Water Wheels---The Turbine---Article 2.

[The annexed is an essay on the turbine water wheel, by James B. Conger, of Jackson, Tenn., a practical millwright of great experience and scientific attainments, an inventor and patentee, and who has devoted much attention to the subject. It is divided into a series of chapters, which will be continued through several numbers, some of which will be illustrated by diagrams.]

MECHANICS—WATER AT REST.—1 In mechanics, all matter may be considered as continually under the operation of forces, whichif mutual and in opposite directions, maintain it in equilibrio, but if a portion of the force acting in any direction on a body at rest be removed the body will then tend to move in an opposite direction to, and with a force equal to the force removed.

2 The term *force* is applied to every cause which impresses on matter a motion, or tendency to motion. Action and re-action are equal in degree and opposite in direction, there can be no force acting in one direction without an equal force acting in an opposite direction, or rather the same force acts in opposite directions. Hence force may be termed that which causes matter to tend, to separate, or approximate.

3 MATTER IN MOTION.—The indifference of matter to a state of motion or rest, is termed inertia. It is a consequence of this principle that one body when struck by another exerts an effort of resistance to the impulsion whilst acquiring a portion of the motion of the striking body; and while in motion exerts an equal effort to having its motion arrested. By this same principle, a body having received an impulse must move uniformly in a right line, if not opposed by any obstacle, for there can be no reason why the body should deviate to one side rather than the other, nor that its motion should be accelerated rather than retarded. It is likewise a consequence of inertia that a body while in motion opposes a change in its direction while being deflected by a force and deviates from a right line a distance equal to that which an equal force would have caused it to move from a state of rest in an equal portion of time.

4. These two principles, force and inertia, originate, carry on, and terminate all mechanical operations, both in nature and art, the worlds are governed and regulated by them, and mechanicians know of no other principles by which operations are effected.

5. Motion is the act of changing the place of bodies, the passing of a body from one place to another, or the change of distance between bodies. Space being infinite, motion can be relative only. Bodies on the earth may move as relates to the earth, the earth move as relates to the sun, the sun move as relates to the stars, and they move as relates to each other, but if there was but one body in space, it could not be said to move. Hence a body in motion is not effected by that motion, only so far as it brings it under the influence of some other body, and the influence will be the same whether it move, or be at rest, and the other moves.

6. If, while a body is moving in space, it be acted on by an incessant force tending to draw it to a point, perpendicular to its line of direction, the body will describe a curve around the point. And if the force be such as to generate an equal velocity in the body, if at rest, by acting on it through a space equal to half the distance from the body to the point to which it tends, or arrest its motion if directly opposed to it through the same space, the curve will be a circle. And in all cases of circular motion, the force required to compel the body to leave a direct line and describe a circle, will equal that which would bring the body to rest by directly opposing its motion through a distance equal to half the radius of the circle.

This resistance to a change of direction is called centrifugal force, and the force which compels the body to describe a curve is called centripetal force.

7. If a body free to move be acted on by an incessant force by article 3, motion will ensue which will be accelerated so long long as the force acts, or the body has space to move in, unless arrested by some other force. During the first instant of time the body will pass over a certain space, and will have acquired a certain velocity, which would carry it over double the space in the next instant of time, but the force being incessant, will cause the body to move the same distance in the next instant of time, independent of the previously acquired velocity, which jointly will carry it over three times the distance the second instant of time that it moved in the first, and its velocity will be doubled. Hence the spaces passed over in equal successive portions of time, will be as the odd numbers, 1, 3, 5, 7, &c., and the velocity acquired at the end of each portion of time, simply as the times 1, 2, 3, 4, &c. The velocity will be as the time the force is acting, and the space passed over as the square of time.

Heavy bodies subjected to the action of gravity near the surface of the earth will describe, in the first second of time, a distance equal to 16·0799 feet. But for all practical purposes 16 feet is near enough the truth. A heavy body will fall from rest one foot in the first fourth of a second, and acquire a velocity of one foot per eighth of a second, therefore the square root of the distance fallen in feet, will equal the velocity in feet per eighth of a second, which if multiplied by eight will give the velocity in feet per second.

8. The want of uniformity in terms as used by writers, has caused considerable confusion, and many misunderstandings. The terms below will be used as indicated.

Power is the term used to express the power of a certain force, or a force of certain intensity operating through a certain space, whose unit is one pound descending by, or raised against gravity one foot. When the force is constant it is usual to estimate the power at so much per second or minute, as for instance 33,000 pounds raised one foot per minute, or 550 pounds raised one foot per second, is termed a horse power. The effect produced by a power is estimated similarly.

