

Science Notes.

The fourth centenary of the discovery of India by Vasco da Gama will be celebrated by an exhibition in Lisbon next year of Indian products, in which Senor Aronca is instructed to invite England to take an important part.

A phosphorescent 5 o'clock tea was recently given in Paris at 8 in the evening, at which no lights were used, the light coming from the ceiling, carpets, chairs, pictures, teacups, and flowers. The ladies wore phosphorescent dresses, and their faces, shoulders, and arms gleamed with light. M. Henry, of the Académie des Sciences, has invented a phosphorescent starch which was used on the occasion and which may be employed as a face powder.

Litmus is an admirable indicator of acids and alkalis, but for this purpose can only be relied upon when pure. Its preparation in a pure state is not easy. A new and convenient means of making litmus paper is provided in the litmus pencil. Thus, by merely rubbing paper with the pencil, marks are obtained which are very sensitive to minute quantities of acids and alkalis, according, of course, as to whether the blue or the red end of the pencil has been used.

A sanitary engineer of this city is responsible for the following: A new danger has been found in the tall buildings of our largest cities. It is that draughts of sewer gas from the escape pipes of overtopping buildings come into the windows, chimneys and light shafts of adjacent office buildings or houses. A well known sanitary engineer states that the entire family of a superintendent of a large office building surrounded by loftier buildings suffered from severe forms of zymotic disease including repeated attacks of malarial fever and that even growing plants were destroyed.

William P. Mason, of the Rensselaer Polytechnic Institute, Troy, was once requested to state the weight in grains of a United States gallon of water at 60° Fah., and upon investigation found that much confusion existed on this point. He gives the following results, which are presented in the Pharm. Record:

U. S. Pharmacopœia, 1870	58328-8862 grains.
" " " " 1880	58329-6 "
Miller's Chemistry	58317-3 "
Am. Chemist, Vol. I, p. 318	58319-8 "
U. S. Dispensary	58328-886 "
Oldberg's Weights and Measures	58335-218 "
U. S. Treasury Department	8-3312 lb.

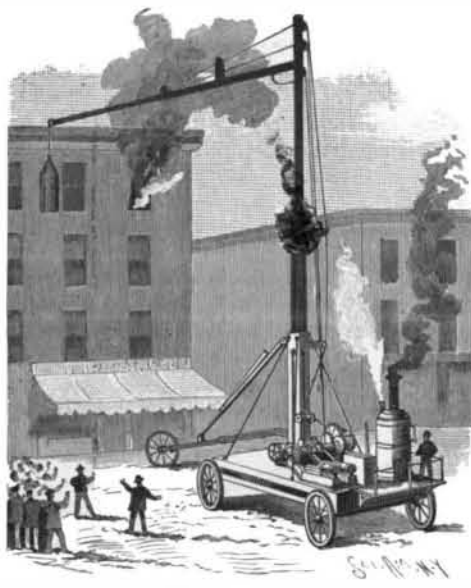
The Astrophysical Observatory at Potsdam is to have a large refracting telescope, says the Astrophysical Journal. With the 11 inch refractor hitherto used for the spectrographic researches of Profs. Vogel and Scheiner, the motions in the line of sight of 51 stars were determined with great accuracy, but it was impossible to photograph stars appreciably fainter than the second magnitude with the large spectrograph. It is reported from Berlin that the aperture of the new telescope will be about thirty inches. The light collecting power of such an instrument should be sufficient to bring stars of the third magnitude and some even fainter ones within reach of the large spectrograph, whose range will thus be trebled if not quadrupled.

A correspondent in Nature recently tried some interesting experiments with formic acid, which has so repeatedly been recommended to promote a magical growth of plants. The seeds used were those of the Scotch thistle. He used formic acid diluted 1-5000. The experiments were carried on in a greenhouse where the temperature ranged from 55° Fah. to 75° Fah. The seeds showed no sign of life, though those planted under ordinary circumstances did. He then procured pure concentrated formic acid; the result was the same. Various other seeds were then tried with no success. His conclusions are that the acid retarded the growth of the seeds, but seemed to increase their density. He also tried the injection of formic acid (1-5000) into growing seeds and bulbs with no effect.

