held firmly to their position by other rolls above and below running in contact with them. Armor plate up to 112 inches in width can be produced with these rolls. On each side of the entrance to the rolls is a revolving roller table, the rolls of which are rotated by a system of gearing, and carry the heated plates or ingots upon their upper surface toward the rolls, also receiving the plates after compression. The rolls and the roller table are readily reversible, so that the plate being formed is successively passed back and forth from one side to the other until it has been reduced to the proper thickness. This operation is entirely under the control of a skilled workman upon the platform above, who judges as to the amount of pressure it is best to apply upon each passage of the plate between the rolls, and regulates the pressure by means of the graduated wheel and scale rods shown in Fig. 2. When the plate or ingot is at a pretty high heat, as in going through for the first time, the rolls may be adjusted for a "bite" of as much as three-quarters of an inch or more, this being gradually reduced to a quarter of an inch or less as the metal parts with its heat and becomes more dense. By means of the graduating device, such accuracy of adjustment is possible, for both the vertical and horizontal rolls, that the plates may be rolled to within one-hundredth part of an inch of the required dimensions.

The ingot of steel ready to go to the rolls, shown in Fig. 3, is said to have been the largest ever produced in America. It is the product of several open hearth furnaces united. It is now over four feet thick, but is to be rolled down to 17 inches thick, and 112 inches wide; it weighs 72 tons. The tongs handling it have an opening of 9 feet, and are capable of picking up an ingot weighing 160 tons. This ingot had just been started on its course to be worked up into an armor plate of the largest size, and four days will be required to heat the mass to a rolling heat. Some of the special requirements for the working of such large pieces are shown in the oven-bottom railway car over which the ingot is suspended, the sanded top of the car being really the bottom of the oven when run into the latter to be subjected to the natural gas heat.

Another form of ingot-heating furnace, known as the pit form, is shown in Fig. 5. There are four of these pit furnaces near the rollers. Ingots weighing less than 72 tons each may be heated in any of these furnaces, the furnace being covered with a fire-bricked lid after the ingot has been lowered to place, and the lid being so neatly balanced on its handle that it may be conveniently swung aside as desired.

By means of the powerful hydraulic shears, shown in Fig. 4, the ends of the plates are trimmed with the greatest accuracy. The plates are moved to position for cutting by the shears by the same system of revolving roller table as that shown in Fig. 1, and by these shears steel plates six feet wide and six inches thick are sheared off, apparently with as much ease as one would cut off a slice of bread.

In Fig. 6 is represented the pump house and the landing to the works on the Monongahela River. It was from the windows of this house, after it had been taken possession of by the mob on July 6, that the most deadly fire was kept up on the men aboard the scows, and up this bank from the landing were marched the men who had been obliged to surrender to the mob, the latter inflicting upon their victims a continued series of outrages, compared with which death in open fight would have been far preferable.

Among other machines of immense power at the Homestead works may be mentioned a great press used for straightening or bending to a vessel's form the thickest armor plate made, also an enormous saw, made at the Krupp works, and capable of sawing steel of any thickness as readily as wood is ordinarily sawed, besides gigantic planers for truing the edges of plates, and drills of the largest capacity, etc. A new Bessemer plant is also just completed, which has within a few days turned out its first steel product.

The World's Fair.

It is estimated that the total outlay will be $17,000,000 when the gates are opened, and that it will cost about $3,000,000 to conduct the fair during the six months it is open, and to close and disband the different departments. Of the capital stock of $10,000,000, over $6,000,000 has been subscribed, and more than $5,000,000 paid in; the city of Chicago has appropriated $5,000,000 as a quasi-subscription, all but $500,000 of which has been paid in; the Congressional souvenirs are valued at $3,500,000, making a total of $14,500,000, paid in or subject to call. The actual expenditures thus far amount to $9,000,000, and there is a cash balance on hand of over $1,000,000. But to secure an amount to finish the work, it is now proposed to issue bonds to the extent of $5,000,000, secured by a lien on the gate receipts, and paying six per cent interest; and as there is every indication that these bonds will be readily taken, there need be no further delay in completing all the grand details originally planned, and making the exposition a success from the artistic point of view; $20,000,000 is the estimated amount that will be received from concessions, the gate receipts (already exceeding $75,000), and the sale of buildings and material after the close of the exposition—a sum amply sufficient to pay the running expenses, and to pay both bond and stock holders 100 cents for every dollar invested. Then, in addition to all these millions which are being expended by the exposition proper, there will be from $8,000,000 to $10,000,000 expended by various legislatures, States, associations, and foreign governments. In other words, when the gates are thrown open the visitors will derive the benefits of an exposition costing $30,000,000, the educational influence of which will be felt for years to come, adding to the material prosperity of the entire nation and promoting the growth of every art and every industry.

Transportation.—The Illinois Central Railroad, running along the lake front, is now at work elevating its tracks about twenty feet above datum on the main grade from Fifty-first Street to Sixty-seventh Street, and is laying four additional tracks. When these improvements are completed the officials believe they can handle 50,000 passengers an hour at the elevated stations along the World's Fair front. To do this they will use eight tracks, with 24 trains an hour, 10 cars seating 60 people each to a train. The other trunk railway lines will use the "Stub" system at the main stations, of which there are 36 tracks, arranged to hold 36 trains, that can deliver or carry away 40,000 visitors an hour, and should a rush come near the closing hours, there will be sufficient tracks and trains at a sub-station to carry away 15,000 more people. This "Stub" system is intended for convenience in handling country visitors coming in on excursion trains. The street railway lines claim they can deliver 40,000 visitors an hour, the lake steamers 15,000, and the Alley "L" road 20,000. On the State Street and the Cottage Grove Avenue lines 120 trains an hour, each train having three trailers and a grip car, with a seating capacity of 150, and a crowding capacity of 50 more, will be operated at half-minute intervals. Three hundred new cars are being added to these lines. The cross-town lines are also increasing their rolling stock in anticipation of the crowds. Thus the exposition managers are confident that, should occasion demand, they can handle 100,000 visitors an hour from within the city and 50,000 excursionists from out of town.

The Illinois Central Railroad Company is building a new passenger depot, costing over a million dollars, that will extend along the lake front from Park Row to Twelfth Street, with a frontage on Park Row of 220 feet. Arc and incandescent lamps will furnish the illumination, and electric motors the necessary power used within the building, contracts for which have not yet been signed. The unobstructed outlook over Lake Michigan will make the waiting room unequaled in attractiveness, while another feature will be a marble-lined subway, extending the entire width of the station, with marble steps on each side, by means of which any train can be reached without crossing a single track, or climbing over platforms. The Hall signal system is also being installed between Chicago and Kensington; and 50 engines and 500 coaches, estimated to cost over $2,000,000, will be added in time to handle the World's Fair business.

The Buildings.—Several of the buildings are already completed, and the exterior of the majority needs only the finishing touches of the painter. The Machinery Building is not yet roofed in. The Electrical Building is about two-thirds finished, and nearly the entire exterior is ready for the painter, while the names of Wheatstone, Gauss, Jacobi and other noted workers in the science of electricity appear prominently in white letters nearly a foot in height. The Transportation Building is practically finished, while the exterior of the Manufacturers' and Liberal Arts Building, with its 44 acres of floor space, in which 300,000 people could be seated, is fast approaching completion. The first of the bonded warehouses has been opened as Warehouse A, and several carloads of exhibits are stored away to await the final arrangement. Heretofore these exhibits have been placed in the various freight houses in the city, but hereafter the railway lines will deliver shipments so marked direct to the exposition warehouse. Along the lake front, that ever-changing, horizon-bounded expanse of blue and green that will gladden the heart of our foreign and inland visitors, is a stretch of a mile and a half of graded, curbed, and paved roadway and wide promenade, embanked from the water's edge with a sloping wall of granite blocks. The long pier, extending 2,500 feet out into the lake, is well under way, and will afford ample landing room for passengers brought by lake craft. The lagoons and waterways are assuming artistic shape, reeds and other aquatic plants being placed at the water's edge, while the rich deposit of black earth is fast being covered by the soft green raiment springing up wherever its color and texture will beautify the scene. Referring to the spectacular and fantastic effects to be produced in these lagoons with the aid of electricity, a writer states that "these waterways will literally sparkle at night with tiny colored lights in unique and fantastic designs. Vari-colored lamps will glimmer in the dim green depths of the lagoons.

"Hidden and buried among flowers and translucent water plants, they will appear like veritable *ignis fatui*, or, as skimming over the surface of the water in electric launches, like giant submarine water flies. Great sea serpents, dragons, and sea nymphs will peer out of the depths of the water and cast horrible but harmless looks at the happy thousands who may glide over the rippling bosom of the world's fair waterways. Expensive designs for this feature of the electrical display will be brought from Europe at a great expense. They will consist of Chinese dragons, winged horses, sea monsters, and all the horrors of land, sea, and air that the imagination of man has in the course of centuries given birth to."

At the dedication ceremonies in October the visitors will be treated to a brilliant spectacular display entitled the Progress of the Centuries, and among the twenty-four floats will be one representing "The Genius of Invention," application of steam, etc., and one representing "Electricity." Sixty 6,000 c. p. search lights will illumine their course through the most picturesque portion of the lagoons, and as these stately barges average 50 feet in length and 30 feet in height, it is expected that a scene of unusual splendor will result. The float representing Electricity is thus described by the designer: "This float will need no search lights to reveal its beauties. Indeed, as it approaches, these lights will be darkened so that it may the more perfectly reveal its own glory. The golden barge is of capacious form. Within it seems to be filled with clouds supporting a huge sphere representing the world. This globe is banded in all directions with thousands of incandescent lamps of varying color, incessantly flashing, now green, now blue, now crimson, a hundred tints. Upon it stands an heroic figure of the Genius of Electricity, bearing aloft a brilliant electric lamp. On the high gilt prow stands Franklin with his kite. By ingenious appliances real lightning flashes are made to flash about his kite. On elevated platforms on either side of the great globe are seen Morse and Edison with their discoveries. Far forward sits a female figure representing Europe, and far behind another representing America. To the latter little winged figures are bringing messages. Her fingers rest upon a telegraphic key. Europe receives the message and reads it from a tape, while other winged figures with trumpets proclaim it to the world. This barge will be provided with powerful dynamos to produce the marvelous light effects."

Dedication Ceremonies.—By an act of Congress and proclamation of the President, Friday, October 21, will be a national holiday, and special exercises will be held in every one of the 170 schools in Chicago on Thursday, October 20. No charge will be made for admission to the fair while the dedicatory ceremonies are taking place on Friday. On Thursday and on Friday after 5 P.M. an admission of 50 cents will be charged, as the fireworks and floats will be of such magnitude and such brilliancy and the expenditure will have been so great that the exposition management has decided to charge for the enjoyment of these entertainments. The fireworks will be the most elaborate ever evolved, and in many cases the bombs and display pieces will be fired by electricity.—*Electrical World.*

YALE University had its beginning at Saybrook, Conn., in 1700, and removed to New Haven in 1716.

JOSEPH LE CONTE.

BY MARCUS BENJAMIN, PH.D.

In 1891 the American Association for the Advancement of Science met in Washington, D. C., under the presidency of Professor Albert B. Prescott, of the University of Michigan, and this year it met in Rochester, N. Y., under the guidance of Professor Joseph Le Conte, of the University of California. As we have previously said, the office of president in the American Association, in virtue of an unwritten law, passes from a representative of the physical sciences to one of the natural sciences, and so the chemist of last year is succeeded this year by a geologist.

The name Le Conte is a distinguished one in the annals of American science, and a sketch of its most famous living representative would be incomplete without some genealogical history of the family. It is of French origin, and owing to the political and religious troubles subsequent to the edict of Nantes in 1685, its first American ancestor, William Le Conte, a Huguenot, came to the new world and settled in New Rochelle, near New York City, in 1698. Descendants of the family still reside in that place.

Toward the beginning of the century Louis Le Conte, a great-grandson of William, removed to Liberty County, Georgia, where he had come into possession of the estate of Woodmanston. He devoted himself largely to the dilettante study of the sciences, and was a botanist of considerable reputation, sending from time to time the results of his discoveries to friends in New York, who communicated them to the Lyceum of Natural History, as the New York Academy of Sciences was then called. He did not neglect the physical sciences and was an ardent student in the domain of chemistry and astronomy. At frequent intervals his brother, Major John Sutton Le Conte, of the United States Engineer Corps, paid visits to the home in Georgia, and together they discussed the scientific questions of the time.

It was here and under such influences that Joseph Le Conte was born on February 26, 1823. He was one of the younger members of the family, which included four sons and three daughters. His elder brother John, born in December, 1818, likewise became a scientist of national reputation, and from 1869 till his death in Berkeley, Cal., last spring, was professor of physics in the University of California, as well as president of that institution for a part of the time.

The elementary studies of young Le Conte were pursued at a neighboring school in Liberty County, where, from year to year, new teachers were called to the charge of the pupils of a few of the leading families in the vicinity. This fondness for science was a natural consequence of his association with his father, and his habits of observation were the result of his country life with outdoor sports. Game of all kinds abounded in that part of Georgia, and he was a natural sportsman from his earliest boyhood. As he grew older his practical knowledge acquired in the chemical laboratory in his father's attic or in the botanical garden adjoining the home became of use to him in his extensive ramblings for scientific purposes.

Among the different teachers under whose instruction he passed, none perhaps had greater influence upon his mind than did the youthful law student Alexander H. Stephens, then earning his education by teaching, and who subsequently left a permanent impression on the history of his State and country by his statesmanship. It was under his tuition that he was prepared for college, and then, following in the footsteps of his elder brother, entered the Franklin College of the University of Georgia, where, in 1841, he received his degree of A.B.

Then, choosing medicine as his profession, he went to New York and studied at the College of Physicians and Surgeons, where he took his doctor's degree in 1845. Then turning homeward, he entered on the practice of his profession in the pleasant city of Macon, Ga., but finding the study of science more interesting than that of medicine, his success as a practitioner was not sufficient to induce him to continue in that field.

Cambridge, Massachusetts, was at that time the Mecca of all students in natural science. There, under the magnetic influence of Louis Agassiz, that famous and brilliant group of naturalists who to-day are the pride of American science was educated; among the best known of whom may be named Alpheus Hyatt, Edward S. Morse, Frederick W. Putnam, A. S. Packard, Samuel H. Scudder, N. S. Shaler, and A. E. Verrill, all of whom have a world-wide reputation.

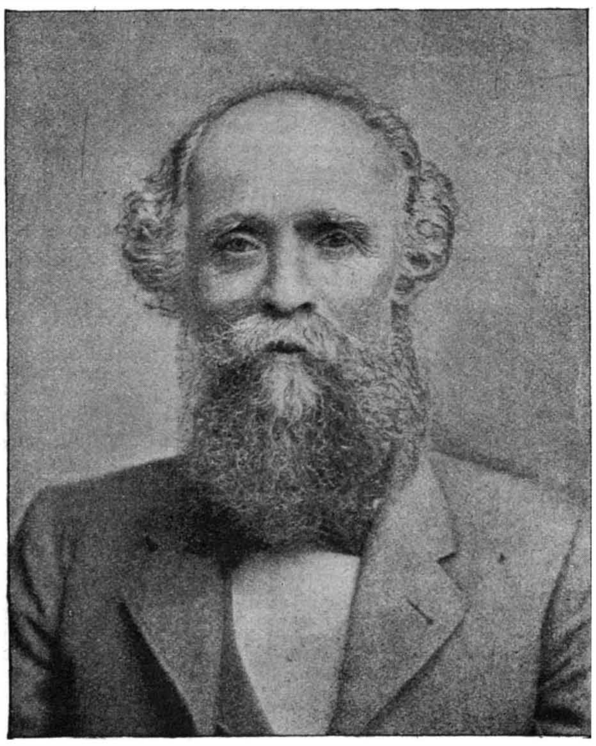
To Cambridge, therefore, Le Conte directed his steps and entered the Lawrence Scientific School. His medical studies made the course a comparatively easy one for him, and in 1851, after spending a year at that institution, he received the degree of B.S.

During the winter of 1851, in company with Agassiz, he spent several months on the keys and reefs of Florida, studying their mode of formation, from which grew his paper, "On the Agency of the Gulf Stream in the Formation of the Peninsula and Keys of Florida," subsequently published in 1856. On leaving Cambridge he was called to the chair of natural science in Oglethorpe University, in Milledgeville, Ga., but a year later relinquished this charge to accept the professorship of geology and natural history in the University of Georgia, in Athens. Here he remained from 1852 till 1856, busily engaged in teaching and lecturing, with but little time at his disposal for original research.

He was then called to the chair of chemistry and geology in the South Carolina College. A more congenial locality could scarcely have been found. Columbia was the political capital of the State, as well as the site of the State University. It was within easy reach of Charleston and Savannah, and in ante-bellum days one of the most attractive spots in the Southern States. His reputation was fast becoming national, and in 1857 he was invited by Joseph Henry, secretary of the Smithsonian Institution, to deliver his lectures on "Coal" and on "Coral Reefs" before that institution.

Of his contributions to science, written at this time, may be mentioned the following: "Place of Organic Science and Geology in a Scheme of Education" (1857); "Morphology and its Relation to Fine Art" (1858); "Principles of a Liberal Education" (1859); "Correlation of Physical, Chemical and Vital Forces" (1859); "Relation of Organic Science to Social Science" (1860); "Importance of National History in the School, and the General Relation of the School, the College and the University to Each Other and to Active Life" (1861).

With the breaking out of the civil war came four long years of cruel hardships. In 1862, all able-bodied men over eighteen years of age were enlisted in the



PROF. JOSEPH LE CONTE.

Confederate army, and the College of South Carolina closed its doors, so that its students might serve their State in the field. Professor Le Conte was a loyal son of the South, and accepting the situation as one of necessity, at once entered the Confederate service, and was for two years chemist in the government laboratory for the manufacture of medicines. Later he became chemist to the niter and mining bureau, and so continued until the close of the war.

Subsequently, when the University of South Carolina was organized out of what was left of the old college, Professor Le Conte was restored to the chair of chemistry and geology, and also was assigned to the charge of chemistry and pharmacy in the medical department.

The educational institutions of the South were slow to recover from the disastrous effects of the war. With limited resources and inadequate support they have persisted in their course, and now the University of South Carolina is again one of the foremost colleges in the South. She has failed to resume her place among the older universities of the Eastern States, and is not equal to many of the newly and richly endowed institutions of the Union. It was, therefore, but natural when an opportunity came to Professor Le Conte in the shape of a call to the chair of geology and natural history in the University of California, organized in 1868, that he should regard the proffer as one of advancement, and leave Columbia.

He removed to California, and was present at the opening of the first session of the new university in September, 1869, since when he has continued to remain on the Pacific coast till last summer.

