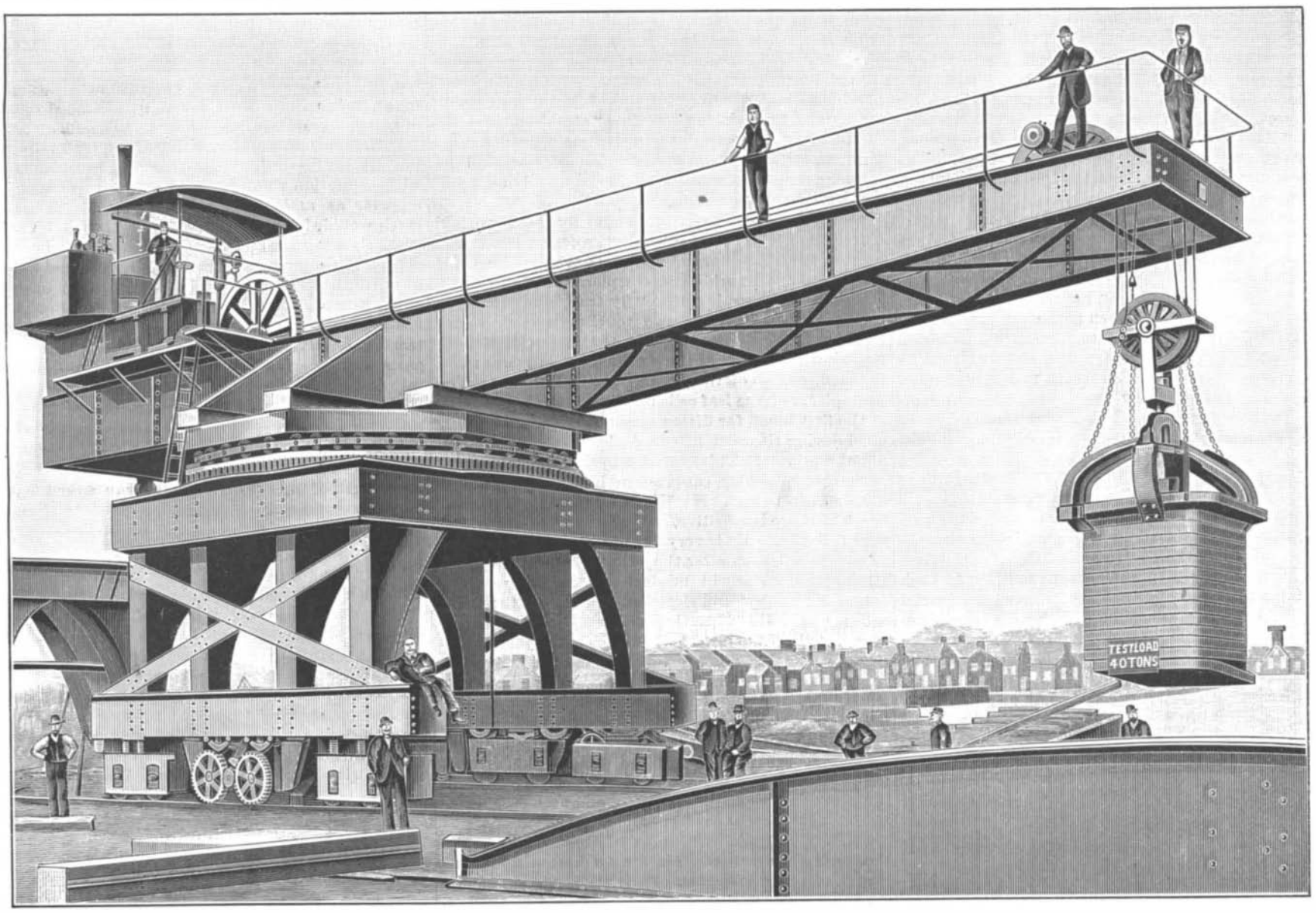
A POWERFUL STEAM CRANE.

