

to violet light grew more rapidly and developed into much more vigorous individuals than those reared under other colored lights. These results, taken in connection with the like ones obtained by M. Serrano-Fatigati on infusoria, seems to show one general character for aquatic animals. It now remains to be seen whether terrestrial animals are influenced in the same way.

TRANSACTIONS OF THE AMERICAN SOCIETY OF ENGINEERS.

The above named publication for the month of November contains some important papers.

The subject of

"WEB STRAINS IN SIMPLE TRUSSES WITH PARALLEL OR INCLINED BOOMS,"

is ably discussed in a paper read by Mr. Elnathan Sweet, Jr., at the twelfth annual convention of the society, held May 25, 1880. Mr. Sweet, in this paper, aims at greater directness and simplicity in the treatment of the subject than has hitherto been attained; and he asserts that the handbooks hitherto published base their solutions of the problems relating to this class of trusses upon a false assumption. This assumption is, that as a moving load passes over the panels of a truss, each panel is fully loaded before the adjacent triangle in advance bears any part of the load.

"In trusses with a single system of triangulation, or those in which the web strains of any panel pass to the abutment through the web members of the adjacent panel, this assumption is obviously erroneous, for the instant the head of the load passes a panel joint of such a truss a part of it is transmitted by the floor system to the adjacent triangle of the same system."

With this proposition in view, the author proceeds to a somewhat abstruse mathematical discussion, in which he adopts as the most natural unit of length the panel length. By this means he is able to simplify the formulæ necessary so considerably as to justify the wisdom of the adoption of the panel length as the unit of length, and to determine the maximum shearing strain at any panel joint by much less complex expressions than have been heretofore required.

A DISCUSSION UPON INTER-OCEANIC CANAL PROJECTS,

referring to former papers which have appeared in the *Transactions*, together with additional information obtained by recent surveys in Nicaragua, by Mr. A. G. Menocal, throws much light upon current questions relative to the problem of communication by means of canals between the Atlantic and Pacific oceans. As an abstract of this paper cannot be given without reference to the papers criticised in it, we can only glance at one or two salient points. One of these is ably taken. In speaking of a canal on the Nicaragua route, the time of transit ought to be estimated not as though the whole distance were canal transit, but the transit ought to be separated into its component parts, to wit: "Canalization, 62 miles; slack water navigation, admitting nearly ocean speed, 63 miles; and lake navigation, admitting ocean speed, 56½ miles;" total, 181½ miles. The time of transit would, therefore, be shortened very much below that estimated by some engineers; indeed, it could be accomplished in 38½ hours, the transit including a lockage of 108 feet.

The practicability of utilizing the channel of the river Grande is another point strenuously urged by the writer in favor of the Nicaragua route.

Minutes of meetings and the annual reports of the Board of Direction, Committee on Finance, the report of a Committee on a Uniform System of Tests for Cements, and a list of members, with additions, changes, corrections, and resignations, complete the contents.

The Committee on Tests for Cements make only a brief report, enumerating an extensive series of papers received from different parts of the world bearing upon the subject, stating that they will commence an interchange of views during the present winter, and announcing that they will endeavor to complete their duties on or before the date of the next annual convention.

Meteorological Observations by Telegraph.

Mr. N. Hoffmeyer, of Copenhagen, observes that "in meteorological prognoses we cannot expect a scientific certainty; these prognoses are based upon empirical suppositions, and are, therefore, subjected to all possible errors which may be caused by that method. So long as the causes and the real nature of meteorological disturbances have not yet been explained, so long as we are only able to know the *how* and not the *why* of meteorological phenomena, so long as a very exact observation only of the storms which by telegraph is transmitted from one coast to another, will be of practical value to the mariner."

This observation, however, is connected with greater difficulties than has been hitherto supposed. Mr. Hoffmeyer has, during a period of 21 months, made the closest investigations in regard to the storms and winds on the Atlantic Ocean, and he maintains that the conditions upon which these meteorological phenomena depend are so highly complicated that the telegraphic reports sent by the "Herald Weather Department" from America to Europe—although being a proof of the energy and ability of Mr. Bennett—have an imaginary value only.

