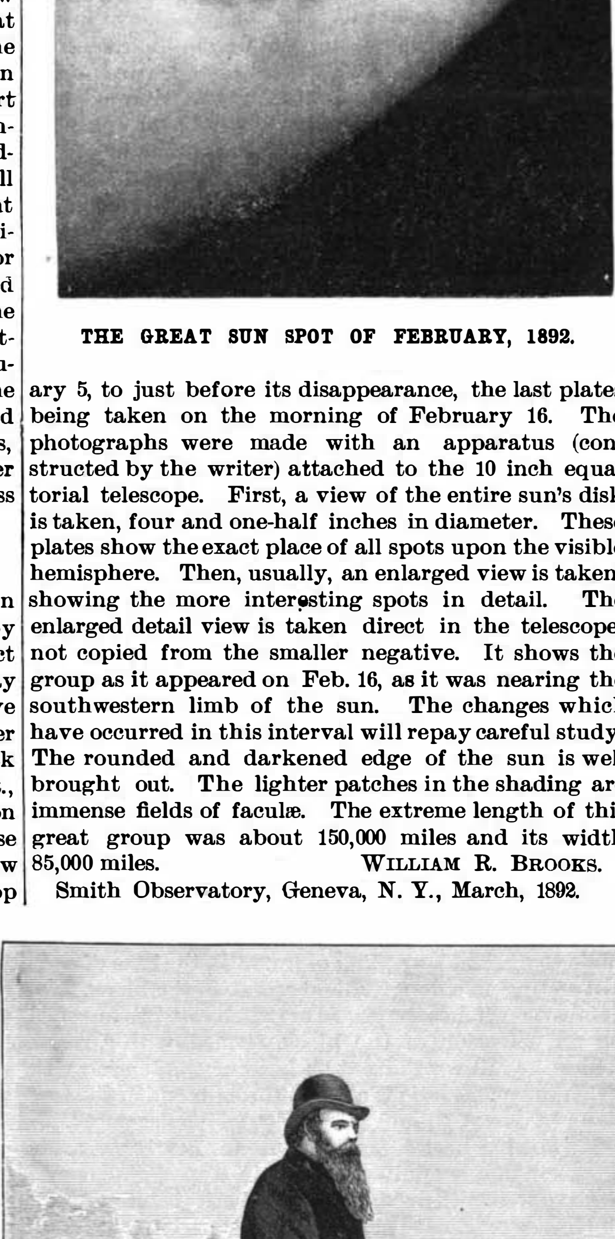
Epidemics—Influenza Due to Dust.

At a recent meeting of the Royal Meteorological Society, a paper on the untenability of an atmospheric hypothesis of epidemics was read by the Hon. Rollo Russell. The author is of opinion that no kind of epidemic or plague is conveyed by the general atmosphere, but that all epidemics are caused by human conditions and communications capable of control. In this paper he investigates the manner of the propagation of influenza, and gives the dates of the outbreaks in 1890 at a large number of islands and other places in various parts of the world. Mr. Russell says that there is no definite or known atmospheric quality or movement on which the hypothesis of atmospheric conveyance can rest, and when closely approached it is found to be no more available than a phantom. Neither upper nor lower currents have ever taken a year to cross Europe from east to west, or adjusted their progress to the varying rate of human intercourse. Like other maladies of high infective capacity, influenza has spread most easily, other things being equal, in cold calm weather, when ventilation in houses and railway cars is at a minimum, and when, perhaps, the breathing organs are most open to attack. But large and rapid communications seem to be of much more importance than mere climatic conditions. Across frozen and snow covered countries and tropical regions it is conveyed at a speed corresponding, not with the movements of the atmosphere, but with the movements of population and merchandise. Its indifference to soil and air, apart from human habits depending on these, seems to eliminate all considerations of outside natural surroundings, and to leave only personal infectiveness, with all which this implies of subtile transmission, to account for this propagation.—The origin of influenza epidemics was discussed by Mr. H. Harries. The author has made an investigation into the facts connected with the great eruption of Krakatoa in 1883, and the atmospheric phenomena which were the direct outcome of that catastrophe. He has come to the conclusion that the dust derived from the interior of the earth may be considered the principal factor concerned in the propagation of the recent influenza epidemics, and that, as this volcanic dust invaded the lower levels of the atmosphere, so a peculiar form of sickness assailed man and beast.

