

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

A Wonderful Turbine.

MESSRS. EDITORS:—On page 258, No. 17, current volume of SCIENTIFIC AMERICAN, you publish a communication from F. Wilber, on "Turbines and Water Power," who asks your opinion, or that of some of your readers, as to the possibility of a six inch turbine doing more work than two twenty feet overshots, as stated by parties using a "Lefel Turbine," in an advertisement to which he refers; in reply, allow me to say that the power of a turbine does not depend necessarily upon the diameter, but upon the quantity of water which it discharges, and which is commonly denominated "square inches of discharge," and which means the quantity of water which will flow through an opening of the given area, under the given head, without "contraction."

It is stated that one set of cards, one jack of one hundred and eighty-four spindles, two looms, etc., are driven by a Lefel turbine, under forty feet head, with three-fourths of a square inch of water. Now a vein of water of three-fourths of a square inch cross section, discharging under forty feet head, will give theoretically 12-10 horse power. The best turbines usually develop about eighty per cent. of the theoretical powers of a given quantity of water. Eighty per cent. of 12-10 horse power gives 96-100 horse power to do the amount of work stated, but which actually requires not less than four horse power. It is also stated that this wheel does double the amount of work that could be done with two twenty feet overshots, which were as good as were ever built; consequently they must have given seventy-five per cent. Therefore this turbine must have developed one hundred and fifty per cent. of the power expended. Again, eighty-four gallons of water per minute are stated by the parties to be furnished by their stream. A gallon of water weighs 8.3333 pounds, from which we have $84 \times 8.3333 \times 40$ ft. head = 848 H. P. theoretical ef-

fect, 80 per cent of $\frac{848}{1000}$ H. P. is $\frac{678.4}{1000}$ H. P. to do the work stated. These, Messrs. Editors, are the facts of the case from which your correspondent and the public will see that this wheel, according to figures which "cannot lie," is developing from one-and-a-half times to more than three times the amount of power there is in the water itself. A most remarkable achievement and worthy the attention of all desiring great economy of water!
CHAS. E. FOWLER.
Carmel, N. Y.

Prevention of the Musketo Pest.

MESSRS. EDITORS:—In a recent number of the SCIENTIFIC AMERICAN I noticed an article entitled "The Musketo Pest," with an invitation for suggestions of means of defense against these insects. "Persian Insect Powder" and Carbolic Acid are mentioned as remedies, but in either of these cases many would consider the remedy worse than the disease. The only remedy is the exclusion of the musketo from the dwelling. This is attempted by a fine netting stretched over the windows and doors. These are of various fabrics, cotton being the material chiefly employed. But the fibers of cotton, even if sized or starched, will spread themselves across the interstices of the netting and prevent the cooling currents of air from entering; and they are easily torn, when they become valueless for the purpose intended. I have tried the various kinds of musketo netting, and find that the only proper material is wire cloth. It not only excludes all insects, but, the material being smooth, permits the air to pass freely between the meshes. They can be made plain, or so woven as to present agreeable patterns and pictures to the eye. Such screens should be kept in stock by upholsterers.
Clinton, Mass. G. F. W.

Occult Properties of Numbers.

MESSRS. EDITORS:—Permit me to add to the examples of "extraordinary coincidences" mentioned in the current volume of your valuable journal first on page 227, and afterward continued by Mr. Konvalinka on page 259.

As a professed believer in the occult properties of numbers first expounded by Pythagoras, the number 27,648 has been the object of some study by me. In the first place it is exactly equal to the series $1^1 \times 2^2 \times 3^3 \times 4^4$ and as I believe "that such a remarkable coincidence can not be merely accidental, it must have some deeper foundation in the mysteries of astronomy," such, for example, as the number in which the vast cycle of the precession of the equinoxes is completed. It is true that astronomers do not make the years exactly those I have given, although very nearly identical; so nearly, in fact, that we may well suppose the difference to be due either to imperfection in apparatus or to some "personal equation" or other in observation, for you will notice that the first two digits (27) is a cube ($=3^3$) and the last digit (8) is also a cube ($=2^3$) that the middle digit is twice the cube root of 27 and that the other digit (4) is twice the cube root of 8 and that finally the sum of all the digits is exactly equal to the two first (27) whose cube root is 3 and whose sum is 9 the square of 3

If now the order of the digits is reversed it becomes 84,672 which contains the original number exactly $\frac{4}{3}$ times. Both terms of the fraction expressing the ratio are perfect squares, which are contained a whole number of times in the reversed quantity and their square roots ($\frac{2}{3}$) differ exactly by that constantly recurring number 3, the terms (49-16) differ by 33. Again the 84,672 is divisible without a remainder by the squares of all the digits except 5 and 9, that is, by $1^2 2^2 3^2 4^2 6^2 7^2 8^2$ and also by the cubes of 1 2 3 and 4. The sum of all the digits $8+4+6+7+2=27$ the cube of 3 the first two digits

(84) minus the last two (72) is exactly twice the middle digit (6) the exact difference of the first (8) and last (2).

