

SCIENTIFIC AND PRACTICAL.

SPEED OF MACHINERY BY DAY AND NIGHT

Last month a mill owner at Atlanta, Ill. asked the question in our column of "Notes and Queries" whether there was any appreciable difference in the running of machinery by day and by night, and this month another correspondent answers the question in a communication to this paper. It has long been a mooted question whether the speed of machinery is greater in the night than in the day time, and it is curious to observe how opinion in the matter is divided. Practical operative millers are generally of the firm opinion that a certain head of water or amount of steam will produce more work in the night than in the day, while scientists and mill owners who have not had much opportunity for observation, but rely wholly on scientific principles, scout the idea that there is any appreciable difference between day and night work so far as power is concerned. Since last month a number of millers have written us that more work can be done with a given amount of power at night than during the day, but only a few have attempted any experiment of the alleged fact. Without a doubt the overwhelming mass of testimony is that machinery does actually run faster in the night. Still all the evidence is not in that direction. Several years ago Prof. Cleveland wrote as follows to Prof. Stillman on the subject: "In a former letter I mentioned the opinion existing in this part of the country that saw mills move faster during the night than the day. The explanation usually given by the workmen is that the air becomes heavier after sunset. I selected a fine day in August, and requested that all the mill gates might remain stationary for twelve hours. At two o'clock p.m. I suspended a barometer in the mill; the pressure of the atmosphere was equal to 30.19 inches; the temperature of the water just before it passed the mill gate was 72° Fahr. The log was then detached from the saw, and the number of revolutions of the wheel, being repeatedly counted by different persons, was ninety-six in a minute. At midnight I again visited the same mill. The barometer stood at 30.26 inches, the pressure of the atmosphere having increased seven-hundredths of an inch. The temperature of the water was 72°, the same as the preceding observation, although it had been a little higher during the afternoon. The log being detached as before, the wheel was found to revolve precisely ninety-six times in a minute, showing the same velocity as at the preceding noon. The depth of the water was the same during both experiments. The workmen were satisfied the result of the experiment was correct, but still they seemed to believe that it would be different on a cloudy night." On the other hand, there is plenty of evidence equally good on the other side, the most of it from practical men who have had plenty of opportunities for observation. A discussion on this subject has been carried on in the columns of the Boston Journal of Commerce, and in a recent number of that journal a correspondent signing himself "Mechanical Engineer" gives a number of instances where there was an undoubted increase of speed during the hours of night. He gives the following case: "Another instance of observation was with an undershot water wheel, which ran one set of mill stones to grind grain with. The man having the grinding mill in charge dared not put on the same gate of water evenings and through the nights as he did in and through the days; it would increase the velocity to that degree as to endanger the bursting of the running mill stones. To run the mill the same velocity nights as in the day time requires the gate to be closed about 10 per cent., one night with another, as many tests demonstrated through a considerable period of time." As to the cause of this phenomenon the same writer says: "The above named results, to my mind, are produced by the natural attractions of the sun, and the earth, or globe. When the sun is at the meridian, where we are on the earth or globe, then the sun's attraction on the earth or globe is in the opposite direction to the earth's attraction from the circumference towards its centre. Thus the two named attractions are in opposite directions, and tend to neutralise each other to the greatest degree at the time the sun is at its meridian, causing the specific gravities of all bodies to be perceptibly reduced, while the rays of the sun are warming and thus expanding the atmosphere and the water in mill ponds. Thus their volume is increased and their specific gravity diminished through these conditions, causing the openings of the gates to be the greatest at the meridian of the sun to run the water wheels their required velocities. Now, when the sun's meridian has been changed to the opposite side of the earth or globe, from where we are (at the time usually called midnight) at that time, the attraction of the sun to the earth or globe, and the attraction of the earth's circumference, where we are towards its centre, and the sun's attraction, are both in the same direction—conjointly acting together, thus increasing to the greatest degree, the specific gravities of all bodies in a proportional percentage, being increased by the cooling of the air and water by increasing their densities. Thus, through these combined influences, the gates of the water wheel are required to be partially closed, to have the wheels run at their required

velocities, as above set forth, at and near midnight." Whether this explanation is the true one or not we will not venture to say; but from the testimony offered it certainly seems that this may prove another of the many instances where popular impressions have proved correct in spite of the protest of scientists.—American Machinist