A RAIL FENCE BICYCLE RAILWAY.

A system of passenger travel is about to be put in operation between Mt. Holly and Smithville, N. J., by a company which has been organized to construct what is known as the Hotchkiss Bicycle Railway system. Each passenger furnishes his own motive power. The illustration will give, without any further detail, a good idea of the construction. The track rests upon a foundation of cross ties 3 × 6 in. by 3½ ft., which are placed at intervals of every 6 ft., and upon them rest wooden posts ordinarily 3½ ft. high. These are secured to the ties by bolts and angle irons. Narrow wooden stringers connect the posts, and the top stringer has a T-shaped rail fastened to it on which the bicycle runs. A special form of bicycle is required, although the ordinary saddle, handle bar and propelling mechanism are nothing new. The handle is not required for steering purposes, but is used simply as a means of convenience for the rider when in motion. The frame is double, extending down below the track rail on either side, a distance of 2½ ft., and has at the lower end a small guide wheel running horizontally, which serves to keep the machine in upright position, and absolutely prevents any possibility of jumping the track. The front wheel is the driving wheel, and is 20 in. in diameter, and like the other riding wheel is grooved to fit the rail. Two tracks will be constructed, so that the road may be operated in both directions at the same time. Side tracks will be placed at suitable intervals, at which the bicycles will be stored when not in use and at which point passengers can be supplied, leaving the machines at any station where they would wish to disembark.—*Street Railway Review.*



THE RAIL FENCE BICYCLE RAILWAY.

Overhead Rights.

Although any one may extend an overhead wire across or along a street, it does not seem generally known that no wire may pass over a house without the permission of the proprietor, even though the wire be in no way connected with the house. The owner may, if he pleases, take them all down, for his freehold extends from the center of the earth up to the sky. This is a principle that is not generally understood, but occasionally a householder is found who knows his rights and will not allow them to be infringed. Such a person was the landlord of a large boarding house on Beacon Hill, who made the electric light company provide bulbs for the lighting of his dining room in return for the privilege of stringing wires upon his roof. Few persons are so well posted in the law as to know what their rights are, and it is an object with large corporations to keep them in ignorance.—*Boston Courier.*

THE GREAT SUN SPOT OF FEBRUARY, 1892.

I have thought it would interest the readers of the SCIENTIFIC AMERICAN to have some photographic views of the great sun spot of February, 1892, good descriptions of which have already appeared. Quite a complete photographic record has been secured at this observatory of this great group of spots, from the time that it fairly rounded the sun's eastern limb, on February 5, to just before its disappearance, the last plates being taken on the morning of February 16. The photographs were made with an apparatus (constructed by the writer) attached to the 10 inch equatorial telescope. First, a view of the entire sun's disk is taken, four and one-half inches in diameter. These plates show the exact place of all spots upon the visible hemisphere. Then, usually, an enlarged view is taken, showing the more interesting spots in detail. The enlarged detail view is taken direct in the telescope, not copied from the smaller negative. It shows the group as it appeared on Feb. 16, as it was nearing the southwestern limb of the sun. The changes which have occurred in this interval will repay careful study. The rounded and darkened edge of the sun is well brought out. The lighter patches in the shading are immense fields of faculæ. The extreme length of this great group was about 150,000 miles and its width 85,000 miles.

THE GREAT SUN SPOT OF FEBRUARY, 1892.

WILLIAM R. BROOKS.

Smith Observatory, Geneva, N. Y., March, 1892.

ACCORDING to one of the French papers, electricity is in successful use at the gun factory at St. Etienne for tempering gun springs. The latter consist of steel wire which is wound spirally, and a current of 45 volts and 23 amperes is passed through it. Rapid heating results, and when the required temperature has been reached, the current is interrupted, and the spring is let fall into a trough of water. One workman can temper 2,400 springs per day by this method.

A Railroad from Cartagena to the Magdalena.

The construction of the Cartagena-Magdalena Railway deserves to rank among the most important rail road enterprises undertaken within the past decade in South America, by reason of the far-reaching results which will follow upon its completion. Its object is to connect the port of Cartagena with the Rio Magdalena by a line 52 miles in length, but to appreciate its importance the conditions affecting Colombian traffic must be reviewed.