Momentum is a term used to denote the product of a certain force, acting during a certain time. Its unit is a force equal to one pound, acting during the time of one fourth of a second. The velocity in feet per eighth of a second, multiplied by the mass will equal the momentum of a body in motion.

The momentum of a body in motion is by article 2 and 6, the intensity with which it will act, or the pressure it will exert against an obstacle which arrests its motion in one fourth of a second of time, or is equal to a force that would give the body its motion by acting on it one fourth of a second.

Intensity of a force is its capacity to generate motion. Its unit is equal to the force of gravity on one pound of matter near the surface of the earth.

Impetus is the force of motion, or the power of a body in motion, to produce effect, and is equal to the square of the velocity multiplied by the mass.

The units of space and time being arbitrary, that of velocity is arranged to correspond with that of power. The square of the velocity in feet per eighth of a second multiplied by the mass, will equal the power necessary to generate the velocity.

The Wants and Ills of Life.

REST OF THE SABBATH.—The "North British Review" illustrates the importance of sufficient sleep on a parallel with the natural history of the Sabbath:—"The Creator has given us a natural restorative—sleep; and a moral restorative—Sabbath keeping; and it is ruin to dispense with either. Under the pressure of high excitement, individuals have passed weeks together with little sleep or none; but when the process is long continued, the over driven-powers rebel, and fever, delirium and death come on. Nor can the natural amount be systematically curtailed without corresponding mischief. The Sabbath does not arrive like sleep. The day of rest does not steel over us like the hour of slumber. It does not entrance us almost, whether we will or not; but, addressing us as intelligent beings, our Creator assures us that we need it, and bids us notice its return, and court its renovation. And if, going in the face of the Creator's kindness, we force ourselves to work all days alike, it is not long till we pay the forfeit. The mental worker—the man of business, or the man of letters—finds his ideas coming turbid and slow; the equipoise of his faculties is upset, he grows moody, fitful and capricious; and, with his mental elasticity broken, should any disaster occur, he subsides into habitual melancholy, or in self-destruction speeds his guilty exit from a gloomy world.—And the manual worker—the artisan, the engineer, by toiling on from day to day, and week to week, the bright intuition of his eyes gets blunted; and, forgetful of their cunning, his fingers no longer perform their feats of twinkling agility, nor by a plastic and tuneful touch, mold dead matter, or wield mechanic power; but mingling his life's blood in his daily drudgery, his locks are prematurely gray, his genial humor sours, and slaving it till he has become a morose or reckless man, for an extra effort, or any blink of balmy feelings, he must stand indebted to opium or alchohol."

SLEEP.—Sound, connected, early, refreshing sleep, is as essential to health as our daily food. There is no merit in simply getting up early.—The full amount of sleep requisite for the wants of the system should be obtained, even if it requires till noon. I go to bed at nine o'clock the year round, and I stay there until I feel rested; but I do not go to sleep again after I have once awaked of myself, after daylight.—I remain in bed until the feeling of tiredness goes off, if there is any, and I get up when I feel like it, I do not sleep in the day time; it is a pernicious practice, and will diminish the soundness of repose at night. Dr. Holyoke, after he was a hundred years old, said, "I have always taken care to have a full proportion of sleep, which, I suppose, has contributed to my longevity." The want of sufficient sleep is a frequent cause of insanity. To obtain good sleep, the mind should be in a sober, quiet frame for several hours before bedtime. I think people require one hour's more sleep in winter than in summer.—[Hall's Journal of Health.

GUANO IN CUTANEOUS DISEASES.—Remarkable results have followed the use of guano in pemphigus, psoriasis, chronic eczema, and in arresting the excessive suppuration and degeneration of tissues in scorfulous ulcerations.—Solutions of the same substance have radically cured extensive ulcerations of the cornea also lencomas and thick albugos, and the eye has regained its natural transparency. It has also cured tinea. Internal remedies are not to be neglected while the guano is employed externally: give iodine in favus; arsenical preparations in certain severe herpetic affections; iron and iodine in scrofula; mercury and iodide of patassium in syphilis, etc., and purgatives in all cases. From one to four ounces of guano to a pint of water is the proportion for the solution; it must vary according to the inflammatory condition of the affected parts.—Boil the solution and filter.

Mix one drachm of guano, with one ounce of lard, for a very good ointment.