ALPHA CENTAURI

In an interesting article on southern stars, reprinted in Science, Mr. Pope, of New Zealand, describes Alpha Centauri, the known nearest fixed star to the earth. This magnificent double star, he says, is the finest object of the kind in the heavens. Besides being a binary star of very short period, every one knows that Alpha Centauri is our next neighbour among the stars, and that it was the first to give up the secret of its parallax under direct transit circle observations. The colour of this star is straw-yellow, or sometimes golden-yellow, according to the state of the atmosphere. When there is haze, of course the smaller star is somewhat more effected by it than the larger. This tends to give a slight brownish tint when the sky is not clear. Alpha Centauri is a star of the second class. Its spectrum is very like that of the sun. Even the principal dark lines are fine, and they apparently occupy the same relative positions as do the well known lettered lines in the solar spectrum.

There can be little doubt, in fact, that the physical constitution of this great star is, in most respects, the same as that of the sun. It is probable, however, that Alpha Centauri is less developed than the sun; for, as Mr. Proctor has pointed out, its light is brighter than its mass would lead us to expect it to be, judging from the light of our sun as compared with his mass. While the mass of the star is to the mass of the sun as 2:1, the light of the star is to the light of the sun as 3:1. Now, if it is true, as physicians have good grounds for believing, that the sun is, and has been, very slowly but surely losing his heat, just as our earth has most certainly lost an enormous amount of hers, there must have been a time when the sun and his system were less developed, but far hotter and brighter than they are now—when they formed, probably, a white star—that is to say, there was quite possibly, a time when the light from our sun bore the same relation to his mass as the light from Alpha Centauri bears now to its mass. We may also believe that matters are less advanced in the planets (if there are any) of this neighbouring system than they are with us.

NOTES ON STEAM POWER.

A new method of repairing cracks in boilers, invented in Germany, consists in the use of a sort of wedge link—a pair of tapered pins connected with each other in one solid body by a flat wedge.

To make strong cement for steam joints, take ten parts of white lead ground in oil, three parts of black oxide of manganese, and one part litharge. Reduce to a proper consistency with linseed oil and apply when needed.

The huge Corliss engine used at the Centennial, and better known as the Centennial Engine, has found a permanent abiding place in the Pullman works at Pullman, Ill., a suburb of Chicago. It was put in motion April 2.

When the inside of a steam cylinder becomes dry, or from some other cause, the surface can be restored by grinding out the cylinder with a true segment of lead and sand, or emery. Great care must be taken to do it so as to leave the cylinder true.

It is a frequent practice among experienced engineers to turn on steam when their engine is on or near the centre, and then help the wheel by an application of the full strength of their muscles. They may escape ninety-nine times out of one hundred, but in the hundredth attempt they may get caught and sustain loss of life or limb.

An improvement is very much needed to the present plan of feeding boilers through the front head. The ill effect is not so great when the feed first passes through a heater; but all boilers are not equipped with heaters, and the effect of cold feed upon the highly heated fire sheets, and the sudden contraction that must ensue, cannot but be highly injurious.

There are some fibrous packings which will wear very well in the stuffing box of a piston rod, but they must be of a substance that is not inclined to catch or hold gritty substances. A good metallic packing is far preferable to any other for cheapness and durability. A good quality of plumbago packing does very well, but the plumbago must be of the purest kind which can only be procured from the most reliable dealers.

The following is the rule for finding the weight necessary to put on a safety valve lever when the area of valve, pressure, etc., are known—Multiply the area of valve by the pressure in pounds per square inch, multiply this product by the distance of the valve from the fulcrum; multiply the weight of the lever by one-half its length (or its centre of gravity); then multiply the weight of valve and stem by their distance from the fulcrum, add these last two products together and subtract their sum from the first product, and divide the remainder by the length of the lever; the quotient will be the weight required.

A writer of the American Machinist describes as follows an engine test which took place down in Arkansas. I must give you the test this engine was put to as described by the owner. We will call it the "Arkansas steam engine test." This engine was connected to a line shaft on which was also connected an old slide valve engine of about the same size, both taking steam from the same boiler. The engines were set to run in opposite directions and steam turned on. Result: Quite a struggle for a time, at length the old slide valve succumbed, the whole town is elated, and orders are looked for twenty engines at once.