His laboratory, on the heights of Berkeley, overlooks the Bay of San Francisco, and directly opposite is the Golden Gate, through which, in the afternoons, may be seen the last glimpses of the setting sun as it sinks out of sight into the ocean beyond, while the metropolis of the West is a little to the left. It was here one afternoon in March of last year that Professor Le Conte told the present writer how the university had granted him a year's leave of absence, and that he was about to visit the East and renew his acquaintance among the scientific men, many of whom he had not seen since before the war.

Later, in August, he was present at the meeting of the American Association—the first that he had attended in fully a quarter of a century, but among his former colleagues many had gone. Agassiz, his teacher, was sleeping the long sleep in Mount Auburn, beneath a huge granite bowlder brought from the glaciers of Switzerland—the scene of his early triumphs. Henry, the scholarly first secretary of the Smithsonian Institution, and Bache, the great superintendent of the Coast Survey—they and the two Sillimans, father and son, the able Edward Hitchcock, the courtly William B. Rogers, the learned Barnard, the skillful Lawrence Smith, the genial Asa Gray, and many others had passed away. Of those who had made geology a specialty, Dana, Newberry, and T. Sterry Hunt were unable to be present, but a younger generation, who knew him from his work, greeted him with enthusiasm, and from the moment of his advent in Washington until the time of his election, the name of no other candidate for the presidency was seriously considered.

Subsequent to his arrival in California he devoted considerable attention to geology. His summer vacations were spent in geological rambles with students in the high sierras or in tours through Oregon, Washington, and British Columbia. These expeditions gave rise to such papers as his "Theory of Formation of the Greater Features of the Earth's Surface" (1872); "Ancient Glaciers of the Sierras" (1873); "Some Tributaries of the Lake Valley Glaciers" (1875); "The Great Lava Flood of the Northwest, and the Structure and Age of the Cascade Mountains" (1874); and "Structure and Mode of Formation of the Coast Ranges of California" (1876).

From the rich experiences gained by so keen an observer of nature grew the desire to record his impressions in book form, and so, in 1878, he published his "Elements of Geology," a text book for colleges and for the general reader, which has since passed through several editions, the latest of which, issued in 1891, brought forth the statement that "this standard work has now, after fourteen years, been thoroughly revised in all its parts, and for the American student of geology leaves little that could be desired." It is essentially an American book, and the examples and applications cited are almost entirely derived from this country. In 1884 he issued an abridged edition of this work, which he called "Compend of Geology," and which was especially designed for use as a text book.

Besides geology, he has devoted his attention very largely to the phenomena and theory of binocular vision, and from 1869 to 1877 he published various investigations included under the following titles: "Adjustments of the Eye" (1868), "Relation of the Eyes on the Optic Axis on Convergence" (1869), "The Horoptic" (1869), "A New Mode of Representing Binocular Phenomena" (1870), "Theory of Stereoscopy" (1871), "So-called Images of Illusion" (1872), "Position of the Eyes in Sleep" (1875), "Law of Corresponding Points in Relation to the Law of Direction" (1875), "Comparative Physiology of the Binocular Vision" (1875), and "Structure of the Crystalline Lens and its Relation to Periscopism" (1877). These he collected and issued in book form, under the title of "Sight: An Exposition of the Principles of Monocular and Binocular Vision," which was published in New York in 1880.

In addition to the foregoing he has published two volumes of essays. The first of these, originally issued in 1873, is entitled "Religion and Science," and was a series of Sunday lectures on the relation of natural and revealed religion, or the truths revealed in nature and scripture. Professor Le Conte is an evolutionist of the most thorough-going type, and in 1873 his views were regarded as somewhat radical, but the book was favorably received and recommended "to those who desire to examine closely the strong foundations on which the Christian faith is reared."

In his latest book, "Evolution and its Relation to Religious Thought," he emphasizes his belief in that hypothesis, and boldly says: "We regard the law of evolution as thoroughly established. . . . It is not only certain as—it is far more certain than—the law of gravitation." His aim is to show that "the spirit of man was indeed derived from God, but not directly; created, indeed, but only by natural process of evolution; that it indeed pre-existed, but only as embryo in the womb of nature; slowly developing through geologist time, and finally coming to birth as living soul in man. At this last stage of its development it attained to immortality." Five editions of this book have been called for.

Professor Le Conte is not without honors. The University of Georgia has conferred upon him the degree of LL.D., and shortly after his removal to California he was elected a member of the National Academy of Sciences. Besides being a member of the American

Philosophical Society, he holds either honorary or corresponding relations to many scientific associations, including the Academies of Science in New York and Philadelphia. He has been a member of the Association for the Advancement of Science for many years, and at one of its earlier meetings served as secretary.

No worthier selection could have been made by the American Association from among its more than 2,000 members, for its president, and in the choice of Professor Le Conte a graceful tribute is paid the members from the Pacific States, who showed, nearly twenty-five years ago, their foresight and wisdom in calling him to their first and best scientific educational institution.

Meteorites.

Geologists are indebted to Mr. J. R. Eastman for a concise account of the Mexican meteorites. In a paper read before the Philosophical Society of Washington, January 2, 1892, he presented the latest and most complete information upon the subject, in a compact form ready for reference. A list of the iron meteorites with a table of their weights was given, followed by remarks as to the relative occurrence of iron and stony meteorites.

From the available data the ratio of weight of the former to the latter is as 1 to 12·23. The aggregate weight of meteoric iron observed and discovered to date on this continent is about 153 tons. If the above ratio is true in all cases there should have been a fall of about 1,880 tons of stony meteorites, or in all over 2,000 tons of meteoric matter precipitated upon the earth.

Mr. Eastman offers the following theory to account for the apparent excess of iron over stony meteorites: When a stony meteorite falls to the earth it generally breaks into many fragments, and the ruptured surfaces plainly indicate the nature of the catastrophe. The author knew of no case where an iron meteorite showed any indicati)n of having been twisted, broken, or torn from another mass of the same material.

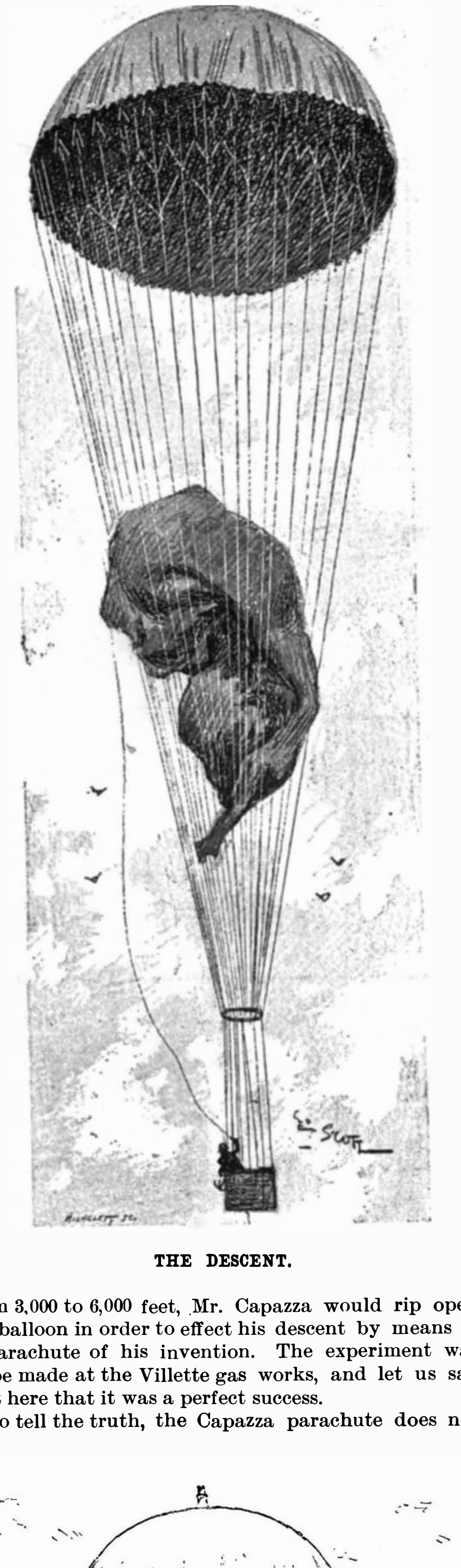
The true type of meteorite which reaches the earth from outer space is probably like that which fell in Iowa County, Iowa, on February 12, 1875. This meteorite is composed almost wholly of stony matter, but scattered through the mass are small grains of nickeliferous iron. This iron may exist in the stony matrix in all forms and sizes, from the microscopic nodule to the mass weighing several tons. When the stony mass comes in contact with the earth's atmosphere the impact breaks up the matrix, sets free the iron bodies, and they reach the earth in the same condition, so far as mass and figure are concerned, as they exist in the original formation. In such cases it is probable that the stony portion of the original body is rent into such minute fragments by the explosion that they would not reach the earth in any appreciable size. The larger the masses of iron the more complete would be the destruction of the original body, and the larger stony meteorites would be those that contain the smaller granules of iron.—*Amer. Naturalist.*

Photo. Prints in Colors.

Prof. Vogel exhibited recently before the Physical Society, Berlin, a remarkably fine series of colored prints of oil paintings, etc., prepared in accordance with his method by Messrs. Vogel and Ulrich. The method consists in first taking a red, a yellow, and a blue negative of the object on plates specially sensitized for colors. The three negatives are then printed on to one and the same paper by means of complementarily colored rollers or stones. In order to obtain the colors exactly complementary to those of the negatives, the colors used for printing were either the colored sensitizers themselves or some substances whose equivalence to these had been determined spectroscopically. The application of the physical principles involved in the above yielded an approximate reproduction of the natural colors which was surprisingly complete, and will become more so as more and more colored substances are discovered suitable as sensitizers. Prof. Koenig described his new spectrophotometer. Its chief improvement consists in the introduction of Lummer and Brodhun's glass cube, which is, however, so modified as to admit of the measurement of the relative intensities of the parallel rays falling into it.

A NEW PARACHUTE.

At the time of the ascension of the Jupiter, the results of which made so strong an impression upon the public, Mr. Capazza invited a few persons to witness an experiment, the simple announcement of which was well calculated to give the chills. It was laconically stated therein that after reaching an altitude of from 3,000 to 6,000 feet, Mr. Capazza would rip open his balloon in order to effect his descent by means of a parachute of his invention. The experiment was to be made at the Villette gas works, and let us say just here that it was a perfect success.



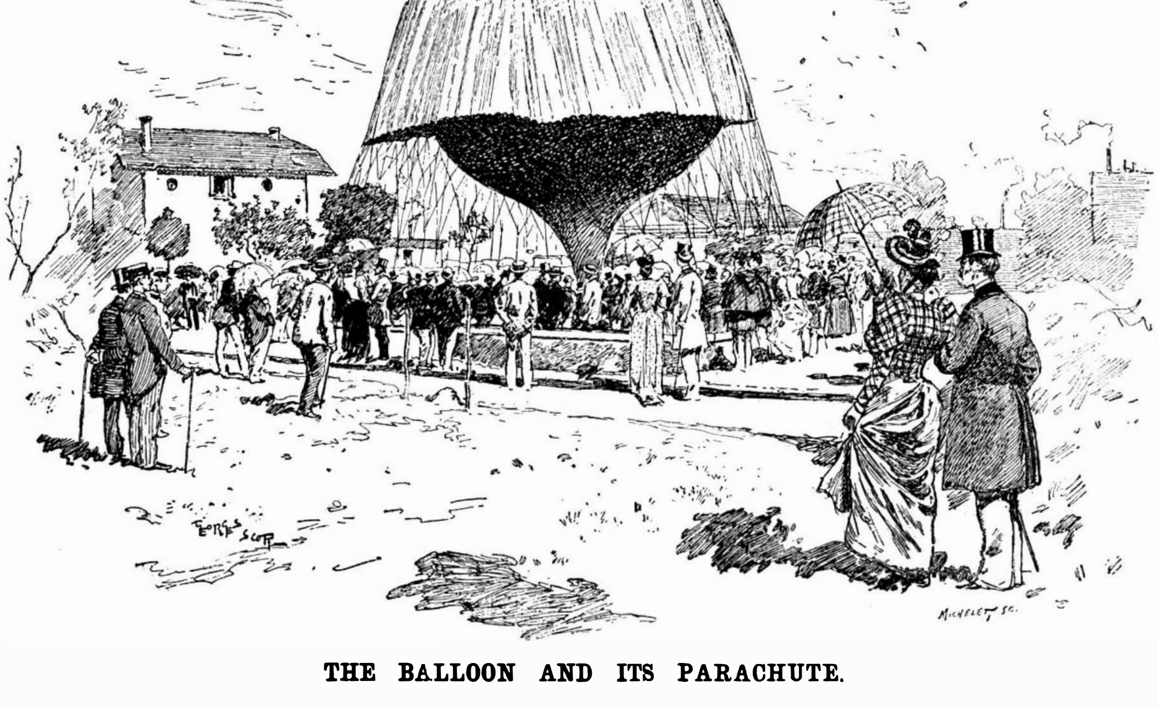
THE DESCENT.

To tell the truth, the Capazza parachute does not constitute an invention in the proper sense of the word. Mr. Capazza has contented himself with improving, by simplifying, what was already known, and especially with more rationally applying the laws that govern the operation of analogous apparatus. In the preceding experiments with parachutes, the apparatus was defective, and, at the moment of acting, remained inert, or else, on the contrary, spreading abruptly, gave a shock which was dangerous for the system as a whole. Moreover, during the descent, the apparatus was wanting in stability and oscillated in the air in a perilous manner. Mr. Capazza's idea consists, in the main, in ascending with his parachute *wide open.* To this effect, his balloon is absolutely free from all fastenings and is not provided with a netting. What takes the place of the latter is the parachute itself, which covers the entire upper part and extends below its "equator."

The balloon covered with its parachute is inflated in the usual manner. It is held by its ascensional force against the parachute and remains in place as long as it is inflated. The parachute is provided throughout its circumference with a band of strong canvas, to which, throvgh the intermedium of metallic eyelets, are hooked fine cords that unite in pairs below and terminate in cords that hold the car at a considerable distance (95 feet) from the balloon. Such a length, unusual up to the present, has the effect of drawing more obliquely upon the edges of the parachute, leaving more liberty to the latter to hold itself open, and to preserve its static equilibrium automatically. Moreover, a sort of conical chimney of canvas placed at the summit of the parachute assures the flow of the gas contained in the balloon when the latter bursts, by accident or otherwise, and afterward serves to allow of the escape of the superabundant air during the descent.

The inflation of the balloon was effected normally, as shown in one of our engravings, except during a sudden squall which gave the persons who held the balloon all the work that they wanted to do. This picturesque incident has been rendered by our artist with much accuracy.

The ascension took place along about five o'clock. Mr. Capazza, alone in his car, rapidly reached an altitude of 4,300 feet, at which he ripped open his balloon. The excitement of the spectators was at a high pitch when the latter was seen to abruptly change form, hang beneath the parachute and then drop upon the ring, while the parachute kept immovable. The descent was made at the very moderate velocity of 4¼ feet per second, and the aeronaut reached earth without difficulty in a wheat field at Drancy. The experiment seems conclusive, and we may believe that the Capazza parachute will hereafter become reglementary for ascensions.—*L'Illustration.*



THE BALLOON AND ITS PARACHUTE.

What are Diatoms?

The plants in question are so small as to be seen only with the aid of the microscope; those of ordinary size, when magnified about three hundred and fifty diameters, appear about a quarter of an inch long. Others are much larger. They are curious little plants with a silica shell, which, in certain places, is provided with little apertures through which living parts of the plant protrude. In this way they are enabled to move about freely in the water by which they are generally surrounded, for, though they are not all strictly water plants, they all need considerable water to enable them to thrive, and so are always found in wet places.

Owing to their freedom of motion, they were at one time supposed to be animals. Now it is known that they are plants, as they can perform all the functions of plants, and no animal, with all his superiority, high nature, etc., is able to do this. They are found everywhere in all inhabited countries, and in fact all over the seas. So it may be readily granted that a plant so common and widespread as this should be quite familiar to every one.

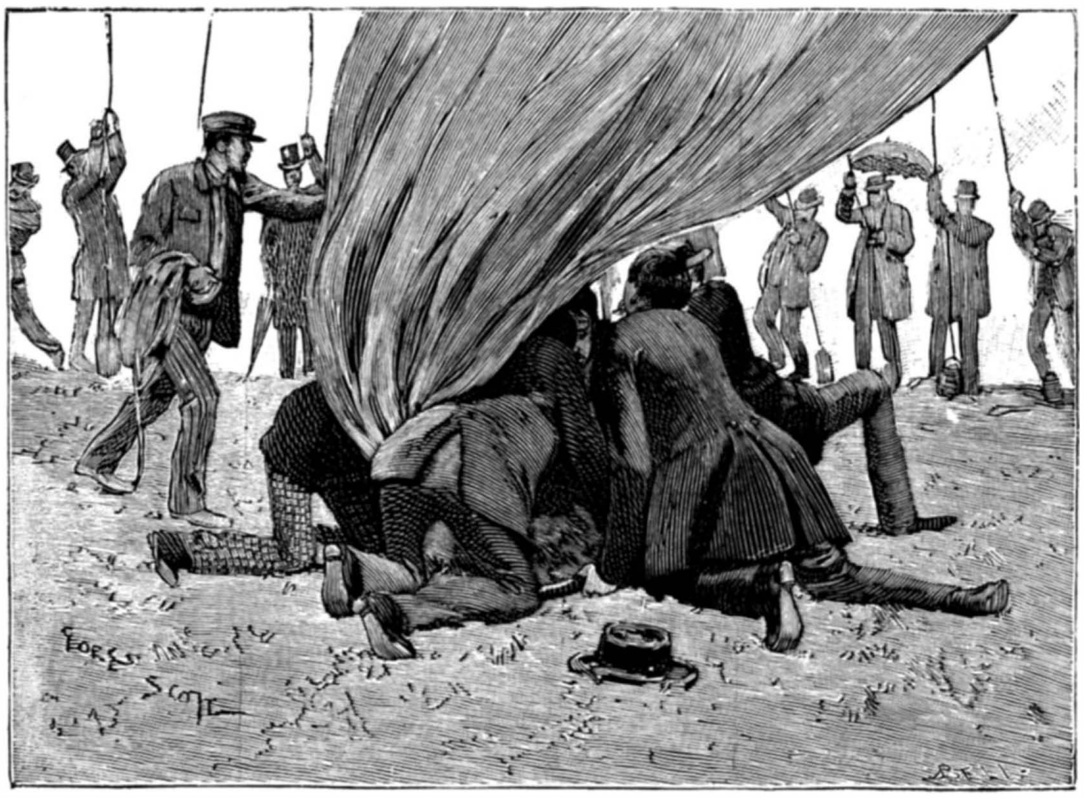
Again, not only are the living plants so widespread and common, but the shells of the dead ones remain intact for many years; and in certain localities these tiny shells are so numerous as to form a large portion of the soil. Some of the best known of these localities are the sites of Richmond, Va., and Berlin, in Germany.—*Emily L. Gregory, Popular Science Monthly.*

Spontaneous Combustion.