The sum and the difference of 84,672 and 27,648 are 112,320 and 57,024 which can be shown to possess remarkable properties but I forbear to speak of them as well as of several properties of the other numbers having made this communication as long as I dared.
WM. G. LEONARD.
Cincinnati, Ohio.

Diagram of the Day Line.

MESSRS. EDITORS:—In the SCIENTIFIC AMERICAN (Vol. XVII., No. 16, page 246) you say that a Mr. Lyman Thayer, of Burlington, Vt., has invented an admirable device for illustrating the day line, etc., and also for telling the relative time of any two points on the earth's surface. Now I have not seen Mr. Thayer's diagram, but the one herein inclosed (completed a month ago) I suppose to be very similar. It, however, is by no means exact, but is only intended to give an idea of the invention. I have taken for the day line the 180th meridian from Greenwich. It can readily be seen that a similar diagram can be made of the southern hemisphere, and also that the device can be applied to all maps, to tell

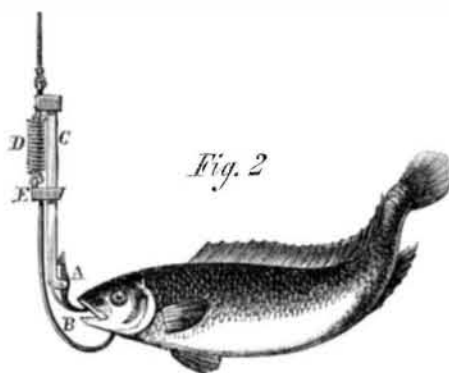
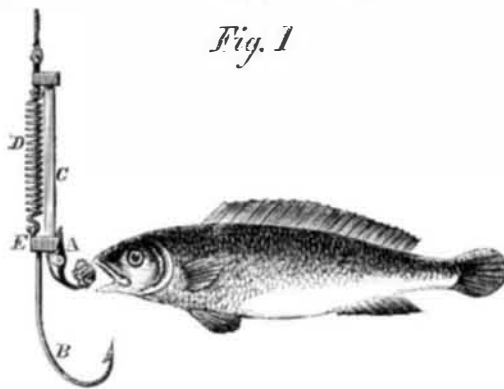


the difference of time between any two points represented on the map. I should have written sooner on this matter, but was waiting until I could finish a large and accurate diagram to send you.

If the 180th meridian be taken as 12 o'clock, 15° E., or the 165th meridian W., represents 1 o'clock, and 15° W., or the 165th meridian E., represents 11 o'clock, etc. According to this I propose to number each meridian, allowing of course 4 minutes to the degree. Any meridian may be taken as 12 o'clock, but this alters all the others.
W. R. SHELMIRE.
Philadelphia, Pa.

LENHART'S SPRING FISH-HOOK.

The engraving accompanying this description represents a device for contravening the proverbial want of success of fishermen. It is a double hook, one, A, being the bait hook, and the other, B, the securing hook. Fig. 1 shows the hook



ready for use and a fish about to take the bait, and Fig. 2 the hook sprung and the intended result. It is a combination of two hooks, connected in a light frame, the smaller or bait hook being pivoted to the bar, C, at its lower end, and the larger or securing hook attached to the spiral spring, D. By pulling down the large hook the slide, E, is engaged with the hook, A, which has a catch on its back and a light spring to throw the catch in place. A slight pull on the small hook, or such a disturbance as may be made by a "nibble," must disengage it from its catch and allow the spring, D, to act, when the fish is held by the larger hook, as seen in Fig. 2. To disengage the fish and to bait the hook anew, the larger hook is pulled down by one hand, while the other holds the top of the bar. It appears to be cruel to the fish—a consid-

eration which probably has little force with anglers—but, unless carefully used, may also be dangerous to the fisherman. A patent for this device is now pending through the Scientific American Patent Agency. All communications should be addressed to the inventor, A. I. Lenhart, New Brunswick, N. J.