The great centers of population in Colombia lie in the interior, with no outlet to the sea except by way of the Rio Magdalena. This remarkable river, flowing down from the mountains of Tolima, is navigable for vessels of 3½ feet draught, between 600 and 700 miles, into the very heart of the republic, and constitutes the artery of commerce between the outer world and the coffee and mining districts of Santander, Antioquia, Tolima, and Cundinamarca. Connection between the centers of production and the river ports is maintained by mule trains across the mountains, and yet in spite of these obstructions to free intercourse, the export and import traffic using the river amounts to 50,000 tons per annum. A further impediment to traffic is met at the mouth of the river, where the stream empties into the Caribbean Sea through a delta, whose several channels are obstructed by shifting sandbars, effectually precluding the entrance of ships.

Many years ago John C. Trautwine was employed by the Colombian government to attempt to control one of these channels, and other engineers have subsequently been engaged upon this problem, but all with negative results. In consequence of this the Bolivar Railroad was constructed from Barranquilla, on the Magdalena, to Salgar, an open roadstead on the Caribbean. More recently, a pier is being built at Puerto Colombia, about 2½ miles southwest of Salgar, and the railroad has been extended to that point. This, however, is also an open roadstead, and is a perilous point for ships during the prevalence of the "nor'westers" which frequently rage along this coast.

Cartagena, on the other hand, possesses a magnificent land-locked harbor, and in the colonial days was the port not only of Colombia, but of the entire western coast of South America as far as the northern confines of Chile. The products of the mines of Peru, of Ecuador, and of Colombia, came over the great mule road by way of Jaen, Cuenca, Quito, Popayan, and Quibdo, to Cartagena, whence they were shipped to Spain. By connecting a few creeks, lagoons, and bayous, the famous Canal del Dique was also constructed from Cartagena to the village of Calamar, on the Rio Magdalena, a shallow waterway which is still open for a few months of each year and diverts a small portion of the Magdalena traffic to this ancient port. It has long been foreseen that the advantages of the splendid harbor at Cartagena would inevitably restore this city to its former position as the port of Colombia, if it were connected with the Magdalena by a railroad. This is now to be done by a company of American capitalists who embarked in it at the instance of Mr. S. B. McConnico, formerly of the Illinois Central Railroad, who conceived the project, obtained concessions from the government, and had the preliminary surveys and estimates made which demonstrated its feasibility.

Two corporations have been formed to carry this work into effect, the Cartagena Terminal & Improvement Company, Limited, capitalized at $1,200,000, with J. Murray Forbes, president; S. B. McConnico, vice-president and general manager; Thomas R. Wheelock, secretary and treasurer; and W. D. Buckner, M. Am. Soc. C.E., chief engineer and superintendent; and the Cartagena-Magdalena Railway Company, capitalized at $1,800,000, and issuing six per cent mortgage bonds to an equal amount, with Thomas R. Wheelock, president; S. B. McConnico, vice-president and general manager; F. B. Beaumont, secretary and treasurer; and W. D. Buckner, chief engineer and superintendent. The full amount of capital needed to complete the road has been provided. Construction has already commenced, ten miles having been graded up to date.—*Railroad Gazette.*

Over Ninety-one Miles Per Hour.

Engine No. 385 of the Central Railroad of New Jersey broke all records of high speed on February 26, by running a mile in 39¼ seconds, or at the rate of 91·7 miles per hour. The engine is a Baldwin compound. In speeding this engine the first mile was made in 76 seconds, the second in 62, the third in 53½, the fourth in 45½, and the fifth in 39¼ seconds. The engineer reports that the engine was running fastest on the sixth mile, but it was not recorded on account of excitement which followed when the engine made this wonderful speed. Mr. Hoffecker, superintendent of motive power, informs the *National Car Builder* that he has every reason to believe the report correct, and that he has timed this engine himself while running a mile in 42 seconds. Four duplicates of this engine have been ordered.

The Race Across the Atlantic.