Dr. Kedzie, professor of chemistry in the Michigan State Agricultural College at Lansing, in a recent address before the Michigan Association of Fire Underwriters, said: "Vegetable oils, and especially spirits of turpentine, tend to take oxygen rapidly from the air, and thus generate heat. The large extent of surface exposed to the air promotes this oxidation, and the rags, being poor conductors of heat, retain the heat produced by oxidation, and hence arises the danger of spontaneous combustion. The danger is increased if the rags are moist. Similar instances of spontaneous combustion are seen in hay mows, when the hay has been put up damp. The danger is greater where the rags are soiled by vegetable oils, for example, linseed and cotton seed oil, and especially spirits of turpentine used in making varnish.

"One day, while returning from Lansing, I saw Mr. Lapman rush out of his planing mill with a box of smoking sawdust in his hands, which burst into flames when thrown upon the road. A painter had rubbed the paint from his hands with the sawdust in the box, and departed unconscious of danger. Within fifteen minutes the oil of this paint thus spread over a large surface of sawdust was smoking and just ready to break into flame.

"The danger from spontaneous combustion is increased where a quantity of greased rags are left in a pile so loosely placed as to allow a free access of air, yet so compact as to keep in the heat caused by oxidation. The mineral oils are much less liable to spontaneous combustion than vegetable oils."



A SQUALL DURING THE INFLATION OF THE BALLOON.

NAVAL RESERVES AT TARGET PRACTICE.

Nelson laid his ship, the Victory, beside the enemy and dashed into the opposing ship his entire broadside. Fifty cannon sent forth each its roundshot and stand of grape—the round to open the way, the grapeshot to follow in and spread destruction generally. Sometimes the opposing ships were so close that their sides ground together on the swell of the sea and the lower port covers had to be blown off to allow the loaders to use their rammers.

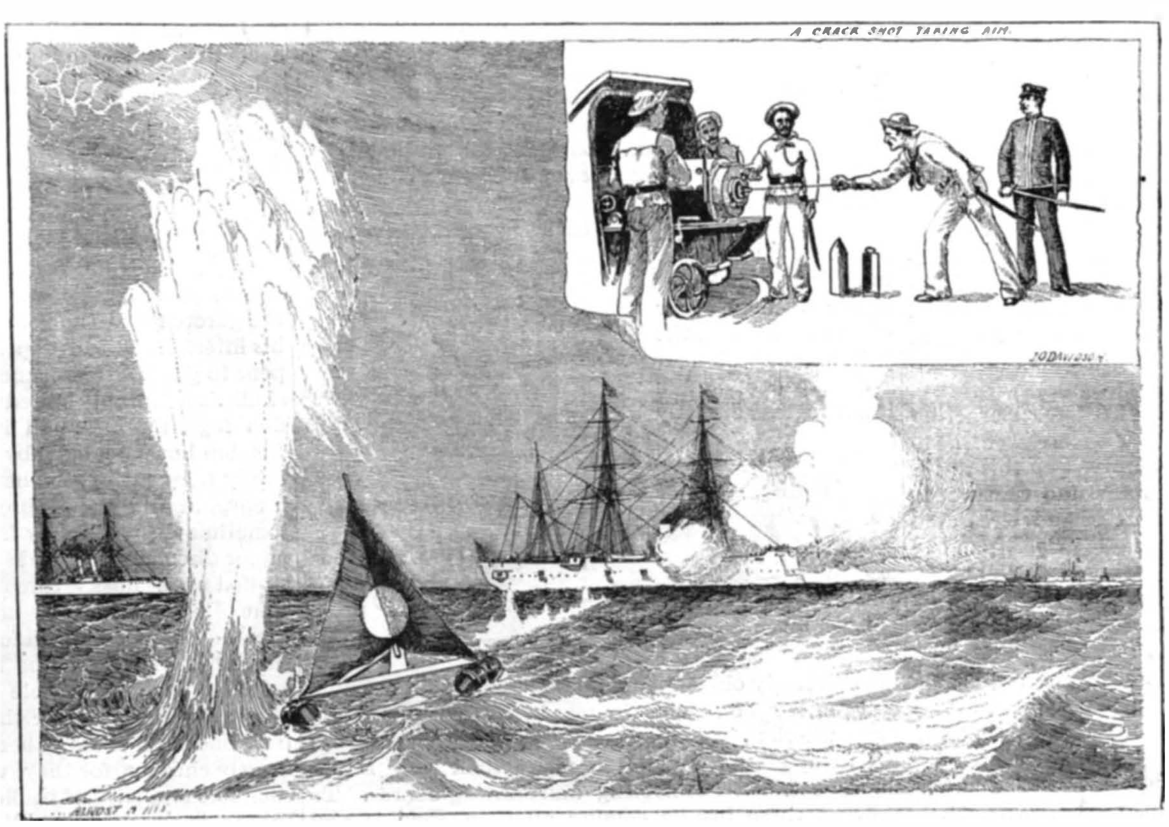
If Nelson had been told by one of his captains (the gallant Trowbridge, for instance) that the day would come when guns would be made carrying a shot equal in weight to his entire broadside and as large and heavy as one of his big guns, and that the shot would go in the breech instead of the muzzle, and its range would be fifteen miles, the good admiral would probably have said:

"Trowbridge, poor fellow! has lost his mind."

We have such guns now, however, and, stranger yet, the men who manned them lately and made their great shots dance over the sea to the horizon were crews of "greenhorns" and "haymakers," who, two years ago, knew nothing about guns and ships. When the gallant naval reserves first trod the white decks of Uncle Sam's war ships the true professional salt water "Jackies" made much of them—patted them on the back encouragingly as they showed them how the big guns were worked. The haymakers, lawyers, and millionaires did little talking but much thinking, and when it came their turn to fire off those big rifles they demolished those targets looking like specks out on the water in a fashion that made the old salts stare and stow away their patronage indefinitely.

To the old-timer, used to twenty-two men at a gun, needing five minutes to fire, there is much to marvel at in the new ten-inch rifle with crew of ten firing a shot in two minutes. The old gunner with his priming needle is also out of date, for the modern gun cartridge is too long for a needle to serve, and in its place there is used a small rifle cartridge, which shoots its little bullet into the big one and opens up a passage throughout the mass of powder, into which the flame follows and ignites it all at once.

Compare, too, the striking power of one of Nelson's guns and those used by the naval reserve. If Nelson's broadside did any damage at a mile, his ordnance officers passed compliments on the excellence of their work. A shot from one of the ten-inch guns that our gallant reserves have been putting through the targets starts on its flight with a striking power at one mile equal to Cleopatra's obelisk in Central Park lifted to Trinity Church steeple and dropped on the pavement. Our picture, for which and the description we are indebted to *Once a Week*, shows the scene at sea when one of these shots strikes close to the floating target. Had it not missed, our artist would have had no chance to show how a target looks.



NAVAL RESERVE TARGET PRACTICE IN GRAVESEND BAY.

Progress of the World's Fair Buildings.

How far along the buildings at Jackson Park are advanced is shown in the official statement issued August 13. There are 8,488 men on the work. This increase is due to the activity of work on the various State buildings, special structures, and concession buildings. The grass plots, flower beds, and roadways are being made. Nearly all the ornamental railings and balustrades around the lagoons are finished. Five large steam rollers are at work packing down the permanent crushed stone roadways and paths around the Woman's and Horticultural buildings. The landscape work is nearly finished around these two buildings, and John Thorpe, of the Bureau of Floriculture, is busily engaged on the large rockery which is to be placed in the central dome of the Horticultural Building.

Of the large buildings not yet completed, the Manufacturers' Building is getting along most expeditiously. The skylight glass is being rapidly placed over the nave trusses. The ironwork is entirely finished on Machinery Hall, and some of the sculptured figures have been placed along the ridgeline of the roofs. Decorative fresco work has been begun in the lobbies of the Agricultural Building, and the large sculptured pediment is being placed; the staff work is being rapidly put on the agricultural annex. The superstructure is well under way for the colonnade connecting the Agricultural Building with Machinery Hall. In the Fisheries Building the aquarial tanks are nearly completed. Upon the Palace of Fine Arts staff work is nearly finished. Twenty-three State buildings are progress. Montana's will probably be the first finished, for the interior work, as well as the exterior staff work, is already well advanced. The Turkey village on the Midway Plaisance will be immediately started. Work has been begun on the building for Germany. On the Mines, Transportation, and Woman's buildings little now remains to be done except the interior decoration. The work on the Electricity Building is being rapidly advanced. The staff covering on its towers advances well. The large hemicycle at the main entrance is now being constructed; under this the statue of Franklin will be placed. The government structures are being actively pushed forward. The main building is nearly finished, while the brick warship Illinois begins to look like a real man-of-war. Its white covering of cement and smokestacks are in place. Work has been begun on the government life-saving station.

The Restoration of Those Overcome by Inhaling Illuminating Gas.

A correspondent of the *American Gas Light Journal* says: I have seen hundreds of men overcome by the inhalation of gas, and I wish to say that to keep a man so overcome on his back would be the worst possible course to pursue; and I should expect to see a man so placed succumb rather than revive under that treatment. The absence of air in the lungs must of necessity cause the limbs to become damp and cold. If the following instructions be faithfully followed—I do not care how bad the case may be—I will guarantee that 99 per cent will be restored inside half an hour. As soon as it is observed that a man is overcome with gas he should be placed on his feet, and large quantities of milk be given him to drink. He may show a disinclination to swallow; if so, the milk must be forced down his throat. A man should be placed on each side of the sufferer, and he should then be walked up and down. He will want to sit down, but on no consideration should this be allowed. When the patient vomits, more milk must be administered, and when the patient is out of immediate danger, which will be the case inside of half an hour, he should be placed in bed, when a little warm brandy and water may be given. The above is a panacea, and I confidently submit the recipe to any one that is engaged on main or service laying.

A VIENNA doctor has declared that cancer can be arrested by an injection of one of the coal-tar derivatives, methyl violet.

Correspondence.

Pottery Remains in Arizona.

To the Editor of the Scientific American:

Captain MacDonald, U.S.A. (retired), tells me of an interesting experience while campaigning on the desert between the Sierra Tunicha Mountains and the San Juan River in Arizona, near Agua Nigra. The troops marched for several miles along a mesa which was thickly strewn with fragments of Indian pottery. The area covered by this deposit was probably of many square miles. The level of this mesa was high above the level of the water courses, and how such vast quantities of earthenware ever reached this position is a question. The officer's theory was that in bygone times a flood washed out an Indian pottery establishment and brought the fragments to the mesa. The pottery was marked only with red painted squares.

M. Y. B.

San Diego, Cal., August, 1892.

The Mamo.

To the Editor of the Scientific American:

In the issue of June 4, 1892, a quotation is given from the very interesting article of Mr. Lucas on "Recently Extinct Vertebrates," published in the report of the National Museum. The reference to the birds of the Hawaiian Islands is, however, quite incorrect. "The last ornithological collector who returned from the islands found no specimen of the *mamo*," it is true; but there were many other things that he did not find in his short visit. Two years ago three mamo came to the sandalwood tree under which I had pitched my tent in the mountains of Hawaii, and the present summer Mr. Palmer has captured one alive. The Bernice Pauahi Museum has four specimens. The feathers were never used to make war cloaks, and none of these have been made for a hundred years. Their use was in making *leis*, or necklaces, and ornamenting the *alaneo*, or royal mamo robes. There is a very small mamo cape in the British Museum, but none here in possession of royalty. None have been made for seventy-five years, and yet twenty-five years ago mamo were found without trouble in the forests back of Hilo, Hawaii.

The tailless rail is probably extinct, unless the rail from Laysan Island proves to be a mere local variety of this bird. We have in the museum a pair of the rail and a pair of the chaetoptila, and there are several other specimens known. The threatened extinction of the native birds is due to ornithological collectors in part, but the wildcats and introduced mongoose and mina birds do their share in the destruction.

WM. T. BRIGHAM,
Curator B. P. Bishop Museum.

Honolulu, H. I., July 27, 1892.

Patent Law Amendments.

To the Editor of the Scientific American:

The postponement to the next Congressional session of Senate bill No. 3,246 affords opportunity for American inventors everywhere to examine its provisions, and if dissatisfied with either of its eleven sections, to interrogate their representatives in Congress on behalf of such modifications as they may think desirable. Section 1, especially, seems worthy of their attention. Its ostensible purpose is the amendment of Clause 2 of Section 4,887 R. S., by which—as is well known—the duration of a United States patent is made dependent upon that of the earliest expiring previously issued foreign patent for the same invention; but the amendment would seem to leave the most obnoxious features of the clause substantially unchanged. Especially vexatious has the clause proved to the creators of those notable devices which, by inaugurating new arts, and opening up hitherto untrodden fields of industry, constitute, to some minds, the chief justification of the patent system. If, as commonly supposed, our legislators aimed, by the clause spoken of, to confer on their constituencies some kind of advantage over the foreigner, that aim has signally failed. The weapon's recoil has proved far more dangerous than its discharge! Of patent-granting countries, ours is now foremost alike in the liberality of its patent law and in the number and character of its useful inventions.

The sum total of "aliens" prevented from exacting royalties on this side of the ocean is a mere *bagatelle* to the host of American inventors deprived by this ill-advised clause of the considerable revenue that would have been drawn from the foreign user and circulated here; for it is notorious that a large majority of our inventors, rather than jeopardize their home patents, elect to forego the dangerous foreign privilege, with the result that American inventions are generally free to all the world outside of the United States. The present writer believes that the effects of the clause have been only evil, and that continually, and would rejoice to see it expunged from the statute book, or, if that may not be, that *American* ingenuity at least be relieved of this unmerited and impolitic restriction.

GEO. HENRY KNIGHT.

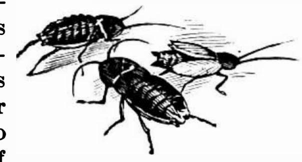
Northampton, Mass., August 12, 1892.

HOUSEHOLD PESTS—WITH SOME HINTS HOW TO GET RID OF THEM.

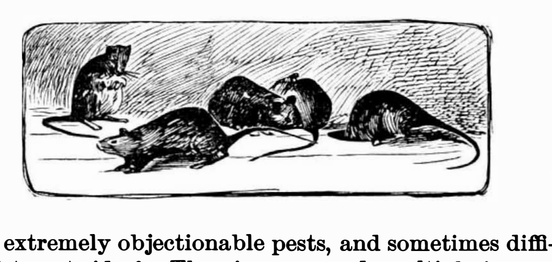
During the season of warm weather there are few houses, especially those in town, that are not invaded by one kind or another of the numerous species of insect life which we consider as household pests, and which often cause much annoyance to the inmates. However vigorous the customary "spring cleaning" indulged in by our housewives may be, these intruders usually manage to make their way in and elude detection. The situation and locality of a dwelling house frequently has a good deal to do with the appearance of these objectionable visitors, and the difficulty is to hit upon the best means of getting rid of them.

Fortunately in this country—mainly owing to its much abused climate—our household pests are not by any means as formidable to deal with as those in tropical countries, where the centipede and tarantula prowl about seeking whom they may devour. Yet at times our own particular pests are quite annoying enough, when they arrive in numbers.

To begin with, the ubiquitous household fly, which breaks its pupal skin on the first approach of warm weather, is a universal intruder. Even churches are not sacred to him. There are two methods of exterminating flies, either by poison or traps; but the latter is certainly the most effective. For this purpose pieces of thick twine or tape, which have been dipped in a sticky, viscid solution or bird-lime, and suspended from the chandeliers or other frequented places, are most effective. The sticky solution can be made by dissolving resin, 10 parts, and gum thus, 5 parts, in 7 parts of linseed oil, by the aid of gentle heat, and allowing to cool, when it is ready for use. This compound may be spread on sheets of waxed paper or plates, which placed about form excellent traps. Then there are the numerous varieties of "fly papers" in use. These are composed of unsized paper soaked in a weak solution of arsenic or quassia wood. An infusion of quassia made by allowing two ounces of the chipped wood to stand in a pint of cold water for a few hours, then decanting the liquid and placing it about in shallow vessels, also answers well. This solution is not poisonous to animals. The destructive moth, which insidiously deposits her larvæ in our furs and upholstery to work havoc therein, may be successfully circumvented by several methods. One of the best preventives is to place small pieces of naphthaline about in likely places for the moth to attack. Naphthaline is a product from the manufacture of coal gas, with a peculiar but not objectionable odor, which soon passes off when exposed to the air. Another popular plan is camphor used in the same way. A still more effective method is to spray benzine, by means of an atomizer, over the furs, etc., before putting away, as it is fatal to the insect in all stages. Care must be exercised when spraying the benzine that there is no fire or artificial light of any kind in the room where it is used, the vapor being highly inflammable. Powdered colocynth forms another excellent exterminator, and the numerous kinds of insect powder when dusted about are also useful. In some parts of England ants are a great source of annoyance when they get into a house. The best plan is, of course, to discover the pests if possible, and exterminate them wholesale. If this cannot be done, the ground flower heads of the *Pyrethrum roseum*, commonly called Dalmatian or Persian insect powder, sprinkled about in their haunts and placed on their track, will drive them away. This powder, which is not poisonous to animals, is extremely useful in destroying all kinds of insect life. Like other things in much demand, it is often adulterated, the best varieties being of a dull, yellow-ocher color.



Cockroaches and black beetles, which infest the lower regions of many houses in enormous numbers,



are extremely objectionable pests, and sometimes difficult to get rid of. They increase and multiply in any place where they can get warmth. Cockroaches will eat away plaster, and often make their way into a house between the flooring and skirting boards. To prevent these insects coming, all such crevices and holes should be carefully stopped up early in the spring. If any intruders make their appearance, ground borax should be plentifully spread round the room and in their haunts. Cockroaches have a great antipathy to borax, and its continued use will effectually drive them away. It also has the advantage of being harmless to domestic animals. Insect powder well sprinkled about is also useful, but as cockroaches have often to swallow a great deal before it proves fatal, any victims found afterward should be swept up and burnt. Several kinds of traps may be utilized, but, as a rule, they are not very successful for any length of time.

Mice often give trouble and do considerable damage when they invade a house. When there are dogs or other household pets about, one of the safest ways of exterminating them is to first lay down some oatmeal mixed with sugar, which will be found to have disappeared by the morning. Then, after this has been done for several nights, mix also a fair quantity of plaster of Paris with the oatmeal and sugar, which will prove too indigestible for Mr. Mouse, and after one meal of the compound he will not require another. Of poisons,

phosphorus paste is probably the safest to use. It should be spread on small pieces of cheese or bread and sugar, and placed about the rooms the mice frequent. A good trap is also effective; and we must not forget the valuable assistance that can be rendered by a good cat, who will always scare the enemy, if he doesn't always catch him.