It has been proved that the atmospheric disturbances usually move in the same direction across the ocean as across the continents, viz., from west to east, and that about 61 per cent of the storms which we have to encounter on the Atlantic have arrived there from the American continent;

but it is also known that 39 per cent of the storms—a number not to be overlooked—are originated upon the Atlantic itself, and that besides only 50 per cent of the storms observed on the Atlantic arrive at Europe. The direction which the atmospheric disturbances show in America, before they arrive at the coast of the Atlantic, can be no secure basis for conclusions regarding the further course of these disturbances and the phenomena connected with them. Even if the observations on the European and American coasts were to be combined, a reliable prediction of what will happen on the ocean will be impossible. If, therefore, meteorological observations shall have a real benefit for our mariners, such observations must not only be made on the coast, but also on the Atlantic itself, and Mr. Hoffmeyer proposes to erect for this purpose a regular meteorological service, the stations of which are situated upon the ocean—i. e., upon islands which lie between the two continents. These stations should be connected by telegraph with the continents, so that Faroe Island, Iceland, South Greenland, and the Azores may be brought into communication with the European coast and the Bermudas with North America.

Although these stations are very distant from each other, the meteorological observations made there will, on account of a meteorological peculiarity of the Atlantic, be of value for predicting the weather and atmospheric disturbances which will occur between these stations.

Mr. Hoffmeyer, by daily constructing synoptical maps, discovered that the barometric minima in the atmosphere which rests upon the Atlantic have a tendency to approach Greenland and Iceland on the one hand, and the Azores on the other, while from the latter to the Bermudas may be usually observed a high pressure of the air and fine weather. Even a slight change taking place at this part of the ocean predicts almost to a certainty great disturbances in the other regions. This barometric maximum, according to Hoffmeyer, forces the depressions of the atmosphere to take a certain direction and influences their velocity of movement in a high degree. Therefore it is absolutely necessary to be acquainted with these atmospheric maxima which prevail upon the ocean, and they can naturally be observed only upon the ocean itself—i. e., upon those islands mentioned; therefore observations made there, in connection with those made on the coast, will be perfectly sufficient for all practical purposes. Mr. Hoffmeyer hopes, proceeding upon this basis, to perfectly transform our meteorological service, and to enable our scientists not only to predict the weather for a day or two, but for a longer period of time. The importance of such predictions for the transatlantic navigation is evident. The synoptic maps will enable the ships leaving the ports to enter regions which are subjected to great atmospheric changes, and to choose those ways which, during a certain time of the year, are the least exposed to danger; they will give important information about the condition of the monsoons near the Azores, which are much more irregular than they are generally supposed to be; and they will be valuable for the owners of vessels in making it possible for them to account for possible delays of their ships.

Mr. Hoffmeyer's labors have been communicated to the meteorological institutions of Europe, and necessary steps will probably be taken to make a practical use of the suggestions of this gentleman, as the resolutions, taken April 3, 1880, at an assembly of the presidents of the German meteorological stations at Hamburg, highly recommend the suggestions made by Mr. Hoffmeyer.

Paper Pulp from Wood.

The following interesting description of the process of making wood pulp is from an account of the opening of the Thorold Pulp Paper Company's establishment published by the *Thorold Post*, Canada:

"The wood, four feet in length and of any thickness, is brought in at the basement, placed in the barking-jack (one stick at a time), where two men, with draw knives, rapidly peel off the bark. It is then conveyed by the elevator to the first floor, sawed in two foot lengths with cross-cut saws, passed on to the rip saw, where it is slabbled (that is, a small portion of wood on opposite sides taken off), to permit it resting firmly in the grinding engine. It is then passed to the boring machine (an upright one and a half inch auger, with foot attachment driven by power), where the knots are bored out. The wood is then placed in racks of the same size as the receptacle in grinding engine and carried out to be ground. The grinding engines are upright, and receive at a filling one-twentieth of a cord of wood. The wood is placed in a receptacle, and by a simple, variable, automatic feed process is pressed flatwise between two outward revolving rolls, composed of solid emery, which are flooded with a spray of water, carrying off the fibrilized pulp in a stream through revolving screens to the tank or stuff-chest in the basement. It is then pumped up into a vat that forms part of the wet machine. In this vat is constantly revolving a large cylinder faced with fine brass wire cloth, which picks up the particles of pulp out of the water and places them on the felt (an endless piece of woolen goods which makes between rolls, for different purposes, a continual circuit of the wet machine). On the cylinder is turning a heavy roll, called the concha; between the two, where they meet, the cylinder leaves the pulp, with most of the water pressed from it. The pulp now makes its appearance on the felt above the concha roll in a beautiful sheet, thirty-eight inches in width, and is carried along in a steady flow a distance of about eight feet, where it passes between (the water here again being pressed from it) but set beyond two heavy roll-

ers, the upper iron, the lower wood; it adheres to the upper roll, which is constantly turning, wrapping it up, and when a sufficient thickness is attained, is cut off by a knife being pressed to the roll, attached to the machine for that purpose. It now leaves the roll in a thick, white sheet, 36 x 38 inches, which is received by the boy in attendance on a table conveniently attached to the machine, and folded into sheets 14 x 26 inches. It is then placed on scales until the weight is one hundred pounds, when it is placed in the press and firmly tied into square compact bundles. It is now ready for shipment to the paper mill to be made into printing and tea paper. The wood paper pulp has been placed in the market and found a ready sale. Last week a contract to the amount of \$1,000 was made with one of our large paper mills."