In a recent Chemical Society paper on "The Temperature of Certain Flames," by W. N. Hartley, F. R. S., the author mentions that he found no practicable means of measuring their temperature, owing to the disproportionate size of the measuring instrument—a thermo-electric couple, for instance—compared with the effective volume of the flame. He measured the temperature of flames by means of gold leaf and with fine wires of platinum 1-3000 inch diameter, such as were drawn by Wollaston and used by Faraday, also with pure platinum wire 1-1000 inch thick. He furnishes evidence of the high temperature of a candle flame, not only from the melting of gold and of platinum in the flame, but by an examination of the spectrum to be seen in the mantle. Experiments made with platinum wires heated in a batswing gas flame are described, which proved that the carbon does not lower the melting point of the platinum, at any rate in any appreciable degree. A small carbon monoxide flame melts platinum wire 1-1000 inch in thickness, and a cyanogen flame was shown to be intensely hot, for it melted such wire with extreme ease. The author believes that his experiments have dissipated the doubt that was cast on Professor Smithells' statement of the high temperature of the mantle of the Bunsen flame, and confirm his own estimate of the high temperature of the Bessemer flame.

A NOVEL FIRE ESCAPE.

The invention shown in the illustration has been patented by Mr. John Alexander Dobkins, of Lebanon, Oregon. It is intended to provide a portable fire escape, specially adapted, by means of a laterally extended arm, to reach the windows of a building which are above the level of such obstructions as electric wires, etc. A stout sill frame, which is mounted upon wheels for convenience of transportation, is provided with a framed platform, or turntable, in which is securely fixed the base of a vertical telescopic mast, the heel of the same being stepped in a suitable pivotal support on the frame of the car. The mast is in three sections, and each section is provided with a wire rope by means of which it may be hoisted to the required height, said ropes passing over suitable pulleys and leading down through the mast to a sheave, from which they lead to the hoisting engine. Near the upper end of the top mast is provided an extensible horizontal swinging arm, which is formed in two parts, the outer one being provided with suitable pulleys and wire rope whereby it may be adjusted to the desired length. This arm is pivoted near its junction with the mast, so that when not in use it may be folded down upon the platform, and when it is extended, and in use, it is supported from beneath by a curved brace and from above by a wire rope, which passes over a sheave at the top of the mast and is carried down to a winch drum over loose pulleys which are adjusted on short laterally extending arms attached to the lower sections of the mast. A fireproof cage is provided to receive the inmates of the burning structure. It is hung from the end of the extensible arm by means of a wire rope, which passes over sheaves at the end of the same, and near the top of the mast, and is then carried down to the drum of the hoisting engine. To assist in bracing the mast an extensible arm is provided, having at its outer end a



DOBKINS' FIRE ESCAPE.

suitable wheel which bears upon the ground. At its inner end said arm is pivotally connected to the base of the mast. Attached to the center of the extensible arm is an extensible prop brace which is carried up to the top of the lower section of the mast, and pivotally connected to the same. By this arrangement the arm may be conveniently folded up when the fire escape is in transit. It will be seen from the above description that, upon arriving at the scene of a fire, the apparatus may be quickly adjusted to the required height, and the fireproof cage may be placed at any desired window for the rescue of the inmates of the upper floors.

Visibility of Lights at Sea.

As a result of the discussion of the subject of anchor and running lights by the International Maritime Conference in Washington, in 1889, says the New York Sun, special investigations were undertaken by officers of the governments of the United States, Germany, and Netherlands to determine the intensity of light needed to fulfill the requirements of the law governing the rules of the road, which says that "the word 'visible' in these rules shall mean visible on a dark night with a clear atmosphere." The result of a large number of observations by the German committee gave as the distance at which a white light of 1 candle power became visible, 1.40 miles for a dark clear night, 1 mile for a rainy one.

The American experiments, undertaken at Long Beach light station, gave the following results in very clear weather: A light of 1 candle power was plainly visible at 1 nautical mile and one of 3 candle power at 2 miles. A 10 candle power light was visible with a binocular at 4 miles, one of 29 candles faintly at 5, and one of 33 candles visible without difficulty at the same distance. On a second evening, exceptionally clear, a white light of 32 candle power could readily be distinguished at 3, one of 5.6 at 4, and one 17.2 at 5 miles.