Imperfection of Malleable Iron.

It has for some time past been known, that the fibrous nature of iron, long considered an element of its strength, is in reality, due to the presence of foreign matters, which are taken up during manufacture, and prevent the adhesion of the adjacent particles of the iron, however carefully or powerfully the metal may be compressed, or however it may be twisted, doubled up, or contorted. The effect is similar to that which occurs with a glass tube hermetically sealed at both ends; however it may be drawn out, however often it may be doubled or twisted together, at even a very high temperature, the air, a foreign substance within it, will prevent the union of its particles, and cause it to have a fibrous appearance, without adding to its strength, but the contrary.

The imperfection of malleable iron from this cause has now been found far greater than was suspected. It has been shown, by experiments made on French and English armor-plates, that, however homogeneous they may seem when cut and polished, whether formed by the rollers or the hammer, they consist of laminae not at all welded together, and presenting an appearance similar to that of a number of sheets of paper. This condition has been revealed unmistakably by the effects produced by projectiles; and it is found to be present even when the plate has been both hammered and rolled at a welding temperature.

This discovery assumes a still more serious character, if possible, when there is question of such forgings as railway axles, screw shafts, the shafts of marine engines, and other portions of machinery, the soundness of which is of vital importance. It explains the difficulty of constructing large forgings of requisite strength; and leads, unfortunately, to the conclusion, that without fusion, as in the case of steel, there can be no adequate security with regard to the homogeneity, and therefore the strength of the material.

The intense heat employed in the manufacture softens the scoriaceous matters, but they are never expelled. This is true, to a greater or less extent, even with charcoal iron. The only advantage possessed by the charcoal iron, in this respect, seems to be that the laminae do not separate during fracture under the blow of a projectile, which is a most trying test of the amount of their adhesion.

It is worthy of notice that the laminae are more distinctly perceptible, the better the iron, and the more capable of resisting fusion at high temperatures. Fusion seems to be an indispensable condition for the prevention of a laminated structure; hence the excellence of metal such as steel, which is subjected to fusion during manufacture. When fusion has taken place, the rolls and the hammer impart new and valuable qualities. The so-called fibrous character of iron causes its practical to be far less than its theoretical power of resistance; and when it begins to give way in the shafts of marine engines, etc., the fracture commences along lines of junction of the laminae; and the results of numerous experiments seem to show that, while the welding is very imperfect in those portions to which the shock of the hammer cannot reach, it is in all more or less faulty.—The Scientific Review.

A Singular Fact.—The Effect of Variable Calibers in Foam Pipes.

It is known to engineers that some practitioners believe that running a pipe from the steam space to the water space, outside the boiler, and attaching their gages thereto, will give them notice of foaming, or priming, and assist in the prevention of these annoyances. We have a letter from a Maine correspondent who says, that on the Portland and Kennebec railroad is a freight engine which has a "foam pipe," tapped into the top of the boiler, running down, and tapped into the leg-water space of the fire box, just above the foot board; which leaves the pipe about three feet long. Into this pipe a water gage is fitted. When the steam is on and the throttle opened, the water in the boiler rises a little, of course; but in the gage it falls at the same time nearly two inches. Still, when the gage was closed the glass would show the two inches of water.

This case, if we can understand it from the letter of our correspondent, is a curious one, but not singular. We have seen but one case similar, but have heard of one other. In both these cases the holes tapped in the steam space and in the water space were at first of varying diameter; that in the steam space being much smaller than that in the water space. In the one case, where the upper hole was half-inch and the lower three-fourths, we failed to get a reliable water level on the gage. In the other case the experimenter finally got a reliable gage by making both holes of the same caliber. The "reason why" we confess we do not understand. We have our theory, but prefer the evidence of those who have investigated more fully than we did.

THE NOVEMBER METEORS.—Just one year ago the public mind was much exercised at an expected display of celestial pyrotechnics which astronomers predicted would be of unusual brilliancy. Disappointed on that occasion, it is hardly to be expected that the same enthusiasm will be exhibited this year, although it is possible that the shower may make its appearance. In the year 1832, the inhabitants of Europe were favored with a meteoric display, which on the succeeding year delighted the American population. Last November the Europeans were again favored, and certain astronomers are confident that the present month will witness a repetition on our side of the water.