Fleas are usually brought into a house by dogs, and the best method of getting rid of them is with the aid of good pyrethrum powder, which when sprinkled about will soon drive them away. All beds constructed of wood should be taken to pieces at least twice a year, and the woodwork well brushed over with a solution of bichloride of mercury (1 per cent), which will destroy all germs of insect life, and is a safe and wise precaution. Fortunately we are not much troubled in Great Britain with that irritating and active little pest, the mosquito; but a hint or two how to circumvent her artful little ways (for it is the female mosquito who thirsts for human gore) may be of use to those who travel in warmer climates. The male is said to be satisfied with vegetable juices, and does not accompany his spouse on her bloodthirsty forays. Would that we could persuade her to remain with him! The best preventive against the incursions of this little pest is to sponge over those parts of the body exposed with a five per cent solution of carbolic acid before retiring to rest. This is an excellent plan, and renders one almost proof against attack. A small quantity of carbolic acid or powder evaporized in the apartments they frequent will also drive them away, and a free use of insect powder is another excellent method of expelling the invader.—*C. J. S. T., in Pall Mall Budget.*

Advantages of Fogs.

No less an authority than the president of the Institute of Civil Engineers has declared that the sulphurous vapor produced during the combustion of coal is most beneficial to the health of the inhabitants of London, disagreeable though it undoubtedly is. As many as 350 tons of sulphur are thrown into the air in one winter's day, and the enormous quantity of sulphurous acid generated from it deodorizes and disinfects the air, destroying disagreeable smells emanating from refuse heaps and sewers and killing the disease germs which find their way into the atmosphere. There may be a good deal of truth in this view, but there is undoubtedly another side to the question. It is an old comparison that a doctor and his drugs bear a relationship to the patient and the disease like that of a policeman toward a householder attacked by a garoter. The policeman lays about with his truncheon, sometimes he hits the householder, sometimes the garoter, and the good or ill which results from his interference will depend upon which party happens to get the most and the heaviest blows. This simile is admirably suited to sulphurous acid in London fogs, for although it may be beneficial to the London householders, by destroying microbes, it certainly frequently does them harm by attacking their lungs and bringing on bronchitis and asthma, which sometimes prove rapidly fatal, to say nothing of the minor discomforts of a disagreeable taste, filthy smell, stuffed nose, husky throat, smarting eyes, and headache. We think that, healthy though the London fogs may be, the discomforts they cause are so great that Londoners would be really better without them, and that less disagreeable and equally efficient means might be found to clear the air of microbes, while at the same time these other remedies would be enormously cheaper, for they would not entail the almost complete stoppage of traffic or the enormous expenditure of gas and electric light which a bad fog occasions.—*Lancet.*

Canary Bird Breeding in Germany.

The United States consular clerk at Berlin says that third in money value among the articles exported to the United States from the consular district of Hanover during the last quarter were canaries. For more than a century canary breeding has rendered bare existence a possibility to many poor people in Germany, and has brought a competence to others. Fifty years ago the industry had grown to such dimensions that it became necessary to seek a foreign outlet for the trade. Salesmen were accordingly sent out, first through the Rhine districts, then to Belgium and Holland, and, soon afterward, to England. The German canary dealers soon succeeded in establishing a brisk trade with St. Petersburg, the birds being brought by carrier to Lubec, and thence forwarded by ship to their destination. Encouraged by their success, the German bird dealers, about the year 1850, began making shipments to New York. This proved a very profitable business, and after the introduction of steamship lines, birds were sent to South America and Australia.

Canary breeding in Germany has, from the commencement, been chiefly a home industry of poor people. The principal seat of the industry was formerly the Hartz Mountains, where the poor mountaineers, engaged chiefly in the timber and mining industries, were in great need. Almost every family then had in the sitting room, the bedroom, or the garret a breeding place for their birds. In the summer the food necessary for the birds was easily obtained, and before the winter came the dealer had purchased them. After the Hartz Mountains became more frequented by visitors desirous of benefiting by the pure Hartz air, the poverty of the mountaineers was diminished, and the canary industry fell off more and more. At present only fine singers are bred in the Hartz, and for these the dealer must pay a high price. The industry was then transferred to Eichsfelde, in the province of Hanover, where there are many very poor weavers. Nearly all of these are now engaged in breeding the cheaper varieties of canaries. The industry exists also in the poorer districts of Hesse, in the great Luneburg Moor, in parts of Westphalia, and among the Sudetic Mountains (Erzgebirge) in Saxony. In the fruitful districts of the province of Hanover, where there is not so much suffering, the business is not carried on extensively. In recent years large numbers of birds have been bred in the cities, chiefly as a pastime. The extent of the canary breeding industry is shown by the fact that about 250,000 canaries are bred every year in Germany.

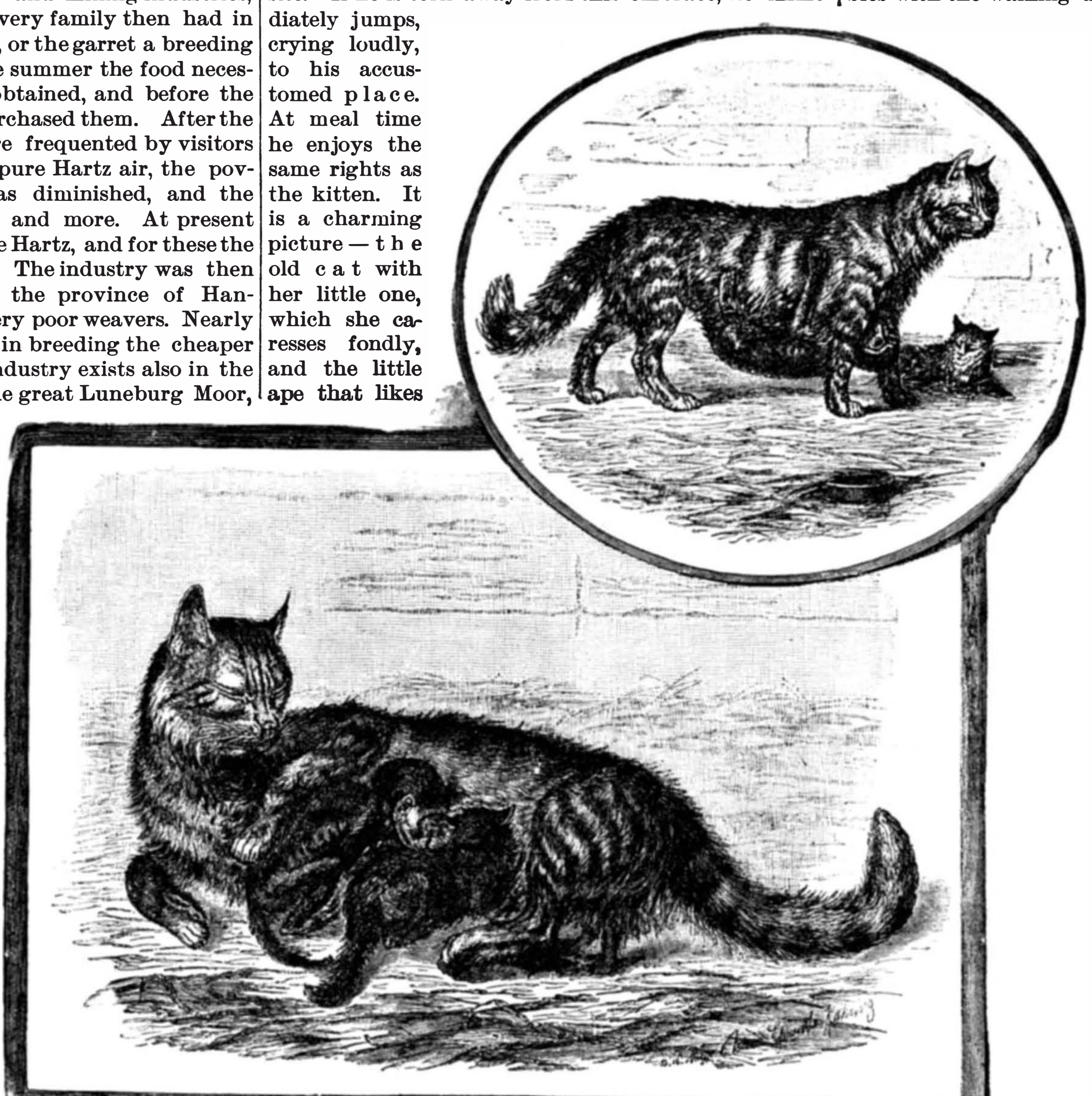
Among the foreign markets the first is the United States, which takes, in round numbers, 100,000 birds annually. Next in importance is the English market, which takes about 50,000 per annum. Then come Brazil, Chile, the Argentine Republic, and Australia. To these countries salesmen are sent with canaries every year. The remaining birds, especially the finer Hartz Mountain birds, are sold in Germany, where more value is attached to fineness of song, and where higher prices can be obtained than anywhere else. The average price for ordinary canaries is from three to four marks for males. Hence the canary industry adds about 1,000,000 marks per annum to the national wealth of Germany, and this amount goes chiefly into the hands of the poorest class. The growth of the industry is said to be due to two causes: (1) The German bird dealers have always been very enterprising, and (2) the canaries bred in Germany are said to sing better than any others. About two-thirds of the canaries exported annually from Germany to the United States are imported by a German resident of New York, whose German home is at Ahlfeld, in the province of Hanover, whither the birds are brought from all parts of Germany. At Braunlage in the Hartz this dealer has a factory which is capable of turning out every day the material for thousand bird cages. This material is given out to the peasants, who make the cages at home. From Ahlfeld the birds are shipped to New York *via* Bremen, accompanied by attendants. Each attendant has under his care about a thousand birds, each in its own wooden cage.

A FRENCHMAN, M. Branbelay, has succeeded in making pearls by simply boring holes in pearl oysters, dropping in minute glass beads, and then hermetically sealing the holes.

A CAT AS FOSTER MOTHER OF AN APE—A PICTURE FROM THE LEIPZIG ZOOLOGICAL GARDEN.

There are plenty of examples in the animal kingdom which prove that most creatures, whether mammals or birds, are capable of conferring their motherly love on the offspring of others as well as on their own. The hen gives the duck that it has hatched the same care that it gives its own chickens, the dog will act as foster mother to a young lion, and the long-eared Egyptian goat as nurse to a young panther. But the exhibition of motherly care to be seen in the well arranged Leipzig Zoological Garden (in charge of Mr. Ernst Pinkert) is new and peculiar, offering a pleasant scene to the lover of animals. A fine, great reddish-brown Angora cat has become foster mother of a very young ape. As the little thing lost its own mother when it was very small and was greatly in need of another nurse, it was given to the Angora cat. The experiment proved successful; the cat received the little orphan affectionately, and cares for it as well as for her own kitten.

The cunning little ape hangs, in the literal meaning of the word, on its tender mother, and is never left by her. Clinging by all fours to the shaggy fur of the mother cat, he accompanies her in all her walks, and the cat is not inconvenienced by her four-legged parasite. If he is torn away from this embrace, he immediately jumps, crying loudly, to his accustomed place. At meal time he enjoys the same rights as the kitten. It is a charming picture—the old cat with her little one, which she caresses fondly, and the little ape that likes so well to lie in her soft, warm fur. When the cat rises she takes her living burden, and walks around, wagging her tail, in the building belonging to beasts of prey in the Zoological Garden. Cats have been known to bring up squirrels, but this is the first time on record that one has acted as mother to an ape.—*Illustrirte Zeitung.*



A CAT AS FOSTER MOTHER OF AN APE—A PICTURE FROM THE LEIPZIG ZOOLOGICAL GARDEN.

The Record of a Walking Delegate.

The case of the Grand Central Hotel, on Broadway, is a typical one, which deserves careful attention. Tilly Haynes, a Boston hotel keeper, some time ago leased the Grand Central and came to New York to expend $100,000 in the work of renovation, of which fully three-fourths was to go for labor. He made terms with his men which were mutually satisfactory. Work had hardly been begun, however, when the walking delegate appeared and demanded that the men should work only eight hours a day instead of nine. Mr. Haynes acceded. A week later the walking delegate came around again and said that some of the carpenters were working for $3.25 a day, and that they must be paid $3.50. This demand also was yielded to. A few days later the delegate informed Mr. Haynes that he had two stairbuilders from Boston, and that, although these men were union men, they could not work unless they had their union tickets changed and paid the fee for working in this city. This trouble was settled by the return of the offenders to Boston.

The next incident is told as follows:

"While the men were at work, the walking delegates entered the building and walked about through it at their pleasure, taking down the workmen's names and asking if they belonged to the union. One of the carpenters replied: 'None of your business.' The next day the delegate met the men when they came to work and told them a strike had been ordered. Some of the men shed tears and said their families were suffering, but all obeyed. Mr. Haynes next received a visit from the Grand Council, who informed him that their delegates must be respected. After consultation the council agreed that the man who had insulted their delegate and the rest of the men might go back to work, but the man must by Saturday become a full member of the union. Notwithstanding this, when the men came to work the next morning, the delegate declared that not one should go to work until the man who had insulted him was discharged. The difficulty was finally compromised by the man being given his wages, in order that he might immediately go and pay his dues and become a member of the union. It was three days, however, before he could get himself into regular standing, and during this time none of the men were permitted to work."

This was by no means the end of Mr. Haynes' troubles with the walking delegate. He had made a contract with a Boston firm to put in some new marble, and on learning this the delegate for the third time made the men quit work, though, upon Mr. Haynes' assurance that no marble from Boston was actually being laid at that time, they were permitted to resume work. Then Mr. Haynes learned that the delegates were going about among the men collecting $1 from each for allowing them to work. When the marble from Boston arrived, the delegates refused to allow it to be unloaded, and when Mr. Haynes sought the protection of the police, the delegates called out all the carpenters and painters. Then the representatives of the steam fitters told Mr. Haynes that he would have to send his engineer back to Boston, and on his refusal the union fitters were made to stop work.

By this time Mr. Haynes decided that he had suffered enough from the tyranny of the walking delegate, and he decided to employ no more men who were the slaves of such delegates. He secured a full force of non-union men, whom he finds better workmen than the union men.—*Iron Age.*

Irrigation.

It has been demonstrated in California that surface irrigation is not the best method for orchards. The system is untidy, wasteful, and causes an unnecessary growth of noxious weeds. It also stultifies the tree growth, causing the roots to form in a ball near the surface. An orchard designed for market fruits should be irrigated by means of underground conduits or cement pipes. These are laid below the freezing point and made of sufficient dimensions to carry the requisite quantity of water within three or four feet of the tree. Small holes cut in the top of the pipes and covered by boxes to prevent the holes filling with earth, allow the water to percolate slowly out from the pipe and moisten the soil at the roots of the tree.

By this method the roots go downward, giving the tree a firmness to resist rain storms and withstand the effects of continued dry weather in case the water supply is temporarily exhausted. This system may be considered expensive, but the additional yield of fruit will justify such expenditure. The field of the future irrigated fruit market will be large enough to justify systematic underground tiling as well as piping. Drainages will be more extensively practiced as the market orchards increase, and although expensive, as it may seem, these orchards will be valuable, dividend-paying properties.—*Irrigation Age.*

RECENT experiments made in Germany go to show that asbestos paper is not only of no advantage in a floor as a protection against fire, but it probably aids the conflagration.

RECENTLY PATENTED INVENTIONS.

Engineering.

ENGINE GOVERNOR.—Martin A. Green, Altoona, Pa. This invention provides an improvement in centripetal governors in which the speed is affected by variations of the operative position of the adjustable valve-acting eccentric. A pivot pin projects eccentrically from the hub of the governor wheel, a rocker plate journaled on the pin being connected with the pivotal governor arms, and the valve pin is eccentrically journaled on the rocker plate, the journal being normally over the axis of the wheel when the governor balls are at their normal innermost position. With this construction the operative mechanism is designed to automatically balance up the necessary overbalance of the centripetal force to make the governor stable.

HYDRAULIC PROPULSION OF VESSELS. —James C. Walker, Waco, Tex. A means of applying the jet principle of propulsion has been patented by this inventor, in which main trunk tubes of tapering shape are arranged lengthwise of the vessel, the tubes being largest at their front open end, and having along their length a series of nozzles opening rearwardly along the side of the vessel, while propeller wheels in the main tubes are adapted to suck water in at the front and force it out through the nozzles against the surrounding water. One set of nozzles may be used independently of the other to facilitate steering, or one set may be arranged for forward and the other for backward movement.

Railway Appliances.

MILEAGE RECORDER.—Harry S. Squires, New York City. This is an automatic device for use on passenger cars to record the number of miles for which each seat is occupied. Electro-magnets controlled from the seats of the car are arranged to actuate a series of levers each carrying a point which marks upon a traveling sheet moved by clock work, a governor actuated from the axle locking the levers in place. When each seat is occupied its connected circuit is closed and the record commences, the circuit being broken and the record ceasing when the passenger rises. The sheets may be changed at the end of each conductor's run and turned in with his report.

TORPEDO CLIP FASTENING.—Will C. Schooley, Braddock, Pa. The securing of torpedoes to the rails to hold them in the path of the wheels of a train is provided for by this invention, the fastening being simple and readily applied, so that the torpedo is not likely to get loose. The device consists of a clip formed of an oblong wire loop, to be bent downward at its ends at opposite sides of the torpedo case, a flexible clip being held in the clip fastening and adapted to be doubled upon the rail. The device holds the parts of the torpedo together in such a way that a small torpedo is designed to make as much noise as a larger one used in the ordinary way.

CABLE RAILWAY.—Samuel D. Root and Gordon C. Vineyard, Anaconda, Montana. This invention provides a simple and inexpensive construction, automatic in operation, for use as a freight line in a hilly or mountainous section. Combined with a main stationary cable inclined in the direction of the grade is a second cable formed in sections, each section inclined in reverse direction to the main cable, with intermediate mechanism, whereby the weighted car is made to carry the empty car to the top of the hill. The main cable and the supplemental cables are held to strut frames by means of peculiarly constructed shoes.

Electrical.

ELECTRIC DOOR OPENER.—Louis Bates, Jersey City, N. J. This invention covers an improvement on a formerly patented invention of the same inventor. When the door is to be unlocked the circuit is closed through magnets held in the lock casing by means of a push button in the ordinary way, and when the circuit is closed an armature is vibrated to strike against the arm of a releasing latch, a locking pawl being released from the main latch and held in this position until the door is pushed open.

Agricultural.

CULTIVATOR.—Augustus Tindall, Brenton, Ill. This is an implement of simple, strong and inexpensive construction, in which the blades may be quickly and conveniently raised and lowered. Its construction is such that there may be used, in conjunction with the shank of the cultivator blade, a removable and adjustable colter wheel, capable of being placed at any desired inclination with respect to the blade, the blade being so made that its point is removable and reversible. The colter may be adjusted at any angle with reference to the shank or to the blade, and is laterally adjustable to and from the heel of the blade.