The Dutch governmental experiments, conducted at

Amsterdam, gave the following results: A light of 1 candle power was visible at 1 nautical mile, 3.5 at 2, and 16 at 5 miles.

In the experiments with colored lights it is only necessary to use the green, as it has been conclusively proved that if a light of that color fulfills the required tests, a red one of the same intensity will more than do so. It was found that the candle power required for a green light to be visible 1, 2, 3, and 4 miles at sea was 2, 15, 51, and 106, respectively.

The extraordinarily rapid diminution of the visibility of the green light with the distance, even in good observing weather, and the still more rapid decrease in rainy weather of a character which will but slightly diminish the intensity of a white light, show that it is of the utmost importance to select for the glass a shade of color which will interfere with the intensity of the light as little as possible. The shade recommended is a clear blue green. Yellow green and grass green should not be employed, as they become indistinguishable from white at a very short distance. For the red a considerably wide range is allowable, but a coppery red is probably the best.

The Fleets of the Great Nations.

The Carnet de poche d'officier de marine contains a classified list of the fleets of the great nations, according to which, taking into account only the latest types, England, Italy, Germany, Austria, Russia, France and the United States possess the following ships:

Armored vessels:

(1) Battleships of 13,000 tons and a speed of at least 18 knots: England 7; 10,000-13,000 tons and at least 16 knots: England 11, Italy 4, Germany 4, Russia 3, France 6 and United States 3; 8,000 tons and from 14 to 16 knots: England 11, Italy 3, Germany 1, Russia 6, France 7; and of less than 8,000 tons and less than 16 knots speed: England 1, Germany 9, Austria 4, Russia 1, France 4, United States 1.

(2) Coast defense ships of 8,000 tons and at least 16 knots: England 2; 6,000-8,000 tons and 14-16 knots: England 2, France 9; and of less than 6,000 tons and 14-16 knots: England 1, Germany 6, France 2, United States 2.

(3) Armored cruisers of 4,000-6,000 tons and at least 18 knots: England 9, Russia 3, France 5, United States 2.

(4) Armored gunboats or monitors of 1,500 tons and at least 13 knots: Austria 2, Russia 3, France 8, United States 1.

Other armored vessels: Italy 3, France 5.

Total armored vessels of the latest type: England 44, Italy 10, Germany 20, Austria 6, Russia 16, France 41, United States 9.

Unarmored vessels:

(1) Protected cruisers and torpedo dispatch boats of 8,000 tons or more and at least 18 knots: England 2, Russia 1; 4,000-8,000 tons and at least 18 knots: England 21, Italy 1, Germany 5, United States 8; 4,000 tons and 14-16 knots: England 7, France 3; 2,000-4,000 tons and at least 17 knots: England 31, Italy 13, Germany 1, Austria 2, Russia 3, France 5, United States 6; 2,000-4,000 tons and at least 14 knots: England 6, Italy 4, Germany 7, Russia 8, France 12, United States 2; and of less than 2,000 tons and 14 knots or over: England 19, Italy 5, Germany 17, Austria 1, Russia 10, France 7, United States 8.

(2) Torpedo cruisers of 20 knots and over: Italy 8, Russia 6, United States 1; of 15-20 knots: England 9, France 4.

(3) Torpedo boat destroyers of at least 25 knots: England 11, Italy 5, Germany 4; of 20 to 22 knots: England 11, Italy 1, Germany 6, Austria 6, France 19.

Other unarmored vessels: England 21, France 1, Russia 4, Italy 6, and Austria 6.

Total unarmored vessels: England 133, Italy 43, Germany 40, Austria 15, Russia 32, France 51, United States 25.

Torpedo boats:

Torpedo boats of 120 tons and from 20 to 25 knots: England 2, Germany 15, Russia 17, France 9, United States 1; of 100 tons and at least 20 knots: England 10, Italy 2, Germany 18, Russia 3, France 21, United States 1; of 40-100 tons and at least 20 knots: England 54, Italy 92, Germany 59, Austria 22, Russia 23, France 149, United States 1; of 40-100 tons and at least 18 knots: England 12, Germany 25, Austria 34, Russia 10; and of less than 40 tons and at least 18 knots: England 27, Italy 67, Russia 2, France 37.