The illustration represents a huge steam crane, called a steam Titan, built by Messrs. Ransomes & Rapier, of Ipswich, to the designs of Mr. F. G. M. Stoney, M.I.C.E., and to the order of Sir Alexander Rendel, M.I.C.E., consulting engineeer to the Madras Harbor Works, where it will be chiefly employed for transporting blocks of concrete weighing 32 tons, used in the construction of the breakwater now in progress. The weight of the Titan, without water ballast or load, is 152 tons, and with ballast 170 tons. All the motions of the appliance are under perfect control by means of a set of levers situated on a platform and within easy reach of the single operator. A feature of importance in connection with this appliance is that it not only has to be capable of slewing round in a complete circle, but has also, owing to the shape of the breakwater on which it will be employed, to be capable of traveling on a curved road. To enable it to accomplish this the Titan is carried upon twelve wheels arranged as two four-wheeled bogies, one at each end, and with driving wheels in the center. This arrangement enables the Titan to travel with ease round a curve 90 ft. radius. The radius described by the arm is 50 ft., and to minimize the shock produced by stopping a load, owing to the momentum acquired when being slewed round, spring braking devices are introduced in connection with the gearing so as to bring the arm to a gradual stop. The crane is made of mild steel, all parts being carefully machined, and all rivet holes drilled in position. The whole of the work is so arranged that it can be conveniently taken to pieces for transport and re-erected at its destination with a minimum of trouble. This fine crane has been inspected and put through a series of severe tests by Sir Alexander Rendel, and has given general satisfaction. The test load, as shown in the illustration, was 40 tons.—*Industries.*



GENERAL VIEW OF CRANE CARRYING TEST LOAD.

SUCCESS presupposes conditions and preparations for it—the energy, self-sacrifice, and self-abnegation which brings brawn and breadth and dignity, strength and wisdom and skill. We cannot safely jump into success; we are likely to get hurt, and soon fall back disheartened to where we belong. Some try to succeed by jumping into their father's shoes; but these shoes do not fit, and cause the young man to walk so awkwardly he generally makes a fool of himself. Nearly everything of real worth has to be earned. To be appreciated and judiciously appropriated, our possessions must have cost us their value. The very toil and struggle and plodding that bring solid gain bring also the mature experience, thorough discipline, and hard knocks that make up stalwart manhood and permanent success.—*Items of Interest.*

Old Time Weather.

The last bulletin of the Essex Institute contains an account of the annual meeting held last May, and a retrospect of the year, from which we learn that Mr. Perley, in a lecture on "Old Time Winters in Essex County, Mass.," gave interesting particulars on many subjects, including weather. We give the following extract:

"The lecturer spoke of the watch, church services, dress, food, and schools of the early winter seasons; how the people spent their evenings, the winter employment of the people in cutting off the forests, sledding timber and wood, making pipe staves and barrel hoops, and, most interesting of all, the institution of the old-fashioned shoemakers' shops, of which nearly every farm had one a century ago. Women in those days engaged in spinning and weaving. The holidays were referred to—Thanksgiving, Christmas, and New Year's; and the winter pleasures, such as sleigh rides, dancing, spinning and quilting parties, and games, shuffle-board, coasting, skating, trapping, gunning, fishing, singing schools, and girls' samplers. He also spoke of the old modes of travel, snow shoes, etc. Nearly all the heavy teaming was done on sleds, and he mentioned the winter of 1768–69, when the traveling was so bad that the farmers in the western part of the State could not get their grain and provisions to the coast to market. Snow remained on the roads as it fell until about a century ago. Mr. Perley then spoke of particular winters: That of 1641–42, when the Indians said they had not seen the ocean so much frozen for forty years; of 1646–47, when there was no snow to lay; of 1696–97, said to be the coldest winter since the first settlement of New England; of 1701–2, which was 'turned into summer;' of 1717–18, when the snow was from ten to fifteen feet deep and the drifts twenty-five feet, many one story houses being buried; of 1740–41, said to be the severest winter known by the settlers, Salem Harbor being frozen over as early as October; of 1774–75, a wonderfully mild winter; of 1779–80, when for forty days, including March, there was no perceptible thaw, and the snow was so hard and deep that loaded teams passed over the fences in any direction, arches being dug under the snow so that men on horseback could ride under them, and which was long remembered as *the* hard winter; of 1784–85, when, as late as April 15, snow was two feet deep, and frozen hard enough to bear cattle; of 1785–86, when in the remarkable storm of November 25, the snow blew into balls, one of which had rolled 76 feet, measuring 17½ by 22 inches; of 1794–95, when the Betsey was launched in Salem on Christmas Day, the thermometer indicating 80° above zero at noon, and men and boys went in swimming; of 1801–2, when the Ulysses, Brutus, and Volutia, three Salem vessels, which sailed out of the harbor on a summer-like morning in February, were all cast away at night on Cape Cod, in a terrible snow storm, which continued a week. He also referred to more recent seasons, and of the cold winter of 1856–57, when in one week in January was the coldest day by the thermometer ever recorded of late years, mercury in Salem 20° below zero; travel on the railroad between Boston and Salem entirely suspended from Tuesday morning to Thursday afternoon. The recent mild winters were also alluded to."