Mechanical.

SAW SET.—William M. Greilick, Sutton's Bay, Mich. The frame of this device is in the shape of a standard or block adapted for attachment to a bench, a gauge being held horizontally on the frame, on which also is seated a sleeve in which is held a horizontal arm with a lug opposite the set block, there being a key and plates for adjusting the arm vertically, while a punch slides vertically in the sleeve above the set block, and plates are provided for adjusting the punch laterally.

OILER FOR HAND SAWS.—Seth Parmele, Portland, Oregon. This is an attachment to be placed on the saw blade near the handle, by means of which oil may be ejected at any time upon the blade when it sticks while the work of sawing is being done. The oiler extends on each side of the blade, and rests partly on the top of the handle, and it has a circular flexible diaphragm at each side similar to the bottom of an ordinary oil can, and a forward and downwardly projecting nozzle on each side, through which the oil is ejected by pressing upon the diaphragms.

WOOD CARVING MACHINE.—William R. Snyder, Royer's Ford, Pa. This machine has a platen supported on a laterally movable frame, and adjustable to incline it from a horizontal plane and also rotatably and reciprocally adjustable, an arbor being rotatably supported above the platen and adapted to swing orbitally, with cutter adjustable thereon, while there is a turntable support for the arbor, with means to move the turntable and mechanism to effect the rotation and longitudinal adjustment of the arbor. The machine is designed to facilitate the rapid and secure execution of intaglio carving upon a surface of wood or other material, without requiring an outline of the design on the surface to be carved.

CENTERING DEVICE. — Fredrick L. Canham, Lisbon Falls, Me. This is an improved apparatus for use in finding the center of regularly or irregularly shaped ends of pieces of wood or metal bars, etc. In the slotted top of a frame is held an adjustable head carrying a center on the end of which is a funnel held in outermost position by a spring, and directly opposite is similarly arranged another funnel, the outer end of the head being pivotally connected with a lever. An article placed between the funnels assumes a central position, and is thus held.

FELTING MACHINE.—Julius Kittel, Cranford, N. J. This machine is specially designed for making felt to be used in the manufacture of piano hammers, the invention being embodied in a perforated steam drum covered with burlap and means for feeding the felt material. The burlap is sufficiently rough to enable it to take up the felt material fed on to the drum and hold it securely for the required time, the steam passing through in sufficient quantity to merely moisten the material as required to produce good felt.

HAIR CURLING MACHINE.—Junius A. Murphy, New Orleans, La. This machine has an axialy bored cylindrical curling head having its front end formed into a spiral face, and having a cast-off point at the forward terminal of the spiral face, there being a spiral groove between the point and the face. The machine is designed to take the place of hand work by mechanically curling or kinking hair.

EXTENSION SHOE LAST.—James H. Livermore, Port Townsend, Washington. This last is preferably made of metal, and has a detachable toe or sole portion, in the center of which is an elongated slot through which is passed the head of a connecting bar, the rear end of which extends into a hollow heel portion of the last. The connecting bar has on its upper face a series of graduations, and the parts may be readily locked in place in such position as desired.

PITMAN.—Philip Y. Barber, Sharp's Wharf, Va. This is a device more especially designed for use on mowers, reapers, etc., and is of simple and durable construction and arranged to relieve the wrist-pin of all turning or twisting strain. The head, in the free end of which screws a sleeve or tube, is pivotally connected with the actuating crank disk, and a rod pivotally connected with the device to be driven has a reduced part extending through the sleeve, a nut holding the rod in position on the sleeve, but so as to permit its turning.

DIFFUSION APPARATUS.—Samuel Faron, Pahala, Kau, Hawaii. The cane juice is extracted from the sugar cane, according to this invention, by subjecting the cane to the pressure of successive sets of rolls, and the light or thin juice obtained by the last set of rolls is carried back and mingled with the denser and heavier juice extracted by the first set of rolls. A series of mills is connected together by elevators and troughs, but one pump being required and the usual separate tanks being dispensed with.

Miscellaneous.

CLOTHES PIN.—John W. Cook, Harrisburg, Oregon. This clothes pin is formed of a length of wire bent between its ends to form near its middle a number of clasps, and also provided with a bearing to run upon a supporting line and a guide opening for a pulling cord. A number of the pins are supported to move upon a line, upon which the pins and garments are drawn out the garments being connected together by the pins, so that the line can be filled without moving from one place, and can be stretched over any kind of ground.

GATE.—George Ford, New Harmony, Ind. This invention relates particularly to gates known as "hand lever openers," and provides certain improvements whereby the gate may be opened and closed from one side by a single lever. The gate may be opened by one in a vehicle or on horseback, approaching from either side, by pulling down upon a cord attached to a lever, and the invention covers various novel features of construction and arrangement of parts.

COMPOSITION FOR DOLLS.—Solomon D. Hoffmann, Moscow, Russia. The heads, feet, and lower limbs of dolls are constructed, according to this invention, of a composition of glue, glycerine, zinc oxide, and other ingredients, and a novel manner of making the mask and covering it is also provided, the mask being very light, practically indestructible, and slightly elastic.

DESIGN FOR A SPOON.—George P. Tilton, Newburyport, Mass. This design embodies a border ornamentation, of which the primary element is the rose, the stems forming scrolls, while the reverse of the spoon is free from roses and the foliate scrolls are plain, the back of the bowl having an ornamental figure.

DESIGN FOR A SPINNING TOP.—Albert J. Huntoon, Kansas City, Mo. This design presents a novel configuration and ornamentation, the body of the top being hexagonal, and its faces embellished to simulate the sides of dice.

DESIGN FOR A BAKING PAN.—George B. Gifford, Albany, N. Y. This pan has an essentially square, high cover, with paneled sides and handles on its ends, the cover fitting loosely within the flaring side walls of the base portion or pan proper.

ELEVATOR.—William N. Anderson, San Rafael, Cal. A light, durable, and non-combustible door for closing the well of an elevator is provided by this invention, in connection with a simple mechanism by which the movements of the elevator cage will automatically open and close the doors. A vertically swinging door adapted to swing across the well has a segmental rack, and vertically sliding rack bars extending above and below the door at its hinged edge are both geared to the segmental rack, the arrangement being such that one rack opens the door when the cage ascends and the other opens it as the cage descends.

BRICK KILN.—Simon Dewhirst, St. Joseph, Mo. This kiln has in its side walls a series of combustion chambers leading into the interior above the floor, and a series of furnaces arranged on the outside, each furnace communicating with a combustion chamber and each being provided with a separate combustion chamber opening into the interior of the kiln above the first combustion chambers. The invention covers an improvement on a former patented invention of the same inventor, the design being to utilize the fuel in the best possible manner and obtain a uniform heat in all parts of the kiln.

TYPEWRITING MACHINE.—George M. Beerbower, Washington, D. C. The printing of the date, address, signature, etc., upon the paper by the movement of a single key lever is provided for by this invention, the words, figures, etc., being readily changed as may be desired, thereby saving a great deal of time and labor. The invention consists essentially of a type bar or lever carrying the necessary removable interchangeable types, in combination with a supplemental open frame attached to the end of the main frame of the machine, the type bar or lever being pivoted between inwardly curved arms of the frame.

WINDOW.—Robert H. White, Madison, Ind. This invention provides novel and inexpensive appliances to allow the upper and lower sash to be separately or together rocked and placed at any desired angle of inclination, permitting the sashes to slide in their guides while inclined, while also affording means to lock both sashes closed.

FIRE ESCAPE.—George L. Roberts, Grand Rapids, Mich. This is the invention of a fireman and engineer of many years' experience. It is a device adapted for extension upon a fixed rail from the exterior of a building, where it may be moved sidewise to any desired point, affording means for the quick and easy descent of a large number of inmates, at the same time affording the firemen means of access to the fire. A pendent movable ladder-supporting frame is supported on rollers from the rail, and the descent of the ladder is effected by the weight of persons stepping upon its platforms, proper checking devices being provided to prevent a too rapid descent.

CEMENT MILL AND FURNACE.—Henry H. Bourne, Trinidad, Col. This is a combination construction designed to be readily transported from place to place, and be very effective in operation. The casing has a transverse partition forming a mill compartment and a furnace compartment, a smoke stack extending centrally from the partition to connect with the outlet of the furnace, while an agitator in the mill compartment is mounted to turn on the smoke stack. The upper end of the casing is open, so that the material to be treated can be readily thrown or dumped into the mill compartment.

PACKAGE CARRIER.—Frank H. Palmer, Brooklyn, N. Y. A grooved handle, adapted to receive the binding strings of a package, and to hold them in such manner that they are not likely to become detached, is provided by this invention. A transverse groove is formed at its opposite sides with under cuts, and a diagonal groove leads to the transverse groove. The device is very inexpensive, may be quickly applied, and prevents the cutting of the fingers by the strings in carrying packages.

UNICYCLE.—James Imlah, Barre, Vt. This vehicle has a non-rotating inner wheel formed with a suitable framework and a double rim connected with a framework in which the rider's seat is held, the two rim parts engaging ball bearings in an inner annular flange connected by spokes with the tire of an exterior wheel. The machine is designed to be readily manipulated for steering and propelling purposes, while being adapted for travel at a high rate of speed.

MOTOR SPRING FORK FOR BICYCLES.—William Lynch and Eugene Tremper, Wallkill, N. Y. This is a fork of simple construction designed to act as a cushion for the rider when the wheel is passing over an obstruction or over rough ground, also acting as a motor to propel the wheel forward when an obstacle is met. It is made in two sections, the upper one yoke-shaped and the lower one comprising two bars pivoted to the members and adapted for attachment to the axle, there being power connections between the lower section and the wheel, stop devices at the junction of the two sections, and a spring connecting the two sections.

BOOK MAILING ATTACHMENT.—Chas. S. Hardy, San Diego, Cal. A permanent fly leaf is attached to the cover of a book, to be shut within or turned outward around the book as an attached mailing sheet or wrapper, to be sealed or otherwise fastened and having on its exposed surface the owner's name and address, etc. The invention is also applicable to various articles or packages, legal and other documents, but is mainly designed for books, as pass books, bank books, etc.

TOBACCO PIPE.—Thomas T. Ely, West Paris, Me. Suspended in the bowl of this pipe is a sheet metal tobacco-holding cup, there being side perforations near the top of the cup, and an air passage between the cup and bowl from these perforations to the stem. Within the cup is a diaphragm resting upon a spring, which is pressed down when the pipe is charged with tobacco, the spring raising the diaphragm as the smoking proceeds. With this form of pipe the smoke is not drawn through the nicotine deposited by the tobacco, but is drawn through the perforations of the cup near the top of the burning tobacco.

AWNING.—Bernard Branner, New York City. This device is designed to permit an ordinary window shade to be utilized as a part of a door or window awning when desired, and it may also be used as an interior screen for a window or door. It consists of two triangular wings of flexible material, a stretcher rod being secured to the lower end of each wing, the upright edges of the wings being connected to the window casement, while a hook extended from each stretcher rod at its outer end interlocks with a staple or screw eye on the lower part of the awning.

VENETIAN BLIND.—James K. Benway, Albany, N. Y. This invention relates particularly to the pulleys over which pass the cords for raising and lowering the slats, the pulleys being so improved that the slats will respond to the cords more smoothly and with precision, and the hangers of the pulleys will be prevented from marring the bars from which they are suspended.

EXTENSION GUN STOCK.—Erastus Jones and Ralph Townsend, New York City. The back plate and the stock are so made, according to this invention, that the plate may be carried to and from the end of the stock to form an extension of the latter. Between the stock and the plate is a spring cushion, adapted to counteract the recoil of the gun, and the connection of the stock with the plate is such that the latter may be conveniently adjusted to the marksman's shoulder.

RADIATOR.—George E. Longard, Halifax, Canada. This is an improved radiator of simple and durable construction, very ornamental in appearance and adapted for both steam and hot water heating. The headers form top and bottom girders for the pipes, and each of the tubes is formed with a recess adapted to be covered on the outside by a removable metallic screen fitted into the front of the pipe.

SKIRT SUPPORTER.—Georgia V. Smith, Princeton, Ill. An elastic band is provided with a lever-like spring clasp at one end for engaging the other end of the band, and a cord is secured to the clasp to support and hold the band in position on the wearer. This supporter, by reason of its elasticity, will not permanently crumple or crease the skirt, and may be conveniently adjusted or removed by the wearer while on the street.

DESK ATTACHMENT FOR CHAIRS.—Milton C. Hutton, Georgetown, Texas. This attachment may be applied to desks and other articles of furniture as well as chairs, affording a desk or table which may be adjusted toward the person or vertically, means being also provided whereby a book or other object may be prevented from slipping off from the table. Each end of the board constituting the top of the table is provided with different means for attaching it to an article of furniture.

DRAUGHT EQUALIZER.—Erastus Roadifer, Carpenter, Ind. This invention relates to a three or four horse evener, to be used on any machinery or vehicle where it is desired to apply extra power on one side of the center of the draught, but being especially useful on reaping and mowing machines. The construction is such that if the three horses on one side get ahead, the swing of a specially arranged lever throws them further away from the tongue, instead of allowing them to crowd over upon the single horse.

FRUIT JAR.—Charles L. Wight, Mahukona, Hawaii. This is a knock-down jar, its bottom having marginal grooves and intersecting sockets, the cover having similar grooves and holes, the corner posts also having longitudinal grooves and end tenons to enter the base and cover sockets, while the side panels have top and bottom edges to fit the base and cover grooves, and the vertical edges fit the post grooves. This jar may be made of wood and glass, or other suitable material.

ANIMAL TRAP.—Edwin R. and Charles W. Knecht, Shelbyville, Ill. This is a trap to catch small animals, such as rats and mice, and is so made that the animal passing in one end can see through and out at the opposite end, entering either end and perceiving the bait from any portion of the trap. But the bait cannot be taken, the animal approaching it being dropped into a lower prison compartment, to be removed at will.

DESIGN FOR A CARRIAGE BODY.—Aaron T. Demarest, New York City. This design relates to the contour and decoration of coupes, and its main feature consists in the sweep or curvature of the lines of the body at the margins and between the margins as viewed from the side.

DESIGN FOR A BROOCH PIN.—Thomas Tugby, Niagara Falls, N. Y. This pin has something the appearance of an insect having a shell with an oval back and projecting head and horns, and the construction of the pin is strong and simple.

NOTE.—Copies of any of the above patents will be furnished by Munn & Co., for 25 cents each. Please send name of the patentee, title of invention, and date of this paper.

NEW BOOKS AND PUBLICATIONS.

MINER'S POCKETBOOK. By C. G. Warnford Lock. New York: Spon & Chamberlain. 1892. Pp. xvi, 472. Price $5.

This comprehensive little work touches on all topics connected with mining, from the blasting and shaft sinking operations, lighting of mines, treating of ores and similar subjects, to the assay of ores, mine surveying, geology and the properties of metals. A glossary, list of useful books and a comprehensive index are also embodied in the work.

THE ARITHMETIC OF ELECTRICITY. By T. O'Conor Sloane. New York: N. W. Henley & Co. 1892. Third edition revised. Pp. 138. Price $1.

We have already reviewed "The Arithmetic of Electricity" in these columns. The best testimony of the nature of its reception by the public is the early issuing of a third edition. The object of the work is to give a practical review of the mathematics of electricity within the scope of those who are not conversant with algebra and the higher mathematics. It comprises a large number of rules, illustrated by one or more examples each, while, in order to remove from it anything of the empirical aspect, a chapter is devoted to demonstrations of the rules which require it.

PRACTICAL CARRIAGE BUILDING. Compiled by M. T. Richardson. Vol. II. New York: M. T. Richardson Co. 1892. Pp. 280. Price $1.

Previous works have been published by this company on allied topics to the present. The exceedingly practical aspect of the volume under review, with its numerous illustrations, nearly 300 in number, and the eminently clear and simple way in which the matters are expressed, give the work distinctive value. Besides practical notes on the mechanical details of wheels, the use of tools, and the draughting of carriages, the construction of different types of wagons is given in detail. Throughout the work a plea for good workmanship is made.

DYNAMOMETERS AND THE MEASUREMENT OF POWER. By John J. Flather. New York: John Wiley & Sons. Pp. vi, 215. Price $2.

At the present day, when the measurement of power is so often required and when the indicated horse power alone is not accounted sufficient for the engineer's use, a work on dynamometers is peculiarly timely. It is sufficient to say of Professor Flather's book that it covers the ground indicated by its title very satisfactorily and that numerous illustrations elucidate the text where such is required. Brake tests receive in it very full attention.

THE JEWELER'S ASSISTANT IN THE ART OF WORKING IN GOLD. By George E. Gee. London: Crosby Lockwood & Son. 1892. Pp. xxiv, 238.

The properties of gold, its precipitation in waste solutions, its colors, mixing and melting, dry and wet coloring, casting and the various kinds of gilding operations, practical manipulations of articles of plate and jewelry, alloys of bullion and imitations, with numerous receipts and practical hints and exhaustive tables of gold values and alloys, are the topics treated in this book. It would seem evident that it should recommend itself to all workers in the precious metals, professional and amateur. The work is written for the advanced workman of every branch, as well as for the employer, and the preface states that almost everything in the work has been put to the test by the author himself.

Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information and not for publication.
References to former articles or answers should give date of paper and page or number of question.
Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.
Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.
Scientific American Supplements referred to may be had at the office. Price 10 cents each.
Books referred to promptly supplied on receipt of price.
Minerals sent for examination should be distinctly marked or labeled.

(4500) J. L. writes: I have a large looking glass and the quicksilver is spotted. Can you advise what will remedy the trouble? A. No effectual way of repairing a looking glass so damaged is known. Fragments of the amalgam can be loosened from pieces of looking glass by a drop of mercury, and the amalgam can be slid off and dropped upon the worst spots, but your chances of effecting a good repair are doubtful. If the mirror is a silver-plated one, the above treatment is useless. You may then succeed in replating by some of the well known silvering processes.

(4501) B. A. H. asks: Will a bell that is struck on the inside give out any more sound than if struck on the outside? The bell not to swing in either case. A. The manner of arranging the hammer stroke on large bells is a matter of safety and convenience. The outside stroke gives the strongest tone and the bell is less liable to crack. It will stand the strongest hammer stroke on the outside. The inside stroke should be avoided, save in swinging bells, where it is necessary.

(4502) A. W. H. asks how the air brake is applied to a train. That is, how is the pressure obtained? A. The air brake is worked by compressed air in a cylinder under the car. An air pump on the locomotive furnishes the compressed air through pipes under the cars. This air is forced into air receivers under each car. The compressed air is kept from entering the brake cylinder by a valve which is only kept closed by the compressed air with which the pipes are filled when the brake is off. To apply the brakes the engineer simply allows this air to escape from the pipes, when the valve on each car opens communication between the air receivers and the brake cylinders.

