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Contents:

(Illustrated articles are marked with an asterisk.)

ROTARY AND RECIPROCATING ENGINES.

We are in receipt of several communications upon the relative value of rotary and reciprocating engines, and the supposed waste of power by the use of the crank while passing the center. In one instance we are asked to compute the precise "diameter of a rotary engine, that will equal in efficiency a reciprocating engine having an equal piston area, and a crank of given length." This question of loss of power by the crank is constantly recurring in one form or another, and we have so often discussed it in our columns that we think our views upon it should be well understood by those who have been for any considerable time readers of our paper. The attempt to substitute any other method than the crank, for changing a reciprocating motion into a rotary one, where any heavy work is to be done, has always resulted in a demonstration of the superiority of the crank. The latter is at the same time one of the most simple as well as one of the most beautiful of all mechanical movements. The notion that it wastes power is not founded upon fact, and we think we can make this perfectly plain to our correspondents.

Steam under a given pressure possesses a fixed amount of mechanical power for every unit of volume. The application of the pressure and expansive force of a given amount of steam through the entire revolution of a crank, provided it might be so applied, would not increase its working efficiency. The same amount applied to a portion of the revolution so that its entire efficiency should be used would produce the same result. Suppose a windlass to have a fly-wheel attached of sufficient weight to store up and to impart considerable more power than is required to raise the weight attached to it. Suppose further, that a power of 4 lbs. applied to the winch through its entire circuit is sufficient to raise the required weight. Then will a force of 16 lbs. applied successively through ¼ its revolution continuously raise the weight. In this case 12 lbs. of force are taken up by the fly-wheel and gradually expended in raising the weight through the three fourths of the revolution to which the power is not directly applied. In reciprocating engines the steam is applied only through a partial revolution, but enough is applied so that the surplus force absorbed by the fly-wheel, expended during the remainder of the semi-revolution through which the crank must pass, is sufficient to keep up the speed at the required rate. Therefore there is no loss of power, provided the parts of the engine are properly adjusted, and the steam is cut off at such a portion of the stroke that the full force of its expansion is realized. The steam in a reciprocating engine is applied while the connecting rod is nearly at a right angle with the crank; the fly-wheel transmits its store of force in a direction always at right angles with the crank; hence it is absurd to suppose that other devices having for their object the application of the steam in a direction uniformly at right angles with it, can possibly possess any great superiority over the crank and fly-wheel which does so very nearly the same thing.

Now a word in regard to rotary engines. If steam is applied to them only through the same fraction of a revolution that it is applied to reciprocating engines, we think there is no one who would suppose them superior to reciprocating engines. But if steam were applied only through one fourth of a revolution, twice during each revolution, it will take twice as much steam to supply it during the entire revolution. In the latter case more power would be obtained, but it would be at the expense of more steam. Hence we assert that a rotary steam engine having the same piston area as a reciprocating engine, properly constructed and manipulated, and its semi-diameter equal to the length of the crank, can never do more work in proportion to the steam used (leaving out of the question the slight disadvantage in the application of the power above alluded to), while on account of the imperfect use of the expansive force of the steam, it is less efficient. The account summed up would leave a balance in the favor of the latter.

IS MANUAL OR MECHANICAL LABOR EITHER DISHONORABLE OR UNPROFITABLE?

We shall take the negative of this question most decidedly; yet from the practice of most persons one would think that the facts were against that view. Even the most successful practical mechanics do not generally commend to their sons their own business, but, seeming to entertain some sort of an antipathy to mechanical labor and to have exalted notions of mental work, or employment involving but little outlay of physical force, strive to *elevate* their sons by placing them in a store, office, or some other place or position to which the idea of useful, hard work does not attach.

It may be that there is less hard work in employing the brain, almost exclusively, than in using the muscles, but the writer in an experience of forty and more years as common laborer, machinist, mechanical engineer, store and office clerk, school teacher, and writer has failed to discover the fact. Perhaps, also, anything or everything pays better than manual or mechanical labor, but that fact has not yet reached the apprehension of the writer. Clerks and even salesmen in stores, copying clerks in offices, the scribbling drudges of corporations, contributors to periodicals, etc., are among the poorest paid and hardest worked classes of the community. Beside this, they are frequently the "servants of servants," envying the independence of the "wood sawyer's clerk."

If wealth brings honor and position, surely the creator of the wealth need not be dishonored by his employment. It is absurd in this country, where there are no family estates held by laws of primogeniture or entailment to nurse a brood of loafers, where whoever *has* must first *get*, to talk of the ignobleness of labor. Our wealthiest—our best men—feel proud to have been the builders of their own prosperity, the arbiters of their own fate, the commanders of circumstances. Wealth acquired or competence obtained by hard, persistent, physical labor is valued and really enjoyed, because the very labor expended has given a zest for its enjoyment, and the knowledge that it is a deserved reward for persistent endeavor gives a conscious right to its possession.