In a recent number of the *Scottish Review*, Professor Henry Dyer gave an interesting article on the race across the Atlantic, in which, says *Industries*, he traces the development of steamships and their machinery, and gives figures to show the increase in speed and efficiency. After a preliminary notice of some of the earlier attempts at steam navigation, Professor Dyer devotes a little space to clearing the reputation of Dr. Lardner of some of the charges which are sometimes brought against him in connection with ocean navigation by steamships, and he expresses the opinion that, while Dr. Lardner may have erred in the way of overcaution, and have failed to estimate the possibilities both of engines and ships, as he based his calculations on a coal consumption of 12 pounds per indicated horse power per hour, with a speed of 8 knots, he does not deserve to be held up to ridicule, as he generally is when his name is mentioned in connection with the early attempts at transatlantic navigation.

The development of the marine engine forms an interesting study, both from a theoretical and a practical point of view. The effects of the increase of the pressure of the steam, the action of the steam jacket and of multiple cylinders, and the present position of practice are all traced by Professor Dyer, and they, combined, show the great improvements which have taken place. These are roughly indicated by the amount of coal consumed per indicated horse power per hour. Until about 1830 the boiler pressure seldom exceeded 3 pounds on the square inch above that of the atmosphere. From that date a gradual increase took place, and in 1845 the average was about 10 pounds per square inch. By 1850 it had reached 15 pounds. In 1856, Randolph, Elder & Co. employed pressures of 30 pounds in their compound engines, but it was not till almost ten years later that such pressures became general in the merchant service. On the compound engine becoming common, pressures suddenly rose to 60 pounds, and in some cases to 80 pounds and 100 pounds per square inch, and now for triple-expansion engines the average is over 150 pounds, while for quadruple-expansion engines it is 200 pounds per square inch. With regard to coal consumption, the earliest marine engines must have used very nearly 10 pounds per indicated horse power per hour. In the well known side lever engines it was about 7 pounds, while for engines in use before the general introduction of the compound type 4 pounds to 4½ pounds was the average. Randolph, Elder & Co., with their compound engines, had an average of from 2½ pounds to 3 pounds. In 1872, when the compound engine had been in use for some years, the average was found to be 2·11 pounds, being a saving of nearly 50 per cent over the ordinary engines, while in 1881 there was a reduction to 1·828 pounds, or a further saving of 13·37 per cent. With triple and quadruple expansion engines there has been a still further reduction of about 25 per cent, the consumption in some of those engines being as low as 1½ pounds or 1¼ pounds per indicated horse per hour.

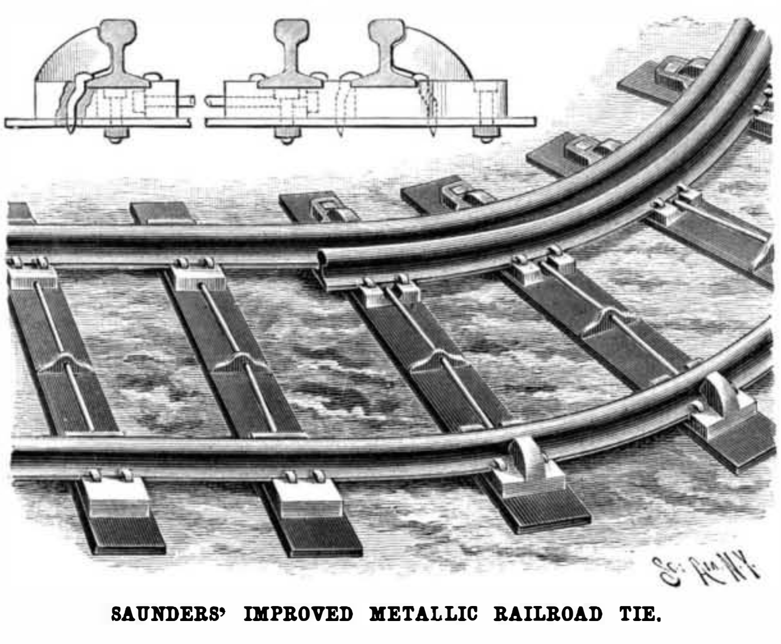
Professor Dyer traces the development of the size of steamships from the Great Western up to the present date. He gives figures to show the best runs during that period, and these are brought down to the recent ones of the Teutonic and Majestic. The latest development of the Atlantic race shows a close approximation between the best steamers of the White Star, the Inman, and the Cunard lines, there being only a difference of a few hours in favor of the order in which their names are given, the fastest passages of each varying from 5 days 16 hours 31 minutes to 6 days 2 hours 31 minutes. The Cunard line is thus temporarily a little behind in the race, but a company which has shown such spirit in the past is not likely to give up the contest. Two new steamers, each 600 feet in length, have been ordered, and it is stated that their guaranteed speed is to be 22 knots on the measured mile and 21 knots at sea. This latter speed will enable the passage across the Atlantic to be accomplished in about 5 days 10 hours.