Communications Received.

Criticism of Animal Drawing. By W. P. Webster.—An Electrical Cabinet. By F. B. Widemayer.—On Aerial Navigation. By C. S. Remington.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

August 16, 1892,

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Packing, rod, C. L. Cook ... 481,105
Paper holder, toilet, J. M. Keep ... 481,034
Paper jogger, R. A. Hart ... 480,768
Paper making machine, E. E. Johnson ... 480,770
Pen, fountain, W. W. Stewart ... 480,751
Pen, fountain, L. B. Woolfolk ... 480,800, 481,090
Pencil, C. W. Boman ... 481,100
Pencil or other article of fibrous material, lead, B. B. Goldsmith (r) ... 11,259
Pencil pointer, F. E. Flagg ... 481,018
Pencil sharpener for school slates, W. D. Black ... 481,097
Piano action rail, J. W. Reed ... 480,829
Pianoforte damper action, Richardson & Dyer ... 481,121
Picture frame, J. Mauerhofer ... 480,953
Picture frame fastener, C. F. Naegele ... 481,117
Pipe coupling, flexible steam, J. E. Marble ... 480,875
Pipe coupling, valved, E. Bartholomew ... 481,130
Pipe threading machine, D. O. James ... 480,871
Pipes, protecting thimble for steam or heating, S. Vanstone ... 481,126
Pneumatic or other dispatch systems, automatic receiver for, A. Bryson, Jr ... 480,805
Poles, detachable step for, V. A. Thomas ... 480,977
Press. See Bag bundling press. Baling press. Brick press. Hay press. Oil press.
Pressure brake, fluid, G. A. Boyden ... 481,135
Pressure indicator, electrical, J. W. Howell ... 480,947
Printing machine, W. Scott ... 480,970
Projectile for small arms, compound, M. Tweedie ... 481,081
Propeller, L. Gayon ... 480,945
Propelling boats, means for, A. M. Haswell ... 481,113
Protector. See Book cover protector.
Puller. See Nail puller.
Pump, O. Brunler ... 480,707
Pump, M. M. Grove ... 481,022
Pump, E. D. Middlekauff ... 481,043
Pump, oil well, G. Allen ... 480,701
Pump or compressor, fluid, J. J. Duffy ... 480,811
Pump rod, elastic, W. C. Westaway ... 480,756
Puzzle, C. Wolf ... 480,983
Rack. See Horseshoeing rack.
Rail brake, C. W. Howlett ... 481,029
Railway, electric, R. M. Hunter ... 480,850
Railway gate, M. B. Mills ... 480,955
Railway joint chair, T. Sayers ... 481,122
Railway rail chair, B. Jennings ... 481,032
Railway rails from spreading, device for preventing, J. H. Burns ... 480,998
Railway switch, A. A. Strom (r) ... 11,261
Railway switch signal, F. M. Nye ... 480,825
Railway tracks, device for illuminating, W. E. Ferguson ... 481,016
Railway trains, electric control of, R. C. Sayer ... 481,062
Railway vehicles, guard shoe for, H. L. Simmons ... 481,068
Razor, F. A. Clauberg ... 480,916
Razor sharpening device, E. A. Sutphen ... 480,976
Reflector, side, C. E. Plumtree ... 481,055
Refrigerating machine, C. F. Miller ... 481,146
Register. See Cash register. Miner's register.
Rheostat, E. Weston ... 480,892, 480,893
Ring traveler, A. F. Bentley ... 481,131
Rivet, J. L. Thomson ... 481,123
Rivet, J. J. Unbehend ... 481,125
Rod. See Gun rod.
Roller. Disintegrating roller.
Rolling mill, universal, A. Reese ... 481,058
Roof, portable, J. H. Rice ... 480,859
Rope clamp, R. M. Downie ... 480,810
Rotary engine, H. Betten ... 481,096
Saddle, harness, J. G. & H. Bruggeman ... 480,996
Saddle, side, Smith & Mayhew ... 481,073
Safe, T. M. Brintnall ... 481,137
Safety switch, Turner & Grant ... 481,153
Sash balance, H. P. Cayce ... 481,103
Sash balance, J. P. Magney ... 481,145
Saw handle, J. Neimeyer ... 480,856
Screen. See Window and door screen.
Seaming machine, G. F. E. Kanzleiter ... 481,033
Seat. See Tilting seat.
Sewing machine, shoe, J. A. True ... 480,882
Shaft coupling, C. W. Barnaby ... 481,092
Shaft, vehicle, G. A. Fraas ... 480,869
Sheaf carrier, W. A. Kirby ... 481,144
Shears. See Animal shears.
Sheet metal, forming hollow balls, etc., from, J. Burkhardt ... 480,708
Shopping bag, lady's, H. C. Milligan ... 481,116
Shutter fastener, G. H. Glad ... 481,111
Signal. See Railway switch signal. Train signal.
Sliding gate, M. L. Walters ... 480,755
Snap hook, J. A. Traut ... 480,792
Snap switch, F. D. Goold ... 480,722
Snap switch, J. Hutchinson ... 480,948
Snatch block, A. C. French ... 481,020
Soap, H. J. & G. F. Ecker ... 480,840
Soda ash, apparatus for reclaiming, L. D. Armstrong ... 480,702
Spindle. See Spinning and twisting machine spindle.
Spindle support, H. F. Woodmancy ... 480,985
Spinning and twisting machine spindle, H. F. Woodmancy ... 480,984
Spring. See Bicycle saddle spring.
Springs, shackle for coupling, C. E. Dobbins ... 481,107
Sprinkler system, W. C. Shaffer ... 480,747
Stamp, coin-actuated, Rosenbaum & Neubert ... 480,966
Stamp, registering, Rosenbaum & Neubert ... 480,965
Stamp, registry, F. A. Lovecraft ... 480,819
Stamp shoes, die holder and die for making, J. Wilson, Sr ... 481,087
Standard, L. T. Stanley ... 480,749
Steam boiler, F. T. Stevens ... 480,880
Steam engine, Henderson & Phelps, Jr ... 480,946
Steam generator, H. Goering ... 480,719
Steam generator, G. W. Sloane ... 480,963
Steam trap, W. C. Baker ... 481,098
Steamer, lawn, or invalid chair, D. Parks ... 481,119
Stone and ore crushing machine, E. H. Booth ... 480,761
Storage battery, E. P. Usher ... 480,883, 480,885
Stove attachment, W. Price ... 480,828
Stovepipe coupling, F. P. Hart ... 481,026
Street sweeper, H. F. Palmer ... 481,054
Supporter. See Garment supporter.
Supporting fixtures, device for, J. T. Robb ... 480,744
Surface gauge, C. Neri ... 480,959
Surgical appliance, J. A. Vance ... 480,911
Switch. See Railway switch. Safety switch. Snap switch.
Syringe and air cushion, combined fountain, J. F. Schan ... 480,785
Table. See Wall table.
Telegraph key and circuit closer, combined, W. F. Lott ... 481,114
Telephone, F. H. Brown ... 481,138
Telephone, E. Noriega ... 481,049, 481,051
Telephone, mechanical, W. J. Bowen ... 481,133
Tent, G. N. Duncan ... 481,014
Thill coupling, W. H. Hannan (r) ... 11,260
Thill coupling, J. A. Kirby ... 480,772
Thill coupling, H. A. Sevigne ... 481,064
Tilting seat, S. W. Peregrine ... 480,961
Time indicating apparatus, electric, E. Weston ... 480,890
Tin can or receptacle, W. Pratt (r) ... 11,264
Tin plate, recovering tin from, M. R. Garcia ... 480,920
Tire, bicycle, A. A. & H. C. Kupfer ... 481,038
Toothed wheel, J. Lindsay ... 480,930
Top, spinning, F. M. Idle ... 480,817
Toy game apparatus, G. Hill ... 480,725
Toy or puzzle picture and producing the same, transparent, W. Grune, Sr ... 481,023
Train signal, electric, G. Merritt ... 481,042
Transplanting machine, plant, G. S. Gundersen (r) ... 11,262
Trap. See Steam trap.
Trolleys, guide for replacing electric, C. Fortin ... 480,766
Trucks, corner structure for, E. Dietz ... 480,716
Trucks, means for radiating car, H. Resley ... 480,830
Truss, J. A. Marvin ... 480,775
Turbine wheel, J. C. Lansing ... 480,929
Turret clamping device, F. H. Richards ... 480,962
Turret mechanism, F. H. Richards ... 480,964
Twine making machines, automatic feeder for, G. A. Lowry ... 480,873
Type plate and blank for the same, Morse & Chase ... 480,933
Valve, Case & Hendrick ... 481,001
Valve, air brake, G. A. Boyden ... 481,134
Valve, boiler blow-off, C. J. Gustafson ... 480,723
Valve, combined intercepting and reducing, J. Player ... 481,148
Valve, compound engine, J. Player ... 481,057
Valve for automatic air brakes, G. A. Boyden ... 481,136
Valve gear, F. E. Smith ... 481,072
Valve, slide, A. T. Doyle ... 481,013
Vehicle box, D. R. Couch ... 480,764
Velocipede, M. J. O'Donnell ... 481,118
Velocipede, H. S. Owen ... 481,053
Velocipede, M. E. Slocum ... 481,070
Ventilating sewers, etc., appliance for, R. McKenzie ... 480,958
Vessels, covering for false bottoms of, A. McDougall ... 480,823
Voter's compartment and shelf, Hinkley & Welch ... 480,925
Wagon frame, A. G. Turner ... 480,980
Wall table, G. W. Curtis ... 481,008
Washer. See Window washer.
Washing machine, M. Burgess ... 481,102
Washing machine, G. A. Coffee ... 481,003
Watch, stem winding, F. Frey ... 480,814
Water elevating and conveying apparatus, V. Boatwright ... 481,099
Water heater, R. F. Walsh ... 480,913
Water wheel, W. G. Spencer ... 481,074
Water wheel, W. W. Tyler ... 480,753
Weighing machine, automatic, J. B. Stoner ... 480,752
Weighing machine, grain, G. W. Wakefield ... 481,084
Welding and heating apparatus, arc, Unwin & Howard ... 480,794
Welding, electric, H. Howard ... 481,030
Well drilling machine, J. Gardner ... 480,906
Well packer, I. N. Hoadley ... 480,926
Well sinking machine, Chapman & Hunt ... 480,904
Wheel. See Car wheel. Elastic wheel. Fifth wheel. Hoisting wheel. Toothed wheel. Turbine wheel. Water wheel.
Whiffletree, W. F. Henry *et al.* ... 481,028
Whip socket, H. E. Schreader ... 481,063
Wind wheel governor, automatic, J. H. Berky ... 481,095
Window, J. W. Cooper ... 480,806
Window chair, A. Boettcher ... 480,991
Window frame, Mesker & Arbegust ... 480,908
Window frame and sash, J. Anderson ... 481,091
Window or door screen, C. J. Shirreff ... 481,066
Window washer, rotating, H. B. Davis ... 481,140
Woodworking machine fence, Bugbee & Danner ... 480,962
Woven fabric, I. McCallum ... 480,855
Wrench, R. Belles ... 480,801
Wrench, Gillespie & James ... 481,110
Zither attachment, Stark & Gutter ... 480,750

DESIGNS.

Badge, L. Reichert ... 21,779
Carriage step, W. R. Wilson ... 21,780
Lamp, carriage, M. L. De Voursney ... 21,778
Spoon, J. C. Badger ... 21,777

TRADE MARKS.

Apparel, outer and underwear, bedding, and the materials of which they are made, wearing, Dr. Jaeger's Sanitary Woolen System Company ... 21,639
Battery compounds, Wright Universal Electric Company ... 21,611
Beer, Conrad Seipp Brewing Company ... 21,638
Beer, lager, Fred Krug Brewing Company ... 21,620
Biscuits, crackers, wafers, cakes, and similar articles, Hitchner & Co ... 21,608
Bitters, R. P. Burwell ... 21,637
Boots and shoes, leather, Solid Oak Shoe Co ... 21,645
Boots and shoes of all kinds, C. A. Raymond ... 21,636
Cheese, McCord, Brady Company ... 21,621
Cigars and cigarettes, F. Hilson Company ... 21,606
Collars and cuffs, waterproof, Celluloid Company ... 21,619
Compound for the cure of rheumatism and rheumatic gout, R. T. Lassiter ... 21,631
Disinfecting paper, A. Ponsot ... 21,635
Douche, nose and throat, W. C. Downey & Co ... 21,628
Edge tools, H. C. Marshall ... 21,622
Facing, skirt, Meyerhof, Marx & Simonsen ... 21,642
Food for animals, prepared, Pratt Food Company ... 21,632
Food for poultry, prepared, Pratt Food Company ... 21,633
Food, prepared poultry, Pratt Food Company ... 21,634
Lamp and accessories pertaining thereto, Clark Bros. Lamp, Brass, and Copper Company ... 21,648
Laxative, P. Steinhart ... 21,615
Lotion for the complexion, Sylvan Toilet Co ... 21,617
Medical compound for external and internal use for skin and blood diseases, E. McFarland ... 21,640
Medical compound for the cure of lung and throat diseases, Vapo-Cresolene Company ... 21,647
Medicated cotton, J. W. Johnson ... 21,629, 21,630
Medicinal sirup, W. H. Winslow ... 21,649
Oil fabrics, Lyon, Hall & Co ... 21,614
Packings, flange, A. W. Case ... 21,605
Paper, blotting, Eaton, Dikeman & Co ... 21,612, 21,613
Remedy for rheumatism, H. S. Searle ... 21,616
Saws of all kinds, E. C. Atkins & Company ... 21,623
Sheet metal ware, enameled, H. Aich ... 21,624
Shoes, C. Treadwell ... 21,646
Snuff, Bruton & Condon ... 21,604
Soap, toilet, Sylvan Toilet Co ... 21,618
Sodawater preparation, W. A. Henninger ... 21,607
Tonic, liver, H. M. Henderson ... 21,641
Tonics, E. Salbey ... 21,644
Umbrellas and parts thereof, Samuel Fox & Company ... 21,643
Varnishes and japans, National Varnish Company ... 21,610
Watches and portable clocks, W. C. Ball ... 21,625, 21,626
Wine, bitter, J. Kolin ... 21,609
Wines, vegetable ferment for the manufacture of, F. Chavauty ... 21,627

A printed copy of the specification and drawing of any patent in the foregoing list, or any patent in print issued since 1863, will be furnished from this office for 25 cents. In ordering please state the name and number of the patent desired, and remit to Munn & Co., 361 Broadway, New York.

Canadian patents may now be obtained by the inventors for any of the inventions named in the foregoing list, provided they are simple, at a cost of $40 each. If complicated the cost will be a little more. For full instructions address Munn & Co., 361 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

Inside Page, each insertion - - 75 cents a line
Back Page, each insertion - - - - $1.00 a line

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

BASE BALL.—A DESCRIPTION OF the great national game of the United States, by an English writer, Jno. Newton Crane, with diagram of the field and 7 illustrations of players. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 693. Price 10 cents. To be had at this office and from all newsdealers.

ARTIFICIAL INCUBATION.—A DEscription of the French process of raising chickens. With 7 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 778. Price 10 cents. To be had at this office and from all newsdealers.

THE COMPASS.—BY CAPT. D. WILson-Barker, Lieut. R.N.R. A valuable paper on this instrument from a historical, theoretical and practical standpoint. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 859. Price 10 cents. To be had at this office and from all newsdealers.

A NEW EDITION OF
The Scientific American Reference Book

This attractive little book, of 150 pages, embraces a great variety of information useful for reference in the house and workshop. It contains the last Census of the U. S. by states and counties, and has the area of square miles in each state and territory, with tables of the occupations and the number engaged in each kind of business; lists of cities having 10,000 inhabitants; all the statistics being compiled from the 1890 census; the United States patent laws, with directions how to obtain patents secure caveats, trade marks, design patents and copyrights.

The book contains tables for calculating the horse power of steam engines, and other information useful and varied. The matter crowded between the covers of this little 150 page volume cannot be obtained from any other source. **Price 25 Cents.** May be had of newsmen or by mail.

MUNN & CO.
Publishers of SCIENTIFIC AMERICAN,
361 Broadway, New York.

TO INVENTORS AND MANUFACTURERS

Sixty-first Grand National Exhibition
OF THE
American Institute of the City of New York

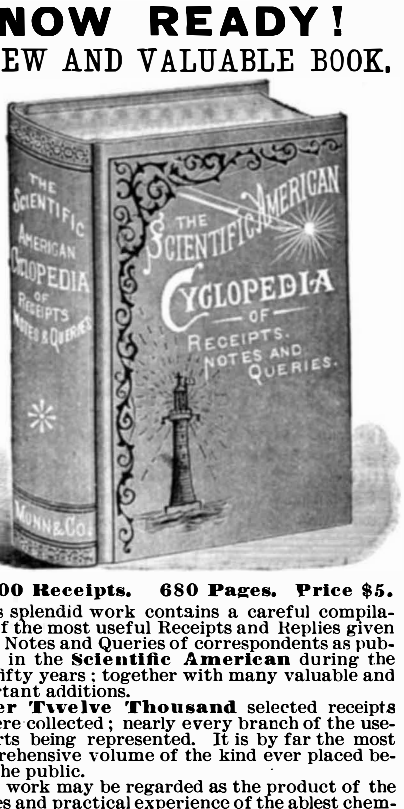
Will open October 10 and close December 10, 1892. Intending exhibitors must make early application to secure proper space and classification. For blanks and other information, address CHARLES WAGER HULL, General Superintendent, American Institute, 113 West 38th Street, New York City.

Undeveloped Wealth.

The edge of an invention crops out of the mind of a thinking man who lacks the mechanical means of following it up. He needs a shop to go to or write to. We have a primer to send.

THE JONES BROTHERS ELECTRIC CO. CIN'TI, O.

NOW READY!
A NEW AND VALUABLE BOOK.



12,000 Receipts. 680 Pages. Price $5.

This splendid work contains a careful compilation of the most useful Receipts and Replies given in the Notes and Queries of correspondents as published in the **Scientific American** during the past fifty years; together with many valuable and important additions.

Over Twelve Thousand selected receipts are here collected; nearly every branch of the useful arts being represented. It is by far the most comprehensive volume of the kind ever placed before the public.

The work may be regarded as the product of the studies and practical experience of the ablest chemists and workers in all parts of the world; the information given being of the highest value, arranged and condensed in concise form convenient for ready use.

Almost every inquiry that can be thought of, relating to formulæ used in the various manufacturing industries, will here be found answered.

Instructions for working many different processes in the arts are given.

It is impossible within the limits of a prospectus to give more than an outline of a few features of so extensive a work.