Steam Company's Liability—Damages.

In a case recently decided by the New York Court of Appeals it appeared that a steam company fitted a store with steam for elevator and heating purposes. The apparatus was tested by letting on the steam, and it worked satisfactorily. The steam company then left the steam on and closed the store for three days. While the store was closed the bonnet of the service pipe blew off, and the steam escaped and injured the goods in the store. The court held (Reiss *vs.* New York Steam Company) that the steam company was not liable for damages, but that, having furnished the best material and employed competent and skilled mechanics, it was not bound to anticipate or guard against such an unusual accident which had never before happened in its business. The court said: This steam apparatus was put into the plaintiffs' store for their benefit. The defendant did not insure or guarantee them against danger therefrom. It was bound only to use that degree of care which ordinary prudence and foresight would under the circumstances suggest and prompt. Whether or not it failed in such care could not be left to mere speculation. The burden was upon them to establish such failure by proof, and this burden they were bound to sustain, however necessary and difficult it proved to be.

A Remedy for Poisoning by Venomous Snakes and Rabid Dogs.

The Berlin correspondent of the *Therapeutic Gazette* says that a remedy for blood poisoning caused by the bites of snakes and rabid dogs has been discovered in Africa, by a Dr. Engels, in the "wild-growing, black, noble palm." Five hundred negroes bitten by poisonous snakes were treated with the extract of the noble palm, and four hundred and eighty-seven were cured in five days. Of sixty-seven farmers and negroes bitten by rabid dogs sixty-five were saved, while two died of weakness. The remedy is injected under the skin, and causes a moderate fever, not exceeding 35·5° C. On the third day the patient is without fever, swelling and inflammation of the affected part have disappeared, and on the fifth, or, latest, on the seventh, day the patient is cured.

Meeting of the American Association.

(*Continued from page* 145.)

Prof. Thomas Gray addressed the mechanical engineers, deprecating the teaching of trades in schools instead of in workshops, the old system of apprenticeship being better. But he strongly advocated teaching of a practical character, both in mathematics and theoretical dynamics, in technical colleges and similar institutions. He named some of the directions in which technical research should be pushed, especially as to the behavior of steam, combustion, and electrical engineering.

In the Section of Economics and Statistics, Prof. James spoke of "The American Farmer, his Condition and Prospects." On awaking to the fact that he is not up with the age, the farmer is apt to explain his ills by the machinations of other classes. He blames bankers, politicians, manufacturers and railroads. Wealth flows from the country to the city. The farmer feels keenly that his interests are not taken into the account as they should be in adjusting taxation, the tariff, and other mooted matters of national financial policy. Unless a radical change is brought about, his future will be darker than his present. Along what line does his hope of improvement lie? Mere alliances will not solve the problem, although they may compel us to listen to the real grievances of the farmer. Agricultural experiments, education, intelligence and sagacity must be relied on to do it. Trained and skillful farming must excel rude and clumsy methods, and the sooner this is realized, the better.

Among the 227 special papers read in the sections, only a few can be mentioned, taken at random, and no better it may be than others. Lively discussion was awakened by Prof. C. V. Riley's arraignment of the Patent Office for trespassing on the rights of other departments. He said that the Department of Agriculture had for five years been experimenting as to methods for destroying scale insects and other parasites, under his direction, at governmental expense. No sooner had his process been perfected, made cheap and available, than a patent was granted to outside parties, against protest, and ignoring the fact that he had officially described and recorded this very process. This was but one of many cases where government officials had seen the fruits of their work snatched away by patents heedlessly awarded to private individuals.

Great interest was excited by the explanation of the electrical tabulating machines by Dr. J. S. Billings (U. S. army), who had charge of the vital statistics for the census, and who originated this system, since perfected by Mr. H. Hollerith, and in practical use in taking the censuses of the United States, Canada and Austria. By a gauge punch holes are made in cards, each containing 12 groups of 24 holes through which a metal rod goes, actuating a series of dials by electrical connection, thus recording the data. Forty such dials are used at once, each for a single class of facts, and grouped on any system required. An operator will punch from 700 to 1400 cards a day, with fewer errors than are involved in any other system. The average number of punched cards passed through the machine with an average of nine daily readings was 7000 for each worker. The saving by this method effected for the eleventh census is estimated at about half a million of dollars, with an increased accuracy of results. It would be difficult to explain this interesting process more clearly without cuts.