[The Doctors, it seems, not to be behind our farmers in the use of guano, have at last admitted it into their pharmacopœia. We have no doubt but a little stable manure would answer as good a purpose for the long list of ills for which guano is recommended.

SICK HEADACHE.—Half a drop of croton oil every hour until free catharsis is produced.—Three to five doses generally required. headache in the majority of cases is more dependent upon a disordered stomach, in which cases the cure is hastened and the action of the oil facilitated, by the previous administration of an emetic of Ipecacuanha. When the disease is attended with distressing dyspnœa, and if complicated with uterine affections, emetics become almost indispensable.—[Nelson's American Lancet.

CRYSTAL GOLD FOR FILLING TEETH.—The last number of the "Family Dental Journal," published at Albany, N. Y. advocates the superiority of crystaline gold for the filling of teeth. It asserts that it is better than gold foil, or gold in any other state or form for dental purposes.

The crystal gold for this purpose, is the invention of Dr. A. J. Watts, of Utica, N. Y. who has one patent for the same, and has recently made application for another improvement.—The crystal gold, possesses the quality of cohesiveness and malleability, and it accommodates itself, to the inequalities of decayed teeth, like a paste. When pressed with a proper tool into the cavity of a hollow tooth it becomes as perfectly metalic as solid gold. We have seen some of this crystaline gold, and can speak of its good qualities, from personal obser vation.

LYING IN BED WITH THE HEAD HIGH.—It is often a question amongst people who are unacquainted with the anatomy and physiology of man, whether lying with the head exalted or even with the body, was the most wholesome. Most consulting there own ease on this point, argue in favor of that which they prefer. Now, although many delight in the bolstering up of their heads at night, and sleep soundly without injury, yet we declare it to be a dangerous habit.

The vessels through which the blood passes from the heart to the head, are always lessened in their cavities when the head is resting in bed higher than the body, therefore in all diseases attended with fever, the head should be pretty nearly on a level with the body; and people ought to accustom themselves to sleep thus to avoid danger.—[Medical Journal.

[If this proves any thing, it proves too much, as it affords a good argument for walking on all fours instead of moving erect like a man. Macklin, the celebrated actor and author, lived till he was 99 years of age; he was exceedingly careful of his health, and was very particular about sleeping with his head elevated far above the common standard.

The "Medical Times and Gazette" mentions a case in which delirum appeared to have been induced by forced abstinence from tobacco, and was relieved by its re-employment. Another similar instance was that of a man whose skull had been trepaned on account of fracture, and who subsequently became raving, but, being allowed to-smoke, was soon relieved and rapidly recovered.

Combustibles and Incombustibles.

A combustible body is one which actually burns, such as carbon. An incombustible body is one that does not itself burn. A supporter of combustion is one that does not burn, but gives strength and support to one that does burn, such as oxygen, which supports carbon in producing heat. A common fire exhibits the union of the carbon of the fuel and the oxygen of the air. A gas light exhibits the union of the carbon, hydrogen, and oxygen to produce both heat and light. In neither process is the oxygen burnt, but only the combustibles, carbon and hydrogen. In all ordinary circumstances oxygen is therefore an indispensable element of combustion, and its proper supply a question of the first importance to economy of fuel. For instance, if only 8 parts of oxygen are admitted for each 6 parts of carbon evolved from the fuel, the combustion is very imperfect, and much of the heat of the fuel passes off in combustible gases, of which carbonic oxyd is the chief. If, however, 16 parts of oxygen are admitted to combine with 6 parts of carbon, the combustion is 70 per cent. better than the last, producing steam and carbonic acid as the products of perfect combustion. Under the ordinary pressure of the atmosphere, oxygen is the supporter, and carbon and hydrogen the combustibles, but in a vacuum, or under the intense action of the oxy-hydrogen blast-pipe, this natural order is reversed, and oxygen becomes the combustible and carbon the supporter of combustion.—[J. Sewell, on Steam and Locomotion.

Black Dye For Felt Hats.

The composition of this dye, for which a prize was awarded, in Paris isas follows. 1. The felt hat bodies are first cleaned, and galled by passing them through the following solution, and washing: fustic, copperas, argal, each 8 lbs. are boiled together in water for half an hour. 2. The dye-bath consists of 55 lbs campeachy logwood, 1½ lbs. gum, 3 lbs galls, which are boiled together in water for 3 hours. To produce the black color, 5 lbs. refined verdigris, 2 lbs. each of blue vitriol, sugar and quicklime, are added to the bath.—[Bulletin of the Society for the Encouragement of Art.

[This is a wretched receipt, for which to award a prize.