Professor Dyer is of opinion that, as progress has been made by slow and steady steps, this is likely to continue unless we have a complete change in the type of ships, of engines, and of boilers. So far as can be seen at present, the shape of steam vessels is not likely to be materially altered, as it is substantially the same as that of the Viking's craft of more than a thousand years ago, and seems to conform to the arrangements of nature, with regard to fishes, as nearly as the materials at our disposal will admit. It must be remembered that increased speed is not simply a question of more power relatively to displacement, but that each shape of vessel has a speed to which it is specially adapted, and that any attempt to drive it beyond that speed would lead to a great expenditure of power with little useful result, as the energy would be chiefly expended in raising waves. If anything like the present speeds had been attempted with vessels of the size which were common on the Atlantic thirty or forty years ago, the size of engines required, and the extra expenses involved, would have reduced the earning power of the ships very much, and possibly in many cases made it disappear.

The future development of steamships, however, depends on conditions about which it is impossible to say anything very definite. The materials of construction have been changed from wood to iron, and from that again to steel. The engines have developed from inverted Watt engines, through a great variety of forms, to multiple-expansion engines of great complexity and considerable efficiency. All these may be rendered useless by some other form of heat engine or by the application of electricity. It is evident, therefore, that the limits of the sizes and speeds of steamships in the future are to be determined by commercial considerations and experience, rather than by abstract scientific speculations.

A PRACTICAL METALLIC RAILROAD TIE.

The improved metallic tie shown in the illustration has been patented by Mr. Ellison Saunders, of Austin, Texas. The base of the tie has outwardly and downwardly turned ends, preventing endwise movement, and rail-supporting blocks of cast or malleable iron are secured to the base by rivets or bolts, as shown in the sectional view. The rails are secured in their seats in the blocks by spikes, the apertures for which are preferably cast with a bend and twist, so that the upper half is out of alignment with the lower half of the aperture, the spike when driven then following the shape of the aperture, by which it is bent and twisted in for its lower half, so that it will not get loose. The two rail-supporting blocks of each tie are connected with each other by a tension rod, by adjusting the nut on which any desired strain may be given to the blocks and base plate to prevent spreading of the rails, the base of each rail resting in a longitudinal recess in the block. On curves or switches the guard or switch rails are fastened on an extension of the block, formed with a recess under the rail for the nut or head of the tension rod. Centrally on each tie is a block through which the tension rod passes, to prevent accidental displacement.



SAUNDERS' IMPROVED METALLIC RAILROAD TIE.

This tie has been in practical use for nearly a year on a portion of a trunk line railway in Texas, and is said to have well withstood the atmospherical changes and the heavy traffic, it being officially stated that "at no time since they were placed in position has any attention been given to them, while on either side the oak ties have needed attention at different times." At the Grand Central Station, New York City, these ties have been in use for the past nine months at a point where some of the largest engines pass over them each day, with many switching engines and cars, and the supervisor of the yard, Mr. Robert White, writes that "they have had no attention paid to them since being put in, and still remain in perfect order. The spikes have not started, but are the same as when put in."

Method of Producing Photo-mechanical Printing Plates.

BY LUDWIG SCHAEFER, OF HEILBRONN, GERMANY.

Upon exposed and developed sensitive gelatine paper I cast a layer of plaster of Paris whose tendency for hardening has been retarded to a certain extent by the addition of marble dust, glue, borax, or the like. As soon as the plaster cast has the necessary degree of compactness the gelatinized paper is removed or pulled off, and in place of the same is laid a glass plate. The plaster cast is allowed to rest on the glass plate, so that the weight of the cast will cause the elevations to be forced back into the mass until every delineation comprising the drawing or representation lies upon one and the same level. The depressions or indentations between the delineations of course lie on a lower level than the delineations; but said delineations occupy a common level, so as to be suitable for printing. From the plane and level plaster cast thus obtained casts in wax, metals, plaster of Paris, or the like can be made, or after the hardening of the original plaster cast I can press into the same any mass that is capable of being shaped or formed.