Prof. Lester F. Ward read a brief paper on the character and purpose of a national university, such as was advocated by Washington, Jefferson, Madison and others, and which was certain to be realized in the near future. It should be national, not political nor sectarian, its chairs held by Americans only, its scholarships allotted by congressional districts and on competitive examination, and its faculties chosen by a special commission from among our most eminent scientific men, its "strong chair" being in the science and art of government, with the aim of ultimately filling all administrative offices from its list of graduates, thus securing trained and skilled officers.

Among other papers read in the Economic Section may be mentioned one by Prof. Anderson on the World's Columbian Exposition, on which $40,000,000 were to be expended; on state railway supervision, by B. W. Snow; on our mercantile marine, by Henry Farquhar; on the muck soils of Florida, by H. W. Wiley; and on the artesian wells and underground waters of Texas, by R. T. Hill.

Prof. Springer attracted the attention of the Chemical Section by his remarks on "A Latent Characteristic of Aluminum," as adapting it for sounding boards of musical instruments. He claimed that it differed from other metals in the absence of the tones described as "metallic," and also in having an elasticity capable of sympathetic vibration uniformly through a wide range of tone pitch, being in this respect superior to any kind of wood. It is also superior to wood in being incombustible, impermeable to moisture, and in permitting the thickness of the sheet to be so reduced as to obtain the utmost amplitude of vibration without injuring the tone.

The processes of mountain building were explained by Prof. Warren Upham in a communication to the Geological Section. Six classes of mountains exist: the folded, arched, domed, tilted, erupted, and eroded. The long mountain belts consist of folded rock formation, wave-like ridges with intervening troughs, the folds being sometimes closely pressed together. Examples are found in the Appalachian, Atlantic, and Laurentian systems of America, and the grand Alp-Himalayan belt of the Old World, reaching from the Pyrenees to the China Sea. The arched mountains are typified by the Uinta range in Utah, an arch having been raised during the tertiary period 150 miles long and 40 wide, and about five and a half miles high. By erosion this arch has been since cut down to half its original height. Domed mountains, exemplified by the Henry mountains in Utah, were formed by volcanic uplifts of previously horizontal strata, the lava being injected between the strata, to which Gilbert gives the name of "alaccolite." The Wasatch mountains and the Sierra Nevada are examples of tilted ranges, being immense rocky masses tilted by the upheaval of one border with a corresponding depression of its opposite border, taking place along fault lines. Volcanic eruption on a grand scale along deep fissures has made mountains like the Andes, the Cascade range, the latter 500 miles long, with lava beds 4,000 feet thick, and lava peaks 14,000 feet high, also the volcanoes of Iceland, Hawaii, etc. Examples were also given of mountains made wholly by erosion, some of which from 5,000 to 16,000 feet high may be seen in Montana. The relation was shown between these different kinds of mountains and the earth's contraction with an attendant necessary relief of stress on its crust by the elevation of certain areas by folding, arching, doming and eruption.

A curious account of the "Venus fly trap" was laid before the Biological Section by Professor J. M. Macfarlane, from Edinburgh, who also gave an illustrated lecture on the hybridization of plants, before the Association. Concerning the "fly trap," he proved by specimens at hand that two touches were necessary to make the leaf close up, but that it made no difference whether one of the six sensitive hairs was twice touched, or two of them each touched but once. The protoplasm of the leaf cells retained sharp recollection of the first touch for fifteen seconds, which was weakened during the next fifteen, and was wholly gone in about a minute. This exactly agrees with the "latent period" of muscular contraction in animals, though longer as to period. He showed that every part of the leaf blade is sensitive, closing after two snips; and that if the first snip is very strong, closure may occur at the second, even after the lapse of two minutes. A strong jet of water will produce sudden closure. The action of chemical and electrical stimuli on these leaf cells is identical in behavior with that on the nerve-muscle-cells of the lower animals. This discussion was made particularly interesting by the presence of a beautiful array of plants from the public botanical garden, loaned for the purpose of demonstration.

The deep well at Wheeling, W. Va., is 4,500 ft. deep, and will be drilled to the depth of 6,000 ft. It was drilled by T. S. Kinsey, and when done will be the deepest well in the world. It has been presented by its owners for scientific purposes, being dry, and useless so far as its original object is concerned.