Under the head of Paper we have nearly 250 receipts, embracing how to make papier maché; how to make paper water proof and fire proof; how to make sandpaper, emery paper, tracing paper, transfer paper, carbon paper, parchment paper, colored papers, razor strop paper, paper for doing up cutlery, silverware; how to make luminous paper, photograph papers, etc.

Under the head of Inks we have nearly 450 receipts, including the finest and best writing inks of all colors, drawing inks, luminous inks, invisible inks, gold, silver and bronze inks, white inks; directions for removal of inks; restoration of faded inks, etc.

Under the head of Alloys over 700 receipts are given, covering a vast amount of valuable information.

Of Cements we have some 600 receipts, which include almost every known adhesive preparation, and the modes of use.

How to make Rubber Stamps forms the subject of a most valuable practical article, in which the complete process is described in such clear and explicit terms that any intelligent person may readily learn the art.

For Lacquers there are 120 receipts; Electro-Metallurgy, 125 receipts; Bronzing, 127 receipts; Photography and Microscopy are represented by 600 receipts.

Under the head of Etching there are 55 receipts, embracing practical directions for the production of engravings and printing plates of drawings.

Paints, Pigments and Varnishes furnish over 800 receipts, and include everything worth knowing on those subjects.

Under the head of Cleansing over 500 receipts are given, the scope being very broad, embracing the removal of spots and stains from all sorts of objects and materials, bleaching of fabrics, cleaning furniture, clothing, glass, leather, metals, and the restoration and preservation of all kinds of objects and materials.

In Cosmetics and Perfumery some 500 receipts are given.

Soaps have nearly 300 receipts.

Those who are engaged in any branch of industry probably will find in this book much that is of practical value in their respective callings.

Those who are in search of independent business or employment, relating to the home manufacture of sample articles, will find in it hundreds of most excellent suggestions.

☞ *Send for descriptive circular.*

MUNN & CO., Publishers,
SCIENTIFIC AMERICAN OFFICE,
361 Broadway, New York.

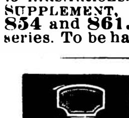
Founded by Mathew Carey, 1785.

HENRY CAREY BAIRD & CO.
Industrial Publishers, Booksellers, and Importers,
810 Walnut St., Philadelphia, Pa., U. S. A.

☞ Our new and Revised Catalogue of Practical and Scientific Books, 86 pages, 8vo, and our other Catalogues and Circulars, the whole covering every branch of Science applied to the Arts, sent free and free of postage to any one in any part of the world who will furnish his address.

DEAFNESS & HEAD NOISES CURED by Peck's Invisible Tubular Ear Cushions. Whispers heard. Successful when all remedies fail. Sold only by F. Hiscox, 853 B'way, N.Y. Write for book of proofs **FREE**

LIFE SAVING DEVICES.—A COLlection of suggestions of devices for communicating between the shore and stranded vessels, offered to the London *Daily Graphic* by various correspondents. With 73 illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, Nos. 848, 849, 850, 851, 852, 854 and 861. Price 10 cents each, or 70 cents for the series. To be had at this office and from all newsdealers



THE BEST LOOSE PULLEY OILER IN THE WORLD.
VANDUZEN PAT. L. PUL. OILER
Keeps Pulley oiled 3 to 4 weeks with one filling. Cost 25, 30, 40, 50, 65 and 85 cents each. Send Price and **TRY ONE.** State diameter and speed of Pulley. Will send Catalogue free. Mention this paper.
The VANDUZEN & TIFT CO. Cincinnati, O. U.S.A.

"CROSS STITCH" SEWED BELT WITHOUT SEAM. CANNOT SEPARATE BETWEEN THE PLIES. DOES NOT STRETCH. PATENTED. MADE BY BOSTON WOVEN HOSE & RUBBER CO. BOSTON, CHICAGO, SAN FRANCISCO.

To Inventors.

E. Konigslow, manufacturer of Fine Machinery and Models, offers Special Facilities to Inventors. Guarantees to work out ideas in strictest secrecy, and *any improvement that he can suggest goes with the work.* Thousands of men have crude though really valuable ideas, which they lack mechanical training to develop. Novelties and patented articles manufactured by contract. 181 Seneca St., Cleveland, Ohio.

Contractors' Machinery
Of every description in stock.
ENGINES, BOILERS, BRICK PLANTS, AND ROLLING MILL MACHINERY.
Thomas Carlins' Sons
ALLEGHENY, PA.
Four-Drum Hoisting Engine.

HOW TO MAKE DYNAMO-ELECTRIC Machines.—By Geo. M. Hopkins. With drawings to scale and full directions for constructing dynamos of different sizes. The small machine is intended for experimental purposes. Will heat from 4 to 6 inches of platinum wire, produce the electric light, decompose water rapidly, magnetize steel, ring a large gong, give powerful shocks, operate induction coils, and will, for temporary use, replace 8 or 10 Bunsen cells. Contained in SUPPLEMENTS 161 and 599. Price 10 cents each. The larger machine produces eight 16-candle lights or one powerful arc light. Can be arranged as a series, shunt, or compound wound machine. Can be run for a short time by two or four men. Requires one horse power for continued running. Best engravings of dynamo ever produced. Details of every part shown. Winding of armature and field magnet plainly illustrated. Any intelligent person with the aid of these drawings and instructions may make useful, durable, and effective machines. Contained in SUPPLEMENT 600. Price 10 cents. MUNN & CO., PUBLISHERS. 361 Broadway, New York.

VOLNEY W. MASON & CO.,
FRICTION PULLEYS, CLUTCHES, and ELEVATORS
PROVIDENCE, R. I.

THE BUNDY AUTOMATIC TIME RECORDER.
Every employe keeps his own time.
Simple, accurate, economical.
Manufactured by
BUNDY MFG. CO.,
Binghamton, N. Y.
☞ *Send for circular.*

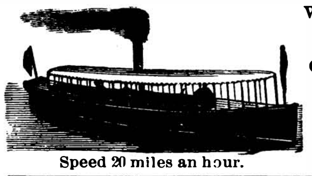
THE KNAPP ELECTRICAL WORKS CHICAGO, ILL. MANUFACTURERS ELECTRIC LIGHT SUPPLIES TELEGRAPH, TELEPHONE, ALARM, & FIRE INSULATED BARE COPPER WIRE ANNUNCIATORS, BURGLAR ALARMS, BELLS, BATTERIES. EVERYTHING ELECTRICAL.

TO BUSINESS MEN

The value of the SCIENTIFIC AMERICAN as an advertising medium cannot be overestimated. Its circulation is many times greater than that of any similar journal now published. It goes into all the States and Territories, and is the in all the principal libraries and reading rooms of the world. A business man wants something more than to see his advertisement in a printed newspaper. He wants circulation. This he has when he advertises in the SCIENTIFIC AMERICAN. And do not let the advertising agent influence you to substitute some other paper for the SCIENTIFIC AMERICAN, when selecting a list of publications in which you decide it is for your interest to advertise. This is frequently done for the reason that the agent gets a larger commission from the papers having a small circulation than is allowed on the SCIENTIFIC AMERICAN.

For rates see top of first column of this page or address MUNN & CO., Publishers,
361 Broadway, New York.

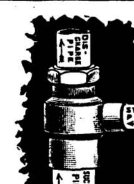
BUILDERS OF HIGH GRADE BOATS.



Speed 20 miles an hour.

We Build Everything, from a Canoe to a Steam Yacht. Complete Stock Oars, Sweeps and Boat Trimmings. We Make all Sizes Pipe Boilers and Engines
Cedar Row Boats from $25 upward.
Vapor and Steam Launches from $300 upward.
☞ SEND 10c. FOR COMPLETE CATALOGUE.
DAVIS BOAT AND OAR CO., DETROIT, MICH., U. S. A.

STEEL TYPE FOR TYPEWRITERS
Stencils, Steel Stamps, Rubber and Metal Type Wheels, Dies, etc.
Model and Experimental Work.
Small Machinery, Novelties, etc., manufactured by special contract.
New York Stencil Wks. 100 Nassau St., N. Y



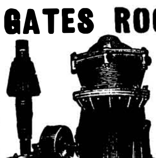
VANDUZEN STEAM JET PUMP
THE BEST IN THE WORLD.
Pumps Any Kind of Liquid.
Always in Order, never Clogs nor freezes. Every Pump Guaranteed.
—10 SIZES.—
200 to 12000 Gallons per Hour.
Cost $7 to $75 each. Address
THE VANDUZEN & TIFT CO.,
102 to 108 E. Second St., Cincinnati, O.

ELECTRO MOTOR, SIMPLE, HOW TO make. By G. M. Hopkins.—Description of a small electro motor devised and constructed with a view to assisting amateurs to make a motor which might be driven with advantage by a current derived from a battery, and which would have sufficient power to operate a foot lathe or any machine requiring not over one man power. With 11 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 641. Price 10 cents. To be had at this office and from all newsdealers.

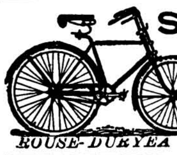
THE WATER JACKET **SIPHON CONDENSER** REQUIRES NO AIR PUMP. 28 IN. VACUUM. CHICAGO WATER JACKET CONDENSER CO. 47 W. WASHINGTON ST. SEND FOR CIRCULAR. CHICAGO, ILL.

Model Makers' —Supplies.— **MODELS** Dies, Castings, Patterns, Tools. Inventions Perfected. Novelty and Duplicate Work. CATALOGUE. A. J. Weed & Co., 106, 108 Liberty St., N.Y.

$10.00 to $50.00 per night. A light and profitable business. Magic Lanterns and Views of popular subjects. Catalogues on application. Part 1 Optical, 2 Mathematical, 3 Meteorological, 4 Magic Lanterns, etc. L. MANASSE, 88 Madison Street, Chicago, Ill.



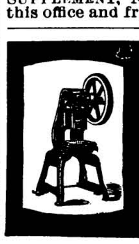
GATES ROCK & ORE BREAKER
Capacity up to 200 tons per hour.
Has produced more ballast, road metal, and broken more ore than all other Breakers combined.
Builders of High Grade Mining Machinery. Send for Catalogues.
GATES IRON WORKS,
50 C So. Clinton St., Chicago
136 C, Liberty Street, New York,
237 C, Franklin St., Boston, Mass



SYLPH CYCLES RUN EASY
Vibration overcome without complication, loss of power or ungainly features. Highest grade in material, construction and finish. All users delighted. Investigate. Agts. wanted. Cata. free.
ROUSE-DURYEA CYCLE CO., 16 G St., Peoria, Ill.

STEVENS PATENT COMBINATION GAUGE. No. 58
Scratch and Depth Gauge combined.
The cut shows this used as a Depth Gauge. Can also be used as a Surface or Scratch Gauge.
Price, per pair $2.00
Ideal and Leader Spring Dividers and Calipers, and Fine Machinists' Tools.
☞ *Illustrated catalogue free.*
J. STEVENS ARMS & TOOL CO.,
P. O. Box 280, Chicopee Falls, Mass.

SEWING MACHINE MOTOR FOR AMAteurs.—By C. D. Parkhurst. Description of a very simple and effective motor, with laminated armature, of sufficient power to actuate a sewing machine. With 11 engravings. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 759. Price 10 cents. To be had at this office and from all newsdealers.



Canning Machinery
Outfits Complete.
Oil Burners for Soldering, Air Pumps, Can Wipers, Can Testers, Labeling Machines, PRESSES AND DIES.
BURT MFG. CO.,
ROCHESTER, N. Y.

HARRISON CONVEYOR!

For Handling Grain, Coal, Sand, Clay, Tan Bark, Cinders, Ores, Seeds, &c.
Send for Circulars. | BORDEN, SELLECK & CO., { Sole Manu'f'ers. } Chicago, Ill.

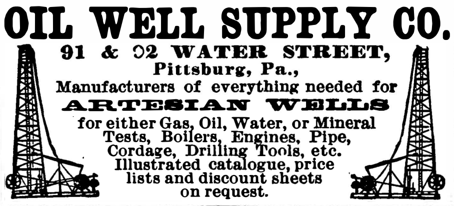
COOLEST BREEZES ON HOTTEST DAYS
IN OFFICES, FACTORIES, HOTELS, STORES.

ELECTRIC FAN MOTORS

All Sizes for All Currents, Direct or Alternating, Arc or Incandescent.
Highest Efficiency—Noiseless—Require no Repairs.
THOMSON-HOUSTON MOTOR CO.
BRANCH OFFICES:

620 Atlantic Avenue.....Boston, Mass.	Gould Building .... Atlanta, Ga.	401-407 Sibley Street. St. Paul, Minn.
173 and 175 Adams Street..Chicago, Ill.	44 Broad Street ....New York.	Masonic Temple ....Denver, Colo.
264 West Fourth Street. Cincinnati, O.	509 Arch Street .....Philadelphia, Pa.	15 First Street.....San Francisco, Cal.

ALUMINUM
In all shapes. Manufactured by
Cowles Electric Smelting and Aluminum Co.,
Correspondence solicited. LOCKPORT, N. Y.



OIL WELL SUPPLY CO.

91 & 92 WATER STREET,
Pittsburg, Pa.,
Manufacturers of everything needed for
ARTESIAN WELLS
for either Gas, Oil, Water, or Mineral Tests, Boilers, Engines, Pipe, Cordage, Drilling Tools, etc. Illustrated catalogue, price lists and discount sheets on request.

ALUMINUM: ITS USES AND APplications. A valuable and interesting article by G. L. Addenbrooke. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 859. Price 10 cents. To be had at this office and from all newsdealers.

FRUITFUL INVESTMENTS
A new form of 8 per cent. Investment, based on irrigated fruit lands of Colorado. Guaranteed by National Bank. For full particulars address
THE DELTA COUNTY FRUIT LANDS CO. DENVER, COLO.

MAHOGANY

And all Fancy Woods.
TEAK FOR YACHTS, SPANISH CEDAR FOR SHELLS, etc.
THE E. D. ALBRO CO.
Eastern Branch, } 200 Lewis Street, Ft. E. 6th St., } New York, U. S. A.
H. T. BARTLETT, Mg'r. F. W. HONERKAMP, Ass't Mg'r.
(Mills, Cincinnati, O.)

CHUCKS. Catalogue No. 12, just issued with over 40 new illustrations sent free. Address,
The Cushman Chuck Co., Hartford, Conn.

ARTESIAN
Wells, Oil and Gas Wells, drilled by contract to any depth, from 50 to 3000 feet. We also manufacture and furnish everything required to drill and complete same. Portable Horse Power and Mounted Steam Drilling Machines for 100 to 1,000 feet. Write us stating exactly what is required and send for illustrated catalogue. Address
PIERCE ARTESIAN & OIL WELL SUPPLY CO., 80 BEAVER STREET, NEW YORK.

Pneumatic Tire Bicycles.
Every One Guaranteed.
Send for Catalogue.
☞ Agents Wanted.
KIRKWOOD, MILLER & CO.
16 South St., Peoria, Ill.

CLARK'S

WOOL WASHERS,
WARP DYEING AND SIZING MACHINES,
PATENT RUBBER COVERED SQUEEZE ROLLS,
POWER WRINGERS FOR HOSIERY AND YARN DYEING,
DRYING AND VENTILATING FANS,
WOOL AND COTTON DRYERS, Etc.
Catalogues free.
GEO. P. CLARK
Box L. Windsor Locks, Conn.

LEARN WATCHMAKING, ENGRAVING. WRITE FOR CATALOGUE No. 6. CHICAGO WATCHMAKERS INSTITUTE 1522-23 MASONIC TEMPLE

SCIENTIFIC AMERICAN SUPPLEMENT. Any desired back number of the SCIENTIFIC AMERICAN SUPPLEMENT can be had at this office for 10 cents. Also to be had of newsdealers in all parts of the country.

After being on the Market Seven Years
THE ACME AUTOMATIC ENGINE AND BOILER
STILL LEADS!
Half to Four Horse Power. Marine and Stationary.
For either Natural Gas or Petroleum as Fuel.
☞ NO EXTRA INSURANCE.
Acme Automatic Safety Engine.—"Stationary." Oil Tank.
ROCHESTER MACHINE TOOL WORKS, Brown's Race, ROCHESTER, N. Y.

SCHOOL OF ENGINEERING,
OHIO STATE UNIVERSITY, - - Columbus, Ohio.
Four year courses are provided in Civil, Mechanical, Electrical and Mining Engineering. Each Department is well equipped with appliances for instruction.
A Catalogue giving full information will be sent on application.

PROPOSALS.

NOTICE TO ARCHITECTS.

THE Honorable the Chief Commissioner of Lands and Works hereby invites Architects to submit, on or before the 30th September next, (competitive) plans and estimates of cost for the construction of certain Provincial Government Buildings.
Particulars of competition and further information can be obtained from the undersigned.
W. S. GORE,
Deputy Commissioner of Lands & Works.
Lands and Works Department,
Victoria, B. C., 16th June, 1892.

U. S. ENGINEER OFFICE, ARMY BUILDING, NEW YORK, August 4, 1892.—Sealed proposals for the construction or sale of a Hydraulic Dredging Steamer for New York Harbor will be received at this office until 12 m. September 13, 1892, and then publicly opened. Specifications, blank forms, and all available information will be furnished on application to this office. G. L. GILLESPIE, Lieut.-Col. of Engineers.

U. S. ENGINEER OFFICE, BOSTON, MASS., AUgust 6, 1892.—Sealed proposals for removal of ledge from the Merrimac River, Mass., will be received at this office until noon, September 6, 1892, and then publicly opened. Specifications, blank forms, and all available information will be furnished on application to this office. S. M. MANSFIELD, Lieut.-Col. of Engineers.

U. S. ENGINEER OFFICE, BOSTON, MASS., AUgust 5, 1892.—Sealed proposals for the delivery of rubblestone in the breakwater at Sandy Bay, Cape Ann, Mass., will be received at this office until noon, September 9, 1892, and then publicly opened. Specifications, blank forms, and all available information will be furnished on application to this office. S. M. MANSFIELD, Lieut.-Col. of Engineers.

U. S. ENGINEER OFFICE, BOSTON, MASS., AUgust 5, 1892.—Sealed proposals for the delivery of rubblestone in the north jetty at Newburyport Harbor, Mass., will be received at this office until noon, September 9, 1892, and then publicly opened. Specifications, blank forms, and all available information will be furnished on application to this office. S. M. MANSFIELD, Lieut.-Col. of Engineers.

U. S. ENGINEER OFFICE, BOSTON, MASS., AUgust, 5, 1892. Sealed proposals for dredging in Kingston Harbor, Mass., will be received at this office until noon, September 6, 1892, and then publicly opened. Specifications, blank forms, and all available information will be furnished on application to this office.
S. M. MANSFIELD, Lieut.-Col. of Engineers.