Somnal.

In a recent article in the *Medical Record* by O. M. Myers, M.D., of Rochester, N. Y., he says:

Much interest has centered upon the new hypnotic, somnal, and clinical reports of its use, together with experimental data, are rapidly confirming, and even exceeding, the claims of its discoverer. The medical fraternity will gladly welcome this new-comer to its materia medica, as it seems to possess the properties of a hypnotic *par excellence*, without the distressing and dangerous qualities of other drugs of this class. All of these latter are notoriously uncertain and inconstant in action, and most of them, especially chloral and morphia, expose the patient to the dangers of habitual use. The administration of somnal is happily free from these unpleasant sequelæ. Since the time of its discovery by Radlauer, of Berlin, in the fall of 1889, the action of somnal has been rigidly scrutinized and impartially investigated, which has resulted in unqualified indorsement of its efficiency and reliability; and its prompt and harmless qualities have been the delight of all clinical observers.

Summary.—1. Locally, somnal is non-irritant, exerting rather a stimulating effect upon the mucous membrane of the stomach. When applied directly to the heart of the frog, it acts as a powerful poison, destroying its electro-excitability.

2. In therapeutic doses the drug exerts no appreciable physiological effect upon the heart, and may be regarded as safe. Toxic doses depress that viscus: *a*, by direct action upon the muscle fiber; *b*, by stimulation of the cardio-inhibitory centers.

3. Therapeutic doses have little or no effect upon the pulse rate. A slight primary rise in the arterial tension may be observed, which soon returns to normal, or may even fall below—the latter probably due to muscular relaxation during sleep. Toxic doses rapidly diminish pulse rate and pressure; probably due to direct action upon ganglionic heart centers.

4. Ordinary doses cause the respiration to become slow and full. Toxic amounts induce rapid, shallow, and irregular respiration; the result of depression of the respiratory center at base of brain.

5. As, in therapeutic doses, sleep is induced without perceptibly affecting any other portion of the economy, it is fair to conclude that somnal acts directly and primarily upon the cerebrum.

Therapeutics.—The indication most promptly and perfectly met by somnal is to induce sleep, and it may be confidently relied upon by the prescriber in all cases where the insomnia is not the result of pain or syphilitic disease. As the nervous element predominates, somnal is the more certain to fulfill the requirements; as, for example, insomnia due to functional over-excitement of the brain after mental strain or anxiety, sleeplessness of delirium tremens, and in maniacal and hysterical disturbances. Its sedative and somniferent action is strikingly efficacious in the insomnia occurring during convalescence from acute disease. Where an adynamic condition exists it must, of course, be used with caution. In whooping cough, spasmodic laryngitis, asthma, "nervous cough," and chorea, it possesses decided sedative properties. A great element of safety is that the action of somnal, so far as I have observed, is never out of proportion to the amount ingested, nor does it act in a cumulative or other unexpected manner. The drug appears to possess little or no influence over insomnia due to acute inflammatory conditions.

A Simple Relief for Lung Troubles.

It has long been known that pine needle pillows would alleviate persons afflicted with lung troubles, and a Florida editor relates an incident in support of the fact as follows: During a visit to the home of a most estimable lady living on Indian River, this editor was told of a discovery that had been made which may prove a boon to sufferers from lung or bronchial troubles. This lady having heard that there was peculiar virtue in a pillow made from pine straw, and having none of that material at hand, made one from fine soft pine shavings, and had the pleasure of noting immediate benefit. Soon all the members of the household had pine shavings pillows, and it was noticed that all coughs, asthmatic or bronchial troubles abated at once after sleeping a few nights on these pillows. An invalid suffering with lung trouble derived much benefit from sleeping upon a mattress made from pine shavings. The material is cheap, and the *Christian at Work* says it makes a very pleasant and comfortable mattress, the odor of the pine permeating the entire room and absorbing or dispelling all unpleasant odors.