Mr. Wm. Hallock laid tabulated observations before the Geological Section. The strata pierced are undistorted, and nearly *in situ*. The well is cased for 1,500 ft., and the uncased portion is mainly in shale. Thermometers were lowered to various successive depths, and the temperature was recorded as registered. In the upper half of the uncased portion the mercury rose 1° Fahr. for every 80 or 90 ft., but increased to 1° for every 60 ft. in the lower half, reaching over 110° at the bottom, which is 3,700 ft. below the sea level. In wells near Berlin and Leipsic, one 4,170 ft. deep, and the other 5,740 ft., the temperature at the bottom is about 118° and 135°. Further observations as to barometrical and other phenomena will be awaited with interest.

Prof. C. B. Thwing explained the Lippmann process of color photography, described in France last February, and which differs from that of M. Becquerel, discovered in 1848. The latter by a photo-chemical method produced a colored image that could not be exposed to the light. Lippmann by a physical method gets an image that retains its colors after treatment with hyposulphite of soda, and is as permanent as any plain negative. A transparent plate is exposed with its film side resting against a reflecting surface of mercury. This divides the film into layers as far apart as the wave length of the incident light, and thus reproduces by reflection the color that produced the layer. Overexposure may completely reverse the colors of nature, giving the complementary colors instead. A number of colored negatives were exhibited illustrating the paper.

Free coinage was discussed by the eminent statistician Edward Atkinson, the secretary reading the paper in the absence of the author; which was followed by another on coinage ratio and our silver policy, by E. T. Peters; these papers presenting the two sides of the exciting question of bi-metalism, and fairly recognizing the difficulties on either side.

In the Anthropological Section several papers were read by ladies, one of which especially, by Mrs. Anita Newcomb McGee, attracted attention both by its ability and the singularity of its subject, namely, "An Experiment in Human Stirpiculture." In other words, she explained the methods and results of the Oneida Community, where between 1868 and 1879 there were sixty children born on what were alleged to be scientific principles, according to a peculiar system devised by Mr. Noyes, that separated the amative and propogative functions. It was claimed that most of these children were remarkably bright and healthy. But the spirit of monogamy prevailed, so that when, in 1879, the question was put to a vote, only three favored the continuance of the experiment. In the discussion following this paper curious facts were brought out as to the Mormons as well as the communists; but some doubted if rural surroundings and unusual care in training did not have more to do with the superiority of the Oneida offspring than any system of stirpiculture.

An elaborate and valuable paper by Miss Alice C. Fletcher, on "The Nez Perces Country," and another on the "Utility of the Psychical Study of Child Life," by Laura O. Talbot, were heard with marked interest.

The veteran State geologist of Tennessee gave a remarkable account of the remains of a megalonyx found in the Big Bone Cave of that State, a synopsis of which is published elsewhere in this issue.

Prof. Doolittle and Prof. Comstock read papers on the secular variation of terrestrial latitude, dealing with a question vulgarly but aptly phrased by a local reporter as amounting to the inquiry, "Does the earth wobble?" The papers bristled with technicalities, showing results of many thousand telescopic observations during a long term of years, and seeming to prove that the terrestrial pole is actually in motion at the rate of 4½ seconds a century. This fact has its bearing on many other questions, and calls for systematic observation simultaneously carried on in all parts of the world for the better determination of the rate and significance of polar motion.

The research fund of the A.A.A.S. ought to be sufficiently increased to enable it to take a share in special inquiries like the foregoing. Accordingly a committee was appointed, of which Prof. Brashear, of Allegheny, is the chairman, to raise if possible the sum of $100,000 for that purpose.

H. C. HOVEY.

Effect of Water on Lead Pipe.

A very remarkable case of danger from water in contact with lead, where neither the conditions of the drainage area nor the results of chemical analysis would arouse any suspicions as to safety, was reported by Dr. Elwyn Waller at a recent meeting of the American Chemical Society. The water in question came from creeks in the mountain districts of Kentucky. Analyses of samples "one" and "two" were as follows, the acid radicles being distributed among varying quantities of the usual alkali and alkali earth metals, with also some silica, iron oxide and alumina:

	Parts in 100,000.	
	I.	II.
Odor when heated to 100° F.	None.	None.
Chlorine, in chlorides	0·0311	0·0560
Phosphates	None.	None.
Nitrogen, in nitrates	0·0165	0·0247
Free ammonia	0·0004	Trace.
Albuminoid ammonia	0·0046	0·0016
Temporary hardness	0·9500	0·7500
Permanent "	1·4000	1·3000
Organic and volatile	1·3000	1·4000
	3·7026	3·5323