U. S. ENGINEER OFFICE, BOSTON, MASS., AUgust 5, 1892.—Sealed proposals for eighteen thousand (18,000) bbls. American hydraulic cement, delivered at Fort Warren, Mass., will be received at this office until September 6, 1892, and then publicly opened. Specifications, blank forms, and all available information will be furnished on application to this office. S. M. MANSFIELD, Lieut.-Col. of Engineers.

U. S. ENGINEER OFFICE, BOSTON, MASS., AUgust 6, 1892. Sealed proposals for dredging from Manchester Harbor, Mass., will be received at this office until noon, September 7, 1892, and then publicly opened. Specifications, blank forms and all available information will be furnished on application to this office.
S. M. MANSFIELD, Lieut.-Col. of Engineers.

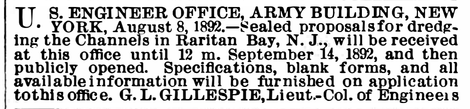
U. S. ENGINEER OFFICE, BOSTON, MASS., AUgust 8, 1892. Sealed proposals for dredging in Weymouth River, Mass., will be received at this office until noon, September 8, 1892, and then publicly opened. Specifications, blank forms, and all available information will be furnished on application to this office.
S. M. MANSFIELD, Lieut.-Col. of Engineers.

U. S. ENGINEER OFFICE, BOSTON, MASS., AUgust 8, 1892. Sealed proposals for dredging from the channel leading to Nantasket Beach, Boston Harbor, Mass., will be received at this office until noon, September 8, 1892, and then publicly opened. Specifications, blank forms, and all available information will be furnished on application to this office.
S. M. MANSFIELD, Lieut.-Col. of Engineers.

U. S. ENGINEER OFFICE, BOSTON, MASS, AUgust 8, 1892.—Sealed proposals for dredging in Mystic River, Mass., will be received at this office until noon September 8, 1892, and then publicly opened. Specifications, blank forms, and all available information will be furnished on application to this office.
S. M. MANSFIELD, Lieut.-Col. of Engineers.

U. S. ENGINEER OFFICE, GRAND RAPIDS, MICH., August 15, 1892.—Sealed proposals for dredging in Frankfort Harbor, Mich., will be received at this office until noon of Saturday, August 27, 1892, and then publicly opened. Specifications, blank forms, and all available information will be furnished on application to this office. WILLIAM LUDLOW, Major of Engineers, Bvt. Lieut.-Col., U. S. A.

U. S. ENGINEER OFFICE, ARMY BUILDING, NEW YORK, August 8, 1892.—Sealed proposals for dredging the Channels in Raritan Bay, N. J., will be received at this office until 12 m. September 14, 1892, and then publicly opened. Specifications, blank forms, and all available information will be furnished on application to this office. G. L. GILLESPIE, Lieut.-Col. of Engineers

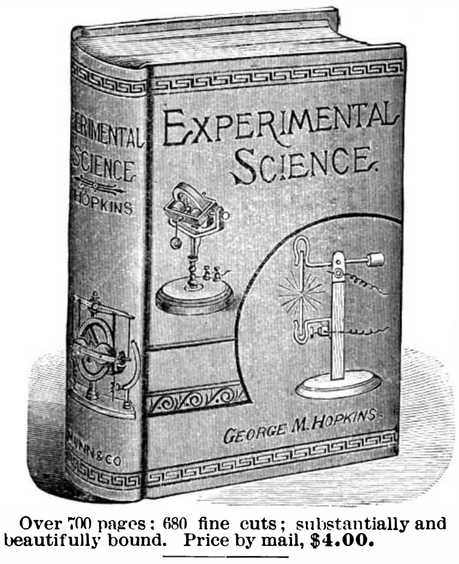


J. H. & D. LAKE CO., HORNELLSVILLE, N.Y. FRICTION CLUTCH PULLEYS AND CUT-OFF COUPLINGS.

HAVE YOU READ

Experimental Science?

This new book, by Geo. M. Hopkins, is just what you need to give you a good general knowledge of Physical Science. No one having the spirit of the times can afford to be without the kind of scientific information contained in this book. It is not only instructive, but entertaining.



Over 700 pages; 680 fine cuts; substantially and beautifully bound. Price by mail, $4.00.

☞ *Send for illustrated circular.*

MUNN & CO., Publishers,
Office of the SCIENTIFIC AMERICAN
NEW YORK.

Advertisements.

Inside Page, each insertion - - 75 cents a line
Back Page, each insertion - - - - $1.00 a line

The above are charges per agate line—about eight words per line. This notice shows the width of the line, and is set in agate type. Engravings may head advertisements at the same rate per agate line, by measurement, as the letter press. Advertisements must be received at Publication Office as early as Thursday morning to appear in the following week's issue.

Victors

OVERMAN WHEEL CO.
BOSTON. WASHINGTON. DENVER. SAN FRANCISCO.
A. G. SPALDING & BROS., Special Agents,
CHICAGO. NEW YORK. PHILADELPHIA.

THE AMERICAN BELL TELEPHONE CO.

95 MILK ST., BOSTON, MASS.

This Company owns the Letters Patent granted to Alexander Graham Bell, March 7th, 1876, No. 174,465, and January 30th, 1877, No. 186,787.

The transmission of Speech by all known forms of Electric Speaking Telephones infringes the right secured to this Company by the above patents, and renders each individual user of telephones not furnished by it or its licensees responsible for such unlawful use, and all the consequences thereof, and liable to suit therefor.

Industrial, Manufacturing, and Uncurrent

SECURITIES DEALT IN.
WORDEN & FANSHAWE,
9 WALL ST., NEW-YORK.

A Woman's Pride

is a beautiful watch:—fine enamel dial, with Arabic figures; the case, of coin-silver or fourteen-karat gold filled, and exquisitely engraved: This is the ladies' style of the new QUICK-WINDING "Waterbury."

Jeweled movement; A warranted time-keeper. A gem to be proud of.

A men's style also is made. Far superior to any cheap Swiss watch, though equally low-priced.

Your jeweler sells it. 3

PATENTS!

MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.

In this line of business they have had *forty-five years' experience*, and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.

A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases. Hints on the sale of Patents, etc.

We also send, *free of charge*, a Synopsis of Foreign Patent Laws, showing the cost and method of securing Patents in all the principal countries of the world.

The 1892 Model Remington Typewriter

For Ease and Convenience of Operation, Simplicity of Design and Durability of Construction, is

UNEQUALED.

SEND FOR CATALOGUE.

WYCKOFF, SEAMANS & BENEDICT, 327 Broadway, N. Y.

KODAKS.

Regular, Junior, Folding, Daylight, Ordinary — 14 styles and sizes for the season of 1892, **$6.00 to $65.00.**

Latest improvements, registers for exposures; glass plate attachments; daylight loading, etc., etc. *Send for catalogue.*

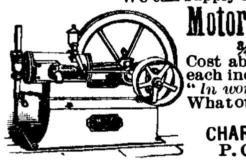
THE EASTMAN COMPANY,
ROCHESTER, N. Y.

COPPER TUBES. SHEET BRASS BRASSWIRE. FINE TOOLS TAPS. 175 177 LAKE ST. CHICAGO. SEND FOR CATALOGUE

DO U SEEK POWER?

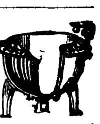
We can supply it with the

Motor of the 19th Century



¾ to 70 horse power.
Cost about one cent an hour to each indicated horse power.
"*In worth, not size, my value lies.*"
What others think of me is stated in catalogue.
CHARTER GAS ENGINE CO.
P. O. Box 148, Sterling, Ill.

PATENT JACKET KETTLES



Plain or Porcelain Lined.
Tested to 100 lb. pressure. Send for Lists.
BARROWS-SAVERY CO.,
S. Front & Reed Streets, Philadelphia, Pa.

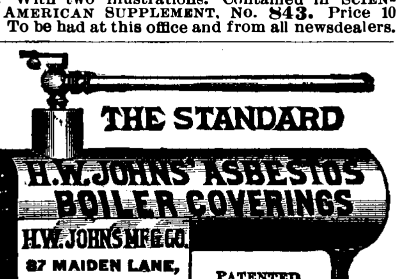
WHAT ELECTRICITY IS.—BY W. W. Jacques. An interesting discussion of the subject, illustrated with some new experiments. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 857. Price 10 cents. To be had at this office and from all newsdealers.

"Improvement the order of the age."

THE SMITH PREMIER TYPEWRITER

Important Improvements.
All the Essential Features greatly perfected
The Most Durable in Alignment.
Easiest Running and Most Silent.
All type cleaned in 10 seconds without soiling the hands
The Smith Premier Typewriter Co., Syracuse, N. Y., U. S. A.
Send for Catalogue.

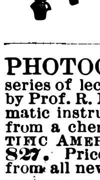
CENTRIFUGAL FORCE AND RESULTING Phenomena.—A lecture delivered by Charles E. Emery, Ph.D., in the Sibley College Course. An investigation of the subject of centrifugal force, particularly the limitations that it imposes on the design of pulleys, flywheels, and other machinery, and the influence that it will have in the near future upon the speed of railway trains. With two illustrations. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 843. Price 10 cents. To be had at this office and from all newsdealers.



CELLULOID ZAPON CO. 41 BARCLAY ST. NEW YORK. MANUFACTURERS OF CELLULOID LACQUERS AND VARNISHES FOR METAL AND WOOD. GUM LACQUERS—BRILLIANT AND DEAD BLACKS—SHELLACS &c. SOLE LICENSEES OF THE CELLULOID COMPANY

IMPORTANCE vs. NECESSITY.

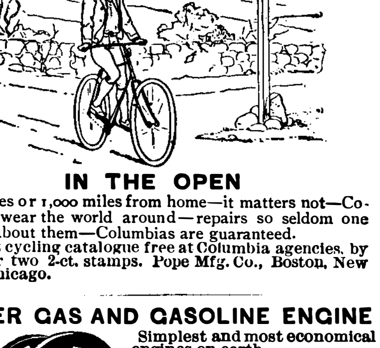
LUNKENHEIMER'S GLASS BODY OIL PUMPS.



Just the thing for pumping oil into the cylinder before starting engine and sight feed lubricator begins to work. Glass body shows the stage of oil. Practical, efficient, ornamental; adapted and highly indorsed by leading engine builders and thousands of other users. Warranted first class. Write for catalogue of valves, lubricators, oil and grease cups, etc., and mention the *Scientific*

The Lunkenheimer Brass Mfg. Co.,
Cincinnati, Ohio, U. S. A.

PHOTOGRAPHIC CHEMISTRY.—A series of lectures delivered before the Society of Arts, by Prof. R. Meldola, showing how the subject of systematic instruction in photography should be dealt with from a chemical point of view. Contained in SCIENTIFIC AMERICAN SUPPLEMENTS, Nos. 825, 826, and 827. Price 10 cents each. To be had at this office and from all newsdealers.

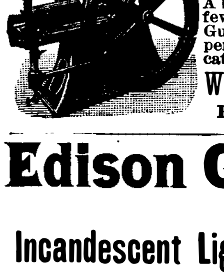


IN THE OPEN

10 miles or 1,000 miles from home—it matters not—Columbias wear the world around—repairs so seldom one forgets about them—Columbias are guaranteed.

Finest cycling catalogue free at Columbia agencies, by mail for two 2-ct. stamps. Pope Mfg. Co., Boston, New York, Chicago.

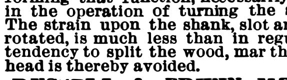
WEBER GAS AND GASOLINE ENGINE



Simplest and most economical engines on earth.
Fully Guaranteed.
A boy starts it, requires only a few minutes' attention a day. Guaranteed cost of running 1 ct per hour per H. P. Write for catalogue. Address Drawer 200,
Weber Gas Engine Works,
KANSAS CITY, MO.

HELICOID SHANK WOOD SCREWS.

U. S. Pats.: July 2, 1885 July 1, 1890; Feb. 17 and Mar. 15, 1892.



This patented improvement in wood screws is especially valuable for use in fine work as well as for all other purposes where ordinary screws are employed. **The chief advantages are:** They obviate the necessity of boring the second time when used in **Hard Wood**; the ribs on the shank performing that function, necessarily making an exact fit in the operation of turning the screw into the wood. The strain upon the shank, slot and head, while being rotated, is much less than in regular screws, and the tendency to split the wood, mar the slot, and break the head is thereby avoided.

RUSSELL & ERWIN MFG. COMPANY,
New Britain, Conn., U. S. A.
NEW YORK, PHILADELPHIA, BALTIMORE, LONDON.

SECONDARY BATTERIES.—BY G. H. Robertson, F.C.S. An interesting and valuable paper treating of the types of secondary batteries successfully employed. Historical Notes. Reversible Batteries, Improvements in the Planté System, Electrolytic Processes, Improvements in the Faure Type, Chemistry of the Acid. With 13 figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. 838. Price 10 cents. To be had at this office and from all newsdealers.

ELECTRO VAPOR ENGINE.

GAS OR GASOLINE FOR FUEL.

NO BOILER. NO FIRE. NO DANGER. NO ENGINEER.

Engine operated by spark from small battery.
You turn the Switch, Engine does the rest.
Regan Vapor Stationary Engines, 1 to 12 H. P.
Regan Vapor Pumping Engines, 350 to 10,000 gallons capacity.

—MANUFACTURED BY—
THOMAS KANE & CO.,
CHICAGO, ILL.
Send stamp for catalogue "V."

Edison General Electric Company

THE EDISON SYSTEMS OF

Incandescent Lighting, Street Railways and Transmission of Power

—ARE THE—

SAFEST—MOST RELIABLE—BEST.

OUR ELECTRIC LAMP SIGNS ARE A GREAT COMMERCIAL INNOVATION.

BRANCH OFFICES:

n, Mass. | 44 Broad Street .... New York.
cago, Ill. | 509 Arch Street .... Philadelphia, Pa.
nnati, O. | 401-407 Sibley Street .... St. Paul, Minn.
nta, Ga. | Masonic Temple .... Denver, Colo.
.... | .... San Francisco, Cal.

THE "GRAVES" PASSENGER & FREIGHT ELEVATORS.
L. S. GRAVES & SON ROCHESTER N.Y. NEW YORK. BOSTON. ST LOUIS. DETROIT.

BARNES'

New Friction Disk Drill.

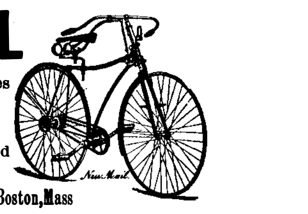
FOR LIGHT WORK.

Has these Great Advantages:

The speed can be instantly changed from 0 to 1600 without stopping or shifting belts. Power applied can be graduated to drive, with equal safety, the smallest or largest drills within its range—a wonderful economy in time and great saving in drill breakage. Send for catalogue.

W. F. & JNO. BARNES CO.,
1999 Ruby St., - Rockford, Ill.

NEW MAIL



—$100—
Cushion Tires, Tangent Spokes
With Pneumatic Tires, $120
Also $135 and $150 patterns.
" Lady's pattern......$100
" Boy's New Mail..... 60
Handsomest and best Diamond Safety. *Send for Catalogue and Second-Hand List.*
Wm. Read & Sons, 107 Wash'ton St. Boston, Mass

THE

SCIENTIFIC AMERICAN

ESTABLISHED 1846.

The Most Popular Scientific Paper in the World

Only $3.00 a Year, Including Postage.
Weekly—52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc. Complete list of patents each week.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States, Canada, or Mexico, on receipt of **three dollars** by the publishers; six months, $1.50; three months, $1.00.

Clubs.—Special rates for several names, and to Post Masters. Write for particulars.

The safest way to remit is by Postal Order, Draft, or Express Money Order. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO., 361 Broadway, New York.

THE

Scientific American Supplement

This is a separate and distinct publication from THE SCIENTIFIC AMERICAN, but is uniform therewith in size, every number containing sixteen large pages full of engravings, many of which are taken from foreign papers and accompanied with translated descriptions. THE SCIENTIFIC AMERICAN SUPPLEMENT is published weekly, and includes a very wide range of contents. It presents the most recent papers by eminent writers in all the principal departments of Science and the Useful Arts, embracing Biology, Geology, Mineralogy, Natural History, Geography, Archæology, Astronomy Chemistry, Electricity, Light, Heat, Mechanical Engineering, Steam and Railway Engineering, Mining, Ship Building, Marine Engineering, Photography, Technology, Manufacturing Industries, Sanitary Engineering, Agriculture, Horticulture, Domestic Economy, Biography, Medicine, etc. A vast amount of fresh and valuable information obtainable in no other publication.

The most important Engineering Works, Mechanisms, and Manufactures at home and abroad are illustrated and described in the SUPPLEMENT.

Price for the SUPPLEMENT for the United States and Canada, $5.00 a year; or one copy of the SCIENTIFIC AMERICAN and one copy of the SUPPLEMENT, both mailed for one year for $7.00. Single copies, 10 cents. Address and remit by postal order, express money order, or check,

MUNN & CO., 361 Broadway, New York.

Building Edition.

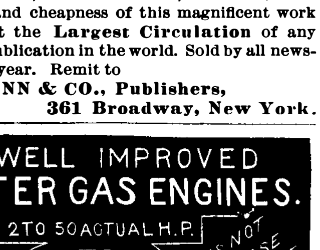
THE SCIENTIFIC AMERICAN ARCHITECTS' AND BUILDERS' EDITION is issued monthly. $2.50 a year. Single copies, 25 cents. Forty large quarto pages, equal to about two hundred ordinary book pages; forming a large and splendid Magazine of Architecture, richly adorned with *elegant plates in colors*, and with other fine engravings; illustrating the most interesting examples of modern architectural construction and allied subjects.

A special feature is the presentation in each number of a variety of the latest and best plans for private residences, city and country, including those of very moderate cost as well as the more expensive. Drawings in perspective and in color are given, together with full Plans, Specifications, Sheets of Details, Estimates, etc.

The elegance and cheapness of this magnificent work have won for it the **Largest Circulation** of any Architectural publication in the world. Sold by all newsdealers. $2.50 a year. Remit to

MUNN & CO., Publishers,
361 Broadway, New York.

CALDWELL IMPROVED
CHARTER GAS ENGINES.
2 TO 50 ACTUAL H.P.
GAS, GASOLINE, NATURAL GAS, PRODUCER GAS.
DOES NOT INCREASE INSURANCE. SAFE, RELIABLE, ECONOMICAL.



TAKES GAS. SIMPLE.
GASOLINE FROM — NO DELICATE PARTS.
TANK LOWER THAN ENGINE AND OUTSIDE OF BUILDING IF DESIRED.
H.W.CALDWELL & SON. SOLE M'F'RS
WASHINGTON & UNION STS. CHICAGO, ILLS.

PRINTING INKS

The SCIENTIFIC AMERICAN is printed with CHAS. ENEU JOHNSON & CO.'S INK, Tenth and Lombard Sts., Philadelphia, and 47 Rose St., opp. Duane, New York