Sticking of safety valves is a very common occurrence. It is most liable to occur in those boilers running at nearly a uniform pressure, with a pressure damper regulator, where weeks, perhaps months, may elapse without the steam pressure increasing sufficiently to lift the valve, which is usually set at ten to fifteen pounds above the working pressure. Under such circumstances they are sure to stick. Safety valves should be "eased off their seats" every day. This can be done with little trouble at a very slight expense, by means of a pulley line from the valve lever to some convenient place in the engine or fire room.

Blowing out externally fired boilers set in brick work, as usually done under pressure immediately after the fires are banked, and while the brick work is yet heated to a high degree, is one of those pernicious customs practised by ignorant men, that has strained the seams, inducing seam tips, crystallised the fire sheets, loosened the tubes, and done greater injury than years of use, with defeating the object for which it is done. It is a fact that the sediment remaining is acted upon by the hot masonry and baked like pottery, so that edged tools are required to remove it. In tubular boilers this can only be done by removing the tubes.

CURIOUS CALCULATIONS

(New York Times.)

Some curious astronomical calculations have been prepared by Mr. C. H. Waring before the Roughshooper Society of Natural Science, a few of which possess general interest. If we suppose the distance between the earth and the sun (about ninety-two and one-third millions of miles) to be reduced to a dozen rods or more, the size of the two globes to be reduced in the same proportion, the distance from the earth to the nearest fixed star would still be, on the same scale about 9,000 miles, and to the more distant ones it would not be less than 18,000,000 miles.

From those more distant stars the light must travel for sixty centuries before it reaches us—and yet light travels so fast that it would circle round the earth more than seven times in a single second of time. If the sun could be reduced, in imagination, to 1-100 of an inch in diameter, the earth would then be of microscopic size, about 1-10,000 of an inch, but the distance between it and the nearest star would not be less than three miles. If the sun were a hollow sphere, and the earth was placed at its centre, with the moon revolving round in its established orbit, there would still be a distance of 200,000 miles from the luna orbit to the surface of the solar sphere.

If these relations of size and distance are inconceivable, the forces which compel the planets to move in their elliptical orbits are quite as much beyond our comprehension. A bar of steel three inches square will sustain a weight of 540 tons, but a bar having a section of 144 square inches, would sustain 8,640 tons, which upon a railroad would require 864 cars to support it and 23 locomotives to transport it. To deflect the moon from a straight course into its present orbit, or what is the same thing, to restrain it in its present course, would require the united strength of not less than eight steel bars, each one hundred miles square, or, more accurately, a single bar whose section is 87,500 miles square—more than large enough to cover the State of New York and Ohio together.

If this force were represented by a web of steel wires, each one-quarter of an inch in diameter, stretched from the earth to the moon, they would be distributed over our earth on the moon side only six inches apart, and if a similar web were stretched from the earth to the sun, the force exerted between these two bodies would require the wires to cover one side of the earth as close together as blades of grass upon a lawn.

THE EARTH'S CRUST.

Mr. Robert Ward, writing in the Journal of Science, considers that the assumption is a fallacy that all but the crust of the earth is a mass of liquid fire. One of the results of the Challenger and other explorations of deep ocean, he says, is to determine that the water towards its bottom is freezing cold. Considering that the ocean covers nearly three-fourths of the entire globe, this fact does not support the theory of central heat accompanied by radiation. The coldest water, it is true, usually sinks by its greater weight toward the bottom, and that it may be said, accounts for its coldness; but on the theory of radiation the water of the ocean has been for long geological ages supported upon the thin crust of the earth, through which the central heat has been constantly escaping, and yet it is still of freezing coldness. Experience

would say that the heat cannot have escaped through the water without warming it, because the capacity of the water for heat is greater than that of any other substance. We can no more, he contends, imagine such a radiation and consequent accumulation of heat in the ocean without the natural result of a great rise in the temperature, than we can believe in a kettle boiling for hours on a hot fire without the usual result of boiling water.

SCIENTIFIC NOTES

English exchanges tell us that steel scale, which has been almost entirely worthless, is now used for the manufacture of paint for the protection of iron and steel from corrosion, in any position and in any climate.