As a further test, sections of 1 in. lead pipe, each 1 in. long, freshly scraped, were put into about a pint of each sample, and for comparison a piece of the pipe was put into an equal quantity of Croton water. A slight cloudiness occurred in No. II. in twenty-four hours, a still further discoloration in No. I., and none in the Croton. Fresh samples were put into bottles with the lead, and left, with glass stopples tied down, for several months. At the end of that time the piece of lead in the Croton water was blackened, and had developed one or two spots of adherent white incrustations. Sample of water No. I. was whitish in color, with some detached white sediment, while No. II. was decidedly milky, and contained a half inch of detached sediment, the action upon the lead apparently going on indefinitely, the scales becoming detached as fast as formed. A similar case was reported some years ago by Prof. Frederick Penny, in his experiments upon the water of Loch Katrine, which showed an almost identical composition by analysis.

PHOSPHATED SALT.—Potassium, sodium, and calcium phosphates in nearly equal proportions are well mixed and finely ground. Common salt is then well ground and incorporated with 3 per cent of the phosphate mixture to form a prepared table salt.—*G. D. Bowie.*

The Dairy of the Exhibition.

Chief of Construction Burnham has designated sites for the Forestry, Sawmill, Dairy and Agricultural annex buildings They will be grouped on the space formerly planned for a lagoon, south of the Agricultural building and near the lake shore. The lagoon, which is a natural one, will disappear, the buildings being constructed on a piling foundation over it. The approximate dimensions of the Dairy building are given as 95×200 feet; those of the Forestry building 200×500 feet. Chief Buchanan, of the Department of Agriculture, has secured the construction of all these structures. The Forestry building will be unique in that it will be surrounded by natural tree trunks as columns, one or more of which will be contributed by each of the several States. The sawmill people have been making a vigorous plea for their building, in which to show the actual operation of producing lumber.

No feature of the Exposition, probably, will possess greater interest or value to the agriculturist than will the dairy school, the holding of which substantially in accordance with the plan submitted some time ago by Chief Buchanan is now assured. The school will include a contest between both herds and individuals of the chief breeds of dairy cattle, with a view of ascertaining the respective merits of each in milk giving and butter and cheese producing. Each herd will be charged each day with the food consumed, accurately weighed, and will be credited with the milk, butter, and cheese produced. Manufacturers of dairy utensils and appliances will gladly furnish all that will be required in their line. Accommodations will be provided, so that spectators may view the processes of butter and cheese making.

The tests and all details of management will be under rules to be prepared by a committee composed of one member from each of the dairy cattle associations in the United States, three from the Columbian Dairy Association, three from the Agricultural Colleges and United States Experimental Stations, and one from the manufacturers of dairy utensils.

The manufacture of the product will take place in the dairy building, in an operating space 25 by 100 feet, above which on either side will be a gallery which will accommodate fully 500 spectators. The school, in all probability, will continue through four months, and each participating herd will be represented by a given number of cows. The results of this test and of the exhibition which will be made of the latest and most advanced scientific methods known in connection with the feeding and care of cattle, the treatment of milk and the production of butter and cheese, cannot fail to be of very great value to the dairy interests of this country. These interests, it is scarcely necessary to state, are of enormous importance and extent, and, indeed, are scarcely surpassed by any other branch of industry in respect of the amount of money invested. It cannot be doubted that the Exposition Dairy School will cause a more economic and scientific management of the dairy interests of the entire country, and consequently a greater return from the capital and labor invested.

The India Rubber Tree.

The India rubber tree cannot stand shade, and unless the seedlings are fully exposed to light and well drained, they cannot grow. Owing to this it is found that in the depths of the forest, where light and air are shut out by the dense crowd of trees of many species, natural reproduction takes place by the germination of seeds carried by birds high up in the crowns of other trees, aerial roots descending in process of time to the ground, and developing into a huge hollow cylinder round the foster stem, which is soon killed. The descent of the roots may take years, but once they have taken hold of the ground, the further growth is exceedingly rapid. In cultivating, the seeds are found to grow much better than cuttings, and these are tended in large nurseries until they are 10 feet high, when they are transplanted into clearings made in the forest, in strips of 40 feet wide, alternating with 60 feet of natural forest, this being found necessary to furnish the necessary moisture, while narrower clearings do not give air and light enough. Trees grown in grass land were found on tapping to yield scarcely any rubber, the difference being attributed to absence of the moisture afforded by the forest. Plants of 1874–75 were found, in April, 1889, to have attained an average height of 61 feet 11 inches and a girth of 11 feet 5 inches, thus having grown at the very rapid rate of 6 feet 1 inch in height and 9 inches in girth per year.—*Demerara Argosy.*

Improved Cementing Material.