Total torpedo boats: England 105, Italy 151, Germany 117, Austria 56, Russia 55, France 216, United States 3.

Grand total:

The total number of vessels of latest type is, therefore, England 287, Italy 204, Germany 177, Austria 77, Russia 103, France 308 and United States 37.

Besides these there are a number of armored vessels of older type, which will be available for defensive purposes as well as in second line. Of these England has 21, Germany 14, Austria 5, Italy 4, France 9 and United States 18.—Journal of the United States Artillery.

Notice.

A premium of \$250 is offered by the SCIENTIFIC AMERICAN for the best essay on THE PROGRESS OF INVENTION DURING THE PAST FIFTY YEARS.

This paper should not exceed in length 2,500 words. The above-mentioned prize of \$250 will be awarded for the best essay, and the prize paper will be published in the Special 50th Anniversary Number of the SCIENTIFIC AMERICAN of July 25. A selection of the five next best papers will be published in subsequent issues of the SCIENTIFIC AMERICAN SUPPLEMENT at our regular rates of compensation.

The papers will be submitted for adjudication to a select jury of three, consisting of—

- Prof. R. H. Thurston, Cornell University.
- Judge A. P. Greeley, Washington, D. C.
- Prof. R. S. Woodward, Columbia University.

Rejected MSS. will be returned when accompanied by a stamped and addressed envelope.

Each paper should be signed by a fictitious name, and a card bearing the true name and the fictitious name of the author should accompany each paper, but in a separate sealed envelope.

All papers should be received at this office on or before June 20, 1896, addressed to

Editor of the SCIENTIFIC AMERICAN,
361 Broadway, New York.

Compulsory Introduction of Coupling Devices.

Sixteen thousand railroad employes were killed in the discharge of their duties in the seven years from 1888 to 1894. The awful record of the killed and injured seems incredible. During these seven years the exact figures are 16,257 killed and 172,130 crippled, maimed and injured. Few battles in history show so ghastly a fatality.

This slaughter of American workmen is about ended, says the Evening Telegram. A national law, the expression of the Congress of the United States, has called a halt to the heartlessness or heedlessness of railroad companies, and it has been decreed that an army of men shall no longer be offered up as an annual sacrifice to corporate greed.

There is a romance in some statistics and history in others. There are many good people who revile statistics and never glance at a table of figures, but they will find food for thought in a study of the facts presented by the Chicago Times-Herald.

In 1893 the slaughter of railroad employes became so great as to attract the attention of Congress. For a generation it had been known in a general way that a large number of men were being annually killed and maimed, but it was not until 1888 that accurate figures were obtainable. It was also known that a large percentage of these deaths was caused by the use of imperfect equipment by the railroad companies. There was not a city, village or hamlet in the United States but that numbered its maimed and killed. In thousands of homes widows and orphans mourned the loss of fathers whose lives had been crushed out beneath the wheels of railway cars. Here is the record from 1888 to 1894, one year after Congress passed an act designed to check this slaughter:

Employes—	Killed.	Injured.
1894.....	1,823	23,422
1893.....	2,727	31,749
1892.....	2,554	28,287
1891.....	2,660	28,140
1890.....	2,451	22,394
1889.....	1,972	20,028
1888.....	2,070	20,148
Passengers—		
1894.....	324	3,084
1893.....	299	3,299
1892.....	376	3,227
1891.....	293	2,972
1890.....	286	2,425
1889.....	310	2,146
1888.....	315	2,138
Other persons—		
1894.....	4,300	5,433
1893.....	4,320	5,435
1892.....	4,217	5,158
1891.....	4,076	4,769
1890.....	3,589	4,209
1889.....	3,541	4,135
1888.....	2,897	3,602
Totals 1894.....	6,447	31,889
Totals 1893.....	7,346	40,268
Totals 1892.....	7,147	36,652
Totals 1891.....	7,029	33,881
Totals 1890.....	6,325	29,027
Totals 1889.....	5,823	26,309
Totals 1888.....	5,282	26,888

Note the marked decrease in 1894 in the number of railroad employes killed and injured. If the figures were obtainable for 1895, the decrease would be more marked. This happy result is the sequence of a law passed in 1893, and is a striking example of what can be obtained by wise national legislation.