Stenile tracts of lands have been converted into fertile plains near Paris, it is stated, by the experiment of irrigating lands with water from the sewers, and that too without any increase of sickness in the neighborhood.

A new meteoric mineral has been found by Prof. J. Lawrence Smith in the analysis of the great meteorite that fell in Emmett County, Iowa, in May, 1879, which is said to be decidedly different from any mineral ever before seen associated with meteorites.

Notwithstanding that the entire length of the St. Gotthard Railway will be finished between Airolo and the Lago Maggiore by the 1st of July, it is thought that the great tunnel cannot be completed before November, owing to difficulties about the vaulting.

The engineers engaged in the work of constructing the ship canal across the Isthmus of Panama, at least advised, had sunk a shaft 300 feet deep, where the Chagres River dam is to begin, and had not yet reached bed rock.

During the past ten months Mount Atlas has had five eruptions of smoke and ash, without any subsequent flow of lava. It is also stated that a great crevice three miles long has recently opened on the eastern side of the mountain, through which there appeared a great cloud of vapors, ashes and smoke, presenting such a phenomenon as was never before witnessed in that section, causing great alarm among the inhabitants of the region thereabouts.

The construction of a ship canal connecting Lake Erie and the Ohio River is being seriously entertained. Two possible routes are described by Major John M. Wilson, United States engineer, the first by way of the Erie and Wabash Canal to the navigable waters of the Wabash River, which would then make the connection through to the Ohio; the second by the Miami and Erie Canal, which joins the Wabash and Erie Canal and a half mile south of Defiance, thus connecting Toledo and the lake with the Ohio River. The cost of either route is estimated at more than \$25,000,000.

Dr. E. R. Heath, says a correspondent from that region, has recently made some important discoveries in South America, having solved the problem of the Beni river, discovered two new rivers, and explored the hitherto unknown mouth of the Madre de Dios, which is 2,300 feet wide where it empties into the Beni. He states that the "multitudes of man-eating savages," so long believed as existing along the Beni river, proved to be a myth, and the superstitious fear that has so long hung over this portion of the Beni river has been dissipated. His perilous expedition was accomplished in a frail canoe with two Indians as assistants.

In a rocky stronghold in a sandy desert of Arizona lives a tribe of the Pueblos called the Moquis, about which but little has ever been written in the history of the aboriginal races of this country. A correspondent states that this people number about two thousand five hundred, occupy six villages, with houses built of stone cemented with mud and clay, and have probably inhabited that particular region for a thousand years. It appears that the Moquis come rather nearer to the Caucasians than the rest of his race. These Indians are unlike most of Indians, being rather industriously inclined. They live well, go respectably clad, but have neither church nor any other place of worship—being wicked and inclined to profanity.

The prospects of aerial navigation, judging from reports from balloon and aerial associations of Europe, (we have no such organizations in this country) are growing more favorable each successive year, and it is thought by many that the day is not far distant when man will have successfully accomplished the wonderful feat of travelling through the air by machinery. Dr. Bell Pettigrew, F.R.S., who has given the subject much attention, states that aerial navigation may well appear Utopian to the mass of mankind. It is not, however, on that account, impossible. It is a question of time, perseverance and ingenuity, simply a very complex physical problem, and the data for its solution are being slowly but surely accumulated.

M. Charney, on his return from a tour of antiquarian research in Southern Mexico, reports the discovery of a ruined Toltec city, in Tabasco, near the Gulf coast; a city which covers a wide area and must have been in its day a place of considerable importance. The greatest curiosities existing in and around the long-forgotten town are a number of temples, pyramids and palaces. The largest of the pyramids is described as being 800 feet high, and a second is said to be 300. From a careful study of the remains of this ancient city, M. Charney is of the opinion that it was founded between 1150 and 1180, and that it was in a perfect state of preservation at the time that Cortez invaded Mexico. It is thought that other Toltec cities exist further up in the adjacent mountains, and other investigations of the territory will be made shortly.