V. L. Daguzau says: This material is called by the inventor pyro-cement, and is "a blackish product, which adheres strongly to iron, wood, stone," etc. The following constituents and proportions yield a useful result: "18 to 25 per cent of gas petroleum or other resinous matters, 75 to 80 per cent of clay or argillaceous earth and silica, 2 to 8 per cent of natural sulphates."

Correspondence.

The Grooved Cartridge.

To the Editor of the Scientific American:

I came across a copy of the SCIENTIFIC AMERICAN, dated April 26, 1890, in which you give a description of the new rifle adopted by the German government. You say for it: The cartridge forms an innovation upon all others that now exist, inasmuch as it has no projecting rim at the base; but, on the contrary, has a small groove, in order to allow it to be grasped by the extractor hook. Now I can prove that I am the original inventor of that construction of cartridge, as will be seen by the plans and specifications, No. 7,779, published at the British Patent Office, entitled "Jennings' Combined Single Loading and Repeating Rifle," and dated 26th June, 1885, that is, three years prior to the German model, 1888. R. JENNINGS.

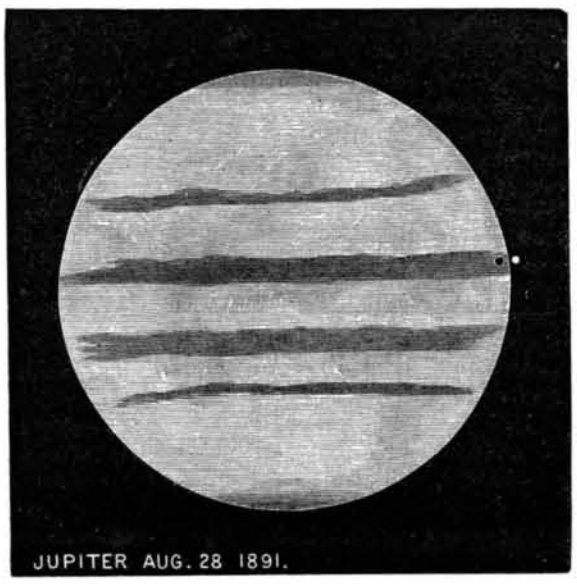
54 Fruit St., Youngstown, O., Aug. 5, 1891.

JUPITER.

To the Editor of the Scientific American:

The planet Jupiter is now in good position to observe even with small telescopes. The ever-changing relations of the four moons to each other and the planet will interest and instruct.

The belts are also of constant interest. I send herewith sketch of the planet as observed last night. Four



belts were very prominent and finely marked. The little white spot near the right hand edge of Jupiter is the first satellite about to transit, which occurred at 9 hours 52 minutes. The small black spot just entered upon the disk of the planet is the shadow of the satellite. It came on 13 minutes before the satellite itself, and, of course, preceded it entirely across the planet. The satellite could be easily seen in transit upon the gray background formed by the belt.

WILLIAM R. BROOKS.

Smith Observatory, Geneva, N. Y., Aug. 29, 1891.

How to Get Rid of Snails.

To the Editor of the Scientific American:

In one of your numbers, a correspondent inquires as to the getting rid of snails and slugs. I remember a few years ago traveling in Brittany and meeting boys carrying sea sand in baskets. Having asked them for what purpose, they answered it was to prevent snails and slugs getting on to the flower beds, and that it answered perfectly. Your correspondent might try this remedy. A. B.

Sainte Adresse, France, August 15, 1891.

Jet Propulsion.

To the Editor of the Scientific American:

I note the remarks of Mr. W. H. Wetherill in your issue of August 29. The principle of hydraulic propulsion is already secured, in that past experiments have shown its superiority to that of the screw propeller; but its adoption has been retarded because experimenters have used impractical pumps; consequently a medium size jet has not been obtained—a condition vitally germane to the success of the method. For example, the two 9 inch nozzles on the English torpedo boat of 66 feet and the one ¾ inch jet of Dr. Jackson's yacht of 106 feet, both size nozzles being extremes.