It seems remarkable that all inventions designed to protect human life are adopted only after some stern statutory enactment, municipal, state or national. Any invention containing features which fairly promise to protect property needs no support from the law-giving power of a community or a nation. The owner

of a building will cheerfully equip it with fire extinguishers and other apparatus designed to save it from a conflagration, but he rarely spends money for a fire escape until some municipal officer enforces a law to that effect. The mine owners in all parts of the world have been progressive on all points looking to the development of their property, and are quick to adopt any method by which the cost of production can be cheapened, but it has been necessary to fill the statute books of both continents with laws before the lives of the miners have been taken into consideration. This seems the natural result of human selfishness. Human life is cheap; property is dear.

Railroad companies have been no exception to the rule. Twenty years ago or more it was practically demonstrated that cars could be automatically coupled, and that it was no longer necessary for a railroad employe to imperil his life by stepping between two cars about to be connected. The automatic coupler was soon applied to all first class passenger trains. It was a paying investment. The former methods entailed a constant damage on the expensive passenger coaches, and the railroad companies welcomed the new invention. But they made no move to apply the automatic coupler to freight cars, as these were strongly constructed and contained no parts which were seriously injured by being jammed together. It was different with the expensive passenger coaches, and as before stated, it needed no aroused public sentiment to hasten the change.

In 1893 the list of killed and injured railroad employes reached the appalling total of 2,727 dead and 31,749 wounded. It was time to call a halt, and in response to appeals from all over the United States Congress took up the matter, and after bitter opposition passed the Safety Appliance act. In view of the fact that this is one of the most successful pieces of legislation ever enacted in the interests of workmen, and the further fact that its provisions are now going into effect, the salient sections of this bill are worth quoting at this time. The act reads as follows:

Section 1. An act to promote the safety of employes and travelers upon railroads by compelling common carriers engaged in interstate commerce to equip their cars with automatic couplers and continuous brakes, and their locomotives with driving wheel brakes, and for other purposes.

Be it enacted, by the Senate and House of Representatives of the United States of America in Congress assembled, that from and after the first day of January, 1898, it shall be unlawful for any common carrier engaged in interstate commerce by railroad to use on its line any locomotive engine in moving interstate traffic not equipped with a power driving wheel brake and appliances for operating the train brake system, or to run any train in such traffic after such date that has not a sufficient number of cars in it so equipped with power or train brakes that the engineer on the locomotive drawing such train can control its speed without requiring brakemen to use the common hand brake for that purpose.

Section 2. That on and after the first day of January, 1898, it shall be unlawful for any such common carrier to haul or permit to be hauled or used on its line any car used in moving interstate traffic not equipped with couplers coupling automatically by impact, and which can be uncoupled without the necessity of men going between the ends of the cars.

Section 3. That when any person, firm, company, or corporation engaged in interstate commerce by railroad shall have equipped a sufficient number of its cars so as to comply with the provisions of section 1 of this act, it may lawfully refuse to receive from connecting lines of road or shippers any cars not equipped sufficiently, in accordance with the first section of this act, with such power or train brakes as will work and readily interchange with the brakes in use on its own cars, as required by this act.

Section 4. That from and after the first day of July, 1895, until otherwise ordered by the Interstate Commerce Commission, it shall be unlawful for any railroad company to use any car in interstate commerce that is not provided with secure grip irons or hand holds to the ends and sides of each car for greater security to men in coupling and uncoupling cars.

In its remaining sections the act authorized the American Railway Association to designate the standard height of drawbars for freight cars, and stipulated that on and after July 1, 1895, no cars used in interstate traffic should be used unless they complied with this standard. Section 6 provides that "any such common carrier using any locomotive engine, running any train, or hauling or permitting to be hauled on its line any car in violation of any of the provisions of this act, shall be liable to a penalty of \$100 for each and every such violation, to be recovered in a suit or suits to be brought by the United States District Attorney in the District Court of the United States having jurisdiction in the locality where such violation shall have been committed, and it shall be the duty of such District Attorney to bring such suits upon duly verified information being lodged with him of such violation having occurred." The last section is so framed that

any employe injured by a train not equipped in conformity to the act "assumes the risk occasioned thereby." He would, therefore, have no redress in a suit for damages.