Loss of Water Pressure in Hose Pipes.

The recent engine test in New York city was interesting in many ways, but in none more so than as exhibiting the loss of power by friction in hose. Two hundred feet of Maltese cross rubber hose were laid from the engines, and at the base of the playpipe a gauge was inserted in the line. The steamers were working at from 100 to 120 pounds steam pressure. The following table exhibits the average general pressures taken every three minutes simultaneously:

Engines.	Steam Pressure.	Water Pressure at Engine.	Water Pressure at Pipe.	Loss by Friction in Hose.
Clapp and Jones	110.83	173.55	93.08	80.50
Ahrens	130.39	166.70	88.38	78.32
Amoskeag	101.84	143.14	74.54	68.60

From this it will be seen that the loss of power by friction in 200 feet of hose was very nearly 50 per cent. Had there been 1,000 feet of hose, the loss would have been very much greater, of course. The size of the hose used was 2½ inches. Had it been 4-inch hose, as the *Journal* has advocated for fire service, the friction loss would have been far less. In his little book entitled "Fire Streams," Chief Leshure, of Springfield, Mass., gives numerous valuable tables illustrating the friction loss in hose. He says: "It may be stated as near enough for most practical purposes, that when delivering the same number of gallons per minute, the friction loss in two pipes (or hose) of equal lengths, the diameter of one of which is twice that of the other, the loss in the larger will be one thirtieth of that in the smaller, or the loss in the smaller will be thirty times that in the larger." A better argument for increasing the size of hose for fire service could not be put forth. The weight of the hose need not be materially increased, for the present hose is made unnecessarily heavy to withstand fictitious pressures: that is to say, hose is now made and warranted to withstand anywhere from three to six hundred pounds pressure. When in actual service the pressures seldom exceed those given above. In a 4-inch hose it would be almost impossible to get 200 pounds pressure on the hose at any point in the line, and the hose could be made correspondingly lighter. As a matter of fact, 4-inch cotton hose is now made in large quantities for mining purposes that weighs but 70 pounds to the section, while much 2½ inch fire hose weighs fully as much or more.—*Fireman's Journal*.

ENGINEERING INVENTIONS.

An improved rotary engine has been patented by Mr. John H. Newell, of Scottville, Ill. The invention consists in mechanism for operating the valve, and the combination therewith of a variable cut-off.

An improved stock car has been patented by Messrs. James V. Brown and Benjamin R. Neal, of De Soto, Ill. The object of this invention is to construct a car for transporting cattle and other live stock, so that the car can readily be divided into two or more stalls, and the food and water be conveniently transported and fed to the animals.

Mr. Daniel Kunkel, Sr., of Oregon, Mo., has patented an improved car coupling, so constructed that the cars will be coupled automatically as they are run together, also permitting their convenient uncoupling.

Chemistry of Plants.

Dr. S. Ringer, who has for some time past been experimenting upon the physiological action of *Narcissus*, *Galanthus*, *Hemerocallis*—genera belonging to the natural order *Amaryllidaceae*—has recently examined the properties of an alkaloid from the common garden tulip—a liliaceous plant, and communicated his results to the *Practitioner*. It has been found by him that nitrate of tulipine differs almost entirely from the alkaloids derived from the amaryllids, it being a muscle poison which affects the muscles like veratria, but to a less degree. These results are interesting from a botanical as well as a physiological standpoint, as going to confirm the theory that the relationships between natural orders may, to a certain extent, be indicated by the nature of their chemical constituents. The nearer relationship of the *Liliaceae* to the *Melanthaceae* seems shadowed forth by the fact that a liliaceous plant has yielded an alkaloid like veratria. In the same manner the position of the Australian genus *Duboisia*, as belonging to the *Solanaceae* rather than to the *Scrophulariaceae*, was demonstrated by the elimination of the alkaloid duboisine, and the discovery that its physiological action was analogous to that of the solanaceous alkaloids.