The experiments made by the English Admiralty employed centrifugal pumps of great capacity and comparatively little power, while the steam pumps used in the United States experiments had great power and little capacity. A pump which combines capacity and power will effect the speedy adoption of the principle.

I contend the screw is not intermittent. It has a continuous thrust—every blade constantly doing duty by turning a complete circle. Suppose one blade were left on the shaft, does Mr. Wetherill think its action is intermittent? If not, conld a screw propeller with more blades be regarded as intermittent? So with three or four constant jets impinging the water of flotation at the same time, while each jet is independent of the others in its work; thus each blade is independent yet continuous in its action.

In conclusion, the possibilities of obtaining greater speed through the screw propeller are nearly limited. The application of its highest power is nearly reached; but with a practical pump three or four times the power can be realized. In this direction lies the probability of four days Atlantic liners.

JOHN W. HAHN.

Newton, Mass., August 29, 1891.

Collapse of a Kitchen Boiler under Apparently Normal Working Conditions.

To the Editor of the Scientific American:

A 30 gallon upright copper boiler had been in use twenty years and was in perfect order. It was supplied from a tank under a maximum head of 8 ft. 6 in. Minimum head (tank almost empty) about 3 ft. 6 in. A few days ago (Monday, Aug. 31), the tank having been drawn down for washing so that the head was about 4½ ft., the upper part of the boiler suddenly collapsed, hot water being drawn at the same moment in the washtubs.

The cause was at first not evident, nor had the plumber any explanation to offer.

The facts are that within a year the range formerly in use has been taken out and a larger one put in, with water back having a much greater heating power. It now appears that for some time a snapping has been noticed in the hot water pipes, which indicates that steam had been formed in the boiler and was condensed with the noise observed; proving that the water back was too powerful for the demands made upon it.

On the morning in question the fire was hot, the water in the boiler was undoubtedly at the boiling point, and had forced back water into the tank until there was a steam space of fifteen or eighteen inches in the boiler.

On opening the faucet in the tub the pressure was relieved—cold water passed into the boiler from the tank, and the condensation was instantaneous, allowing no time for equalization of pressure through the feed, or open faucet, which was at the end of not less than 13 ft. of ¾ in. pipe, and was probably only partly open.

It appears from this that water backs are put in without any calculation as to their capacity, and that under some conditions steam may be formed and a collapsed boiler result, with all the details of inlet and outlet in ordinary working order.

The primary cause in this instance was the unnecessarily powerful water back, to which the low head of water was contributory. The conditions have been the same for twenty years as regards pressure; but a pipe water back running around the top of the fire had been used in the old range.

This accident serves to call attention to the need for especial care in proportioning the water back to the work it has to perform where a low pressure water supply is in use. DURAND WOODMAN.

80 Beaver St., N. Y., Sept. 2, 1891.

White Metal Alloys.

The following alloys are used as lining metals by the Eastern Railroad of France:

Number.	Lead.	Antimony.	Tin.	Copper.
1	65	25	0	10
2	0	11·12	83·33	5·55
3	70	20	10	0
4	80	8	12	0

No. 1 is used for lining crosshead slides, rod brasses and axle bearings. No. 2 is used for lining axle bearings and connecting rod brasses of heavy engines. No. 3 is used for lining eccentric straps and for bronze slide valves. No. 4 is a special alloy for metallic rod packing.

A Light Concrete.

F. Sang states, tufa sand, which is found as small pellets or granules in the Rhenish provinces, is mixed dry or wet with Portland or other cement, and the concrete formed moulded into any desired shape. A mixture of equal parts is said to be as strong as granite and less than half its weight, but for many purposes a mixture of 1 part of cement to 3 to 5 of tufa sand suffices.

Besides being applicable for ordinary building purposes, the patented material is said to be a good non-conductor of heat, and therefore to be fit for forming the roofs of bakers' ovens and similar uses.

THE race of the two-year-olds for the Futurity stake of $75,000 took place at Coney Island, N. Y., on August 29, and was won by His Highness, a bay colt 15·2½ hands high, of such splendid proportions that he would be readily taken for a well furnished three-year-old. He was bred at the Kentucky stud of the late Hon. August Belmont, and was sired by imported The Ill Used, out of imported Princess, the dam of Prince Royal and Her Highness. He cost his owner, Mr. David Gideon, $3,400 at the closing-out sale of Mr. Belmont's race horses at Babylon, N. Y., last February. It is said His Highness has already netted over $100,000 for his owner.