This bill was approved by President Harrison March 2, 1893, and was one of his last official acts. The prediction was made that it would be disregarded by the railroad companies or that it would be fought in the courts and defeated. Neither prediction has come true. On the contrary, the railroad companies have, with a few exceptions, extended their most hearty cooperation in an effort to fully meet the requirements of the safety appliance act.

Before January 1, 1898, all of the great trunk lines of the United States will have complied with the provisions of this law. More than that, the more important roads have already made such progress that the death rate from accidents to railroad men has already decreased thirty-five per cent. In 1894 the number killed had decreased by 904 and the injured by 8,307. It is doubtful if any law ever enacted can show such direct and startling results.

It has been conservatively estimated that it has or will cost the railroads of the United States not less than \$50,000,000 to fully comply with the provisions of this law. Such roads as the Northwestern, the Chicago, Burlington and Quincy, the Lake Shore and other well managed roads have set aside a monthly sum to be devoted to this work and have so planned that their entire equipment will be in shape before 1898.

Book Production in the United States in 1895.

The New York Publishers' Weekly prints the following analytical table of the books published in the United States during last year, the figures for 1894 being included for purposes of comparison:

CLASSIFICATIONS.	1894.		1895.	
	New Books.	New Editions.	New Books.	New Editions.
Fiction.....	573	156	1050	64
Law.....	440	45	400	51
Theology and Religion.....	442	26	471	35
Education and Language.....	426	16	456	32
Literary History and Miscellany.....	208	29	465	13
Juvenile.....	315	29	365	10
Political and Social Science.....	233	21	313	22
Poetry.....	133	133	294	15
Physical and Mathematical Science.....	141	24	198	24
History.....	163	24	185	8
Biography, Memoirs.....	140	21	167	13
Medical Science, Hygiene.....	118	42	141	22
Description, Travel.....	116	28	134	27
Fine Arts and Illustrated Books.....	127	11	133	7
Useful Arts.....	118	20	100	11
Mental and Moral Philosophy.....	42	7	55	6
Domestic and Rural.....	42	9	48	4
Sports and Amusements.....	50	6	34	4
Humor and Satire.....	10	—	32	—
Totals.....	3837	647	5101	368
		3837		5101
		4481		5469

"The classification of fiction for 1895," remarks the editor, "shows a great excess over the novels of 1894; there were 1,114 to 729 of the previous year; among them were some translations from the French, German, Spanish, Italian, Russian and Polish. In law, theology and religion, education and language, juvenile literature, and in fact in every other department, excepting political and social science, for many years so rich in American contributions, and in medical science, useful arts and sports and amusements, the figures ran far ahead of any previous record. In the latter departments they fell behind 1894."

John C. De la Vergue.

John C. De la Vergne, the president of the De la Vergne Refrigerating Machine Company, of New York City, died on May 12. He was born in 1840, and after engaging in various lines of business, he bought an interest in a brewery. It was while engaged in the brewing business, in which ice was used, that he turned his attention to the manufacture of refrigerating and ice making machinery, and designed a compressor with a liquid sealed piston, which prevents the leakage of ammonia gas through the stuffing box, and at the same time lubricates the machinery. The invention made it possible to put the pipes containing the ammonia directly into the rooms, instead of first cooling salt water and then forcing through the rooms.

The success of this invention so encouraged Mr. De la Vergne that he tried it elsewhere, and succeeded in securing contracts for refrigerating plants from several large brewers, in Brooklyn, Newark, N. J., and Philadelphia, and in 1880 he organized what is now known as the De la Vergne Refrigerating Machine Company. At first the place of business was in Bank Street, but in 1888 the company purchased a large tract of land in East One Hundred and Thirty-eighth Street (Port Morris), upon which their present extensive works were erected. At this plant about eight hundred men are employed, and the company gives employment to about four hundred more throughout the country at their various agencies.