A telegram from Cairo, Egypt, on May 2nd, speaks of a remarkable discovery made by Maspero in the opening up of the pyramids of Sapp-Rara, including the tombs of the kings of the fifth dynasty. The despatch states that mortuary chapels

of each contain about eighty square meters of the smallest and most closely written text, giving precise details of the religious belief of that age. It is a curious coup-de-gras to Orlin, Masonic theory and all previous conceptions are entirely upset. Except the finding of the Rosetta stone in 1799, no discovery in Egypt equals this in scientific value. The entrance passage is difficult and dangerous on account of loose blocks that can be rolled. An American Egyptologist and its correspondent were the only persons allowed to visit the interior with Maspero. The latter explorer returns to Paris next month and will publish the discovered text. All the Makkara pyramids about sixty in number, will be opened as soon as possible.

The coasts of France are to be illuminated with the electric light, and to that end the oil lamps in forty-two of the principal light houses are to be replaced by the modern light. If the trial demonstrates that electricity is better than oil for coast lighting purposes, it will be permanently adopted in all the remaining light houses. It is thought that the electric light can be seen at a greater distance at sea than any other, and that it will penetrate much farther into the dense fogs which now practically obscure the present lights for half the year. Oil lamps in clear weather can be seen by vessels 22 miles off the western coast of France, and 27 miles off the south-eastern or Mediterranean coast. It is not too much to expect that in a short time electricity will be employed for lighting the coasts of every maritime nation, and that it will also be extensively used on our principal ocean steamers.

SOME CURIOUS PARAGRAPHS.

Sometimes a pun or play on the name is introduced, such as on the epitaph on John White:

Here lies John, a shiz, a shiz light,  
Whose name, like, actions, all were  
White.

The following was rather enigmatical than epitaphic, in regard to the Rev John Cbecht:

Beneath this spot lies buried  
One Cbecht without another;  
The outer sheet was all that's good  
Who says so of the other?

William Wilton, buried in Lambeth, certainly did not write the epitaph which bears relation to him:

Here lieth W. W.,  
Who never more will trouble you, trouble  
you.

Nor, we may safely say, did Owen Moore pen the following:

Owen Moore is gone away,  
Owin more than he could pay

More likely to be genuine are these epitaphs which involve a bit of bad logic, syntax, or grammar in their composition. In a graveyard at Montrose is said to be the following:

Here lies the bodies of George  
Young and all their posterity  
For fifty years backwards.

And in Wrexham churchyard as follows:

Here lies five babies and children dear,  
Three at Wrexham and two here.

Askin to this in logical blundering is

Here lies the remains of  
Thomas Thomas, who died in  
Philadelphia, March 1783;  
Had he lived he would have  
been buried here.

And another at Nettledon, in Oxfordshire:

Here lies Father and Mother and sister  
and I.

We all died within the space of one short  
year.

We all buried at Wimble, except I.  
And I be buried here.

Lord Byron is credited with an epitaph on an old neighbour of his, near Newstead:

John Adams lies here, of the parish of Swell-  
well.

A carrier, who carried his oad to his seat  
well.

He carried so much and he earned so fast,  
He could carry no more, so was carried a-  
last.

For the liquor he drank, being too much for  
one.

He could not carry off, so he's now carried  
off.

When the celebrated Gen. Wolfe died a  
premium was offered for the best written  
epitaph on that brave officer. A  
number of poets of all descriptions entered  
the competition, and among the  
rest was one who addressed his com-  
munication to the editor of the Public  
Ledger, as follows:—

He marched without dread or fear  
At the head of his bold grenadiers  
And what was more remarkable—say, very  
particular;

He climbed up rocks that were quite perpendicular.

—N.Y. Observer

The carriage works of Montgomery Bros., on Fort street, present evidence that a rushing business is being done by that establishment. In comparison with former years their increase this season is already very considerable. Last year 125 vehicles of various descriptions were turned out; but this spring, although the season is still so near its beginning, 80 have already been completed, while there are others in course of construction which will in a few days bring the number up to one hundred.

At Montreal on Friday night an exhibition of the electric light, both inside and out of doors, was given at the Hochebaga Depot by the Canadian Electric Light Company, and was witnessed by an immense concourse of people. The lamps outside were by no means a success, going out frequently, but in a large shed, which was fitted up as a banquet hall, the lights burned fairly well and were a success. The lamps used were similar to those used on gas brackets with the Edison light inside.