As to the social disabilities often attributed to mechanics and laborers, much misapprehension exists. "Society," *par excellence*, is not confined either to the wealthy or the butterflies of fashion. As much intellect, as much education, as much general knowledge is to be found among our mechanics as among an equal number of our wealthy men. They form institutions for benevolence, for mutual education, for enjoyment, and carry them on successfully. They are among our most forcible debaters on religious, political, or social questions. Their contributions to the daily and weekly press are as potent in their influence as the carefully studied and elaborately constructed leaders of the professional editor. If their social world is theirs only, it will compare favorably with that of the "upper ten." No; the laboring classes are not low in the social scale. Indeed, not unfrequently they give a healthy tone to that so-called higher society which is continually recruited and sustained by members from their ranks. Physical labor, so far from being inimical to intellectual development, is one of the necessities of that development. Then, the workman (muscleman) is not to be pitied or commiserated, but rather to be envied. He is to be envied, because, first, he has an agreeable and healthy employment; second, because, whether reasonable or not, he has the stimulus of hope to achieve what he may consider a higher position—that of competence or affluence. His mind is engaged, his physical powers exercised, his health insured by congenial, constant, and useful employment.

Now as to the relative profit of manual labor and apparent work. While the salesman, clerk, or scribbler must be content with his two, three, or possibly four dollars per day, the mechanic can earn as much or more, even five dollars, with a feeling and knowledge of independence which the clerk can never experience. Still more, as this is a country where labor rather than rich patronage governs, the possessor of a good trade—the master of a useful business—can almost always not only find employment, but even dictate his terms. Such a man is truly independent. He knows that his two hands, guided by his educated brains, are sufficient to provide for him and his, and may possibly place him far above those who consider the "greasy mechanic" a fair subject for insane jests.

MINERAL AND ANIMAL AROMAS AS CONDUCIVE TO HEALTH.

A paper published in the heart of the Pennsylvania oil regions, the Titusville *Herald*, states that "sickness is comparatively unknown in our oil towns, the statistics showing a degree of health unequaled by that of any other portion of the country." Apropos to this it may be stated that petroleum vapor contains much of what is known as carbolic acid, a notable destroyer of the lower organisms and their germs. So we are told that the stench arising from partially putrified hides in a tannery is an antidote to diseases which are supposed to be conveyed, if not propagated, by the atmosphere and destructive to the infinitesimal germ of noxious matter contained in it. We have little faith in either of these statements. They may appear plausible from the fact that nobody who has any sensitive olfactory nerves can live in comfort under the influence of either of these noxious effluviæ. It has been suggested that Venango county, Pennsylvania, would be an excellent retreat for invalids on account of its presumed peculiar healthiness. It may be so, but if our experience of some two months in the oil region is a criterion we do not envy the invalid his sojourn in that delectable atmosphere.

THE PHYSICAL RESEARCHES OF THE AGE.

The physical researches of the present age seem to be devoted in a great degree to the two subjects of optics and acoustics, and some very novel and ingenious practical applications of the principles of these sciences have been made to mechanical engineering, the value of which remains to be demonstrated. The workers in these fields, at the head of whom must be ranked Dr. John Tyndall, have brought to bear an amount of labor and experiment that would scarcely be credited by our readers should we state it. Prof. Tyndall, in speaking of the amount of experiment made to determine the velocity of sound, says: "Those who are unacquainted with the details of scientific investigation have no idea of the amount of labor expended in the determination of those numbers upon which important calculations or inferences depend. They have no idea of the patience shown by a Berzelius in determining atomic weights; by a Regnault in determining the coefficients of expansion; or by a Joule in determining the mechanical equivalent of heat. There is a morality brought to bear upon such matters which, in point of severity is probably without a parallel in any other domain of intellectual action. The desire for anything but the truth must be absolutely annihilated; and to obtain perfect accuracy no labor must be shirked, no difficulty ignored. Thus, as regards the determination of the velocity of sound in air, hours might be filled with the simple statement of the efforts to establish it with precision." The relation of tension to pitch of sound was early established, but its application to the solution of engineering problems has, so far as we are aware, only been made within the present year. This application is due to Mr. W. Airy, who used it to determine the strains upon every one of the intermediate bars connecting the top and bottom members of what is known as the "bowstring bridge." These strains are due to the various arrangements of weights upon the bridge. It is obvious that this is a problem of great complexity, as a weight upon any given point is more or less distributed to other parts of the bridge, on account of its peculiarities of construction; a reaction of strains taking place throughout the entire structure. The problem is by no means indeterminate, although its solution would tax all the resources of mathematics.

It would almost seem at first thought that the sense of hearing would be the least liable to be applied successfully to the solution of such a problem; but the ingenuity of modern experimenters seems almost inexhaustible. Mr. Airy constructed a model of a bowstring girder having its intermediate ties of steel wire of uniform size. By loading a wire of the same size and length of any particular tie, with weights, until its tone was in unison with the tie, the weight would of course be equal to the strain which produced the same tension in the tie. This experiment, which seems to have given very satisfactory results, will no doubt lead to similar tests upon more complicated structures, which present such severe problems of construction that anything more than an approximate determination of the strains to which their different parts are subjected, is by mathematical means not to be expected.

In the science of optics we notice the announcement of the invention of a new photometer, which gives most accurate measurements of the intensities of luminous rays. The delicacy of the instrument is so great that Mr. Crookes, who perfected it, announces that it will indicate a difference of intensity caused by moving a lamp one tenth of an inch. The description of this instrument may perhaps be given in a future article.

In chemistry much is being accomplished. The complex substance called neurine, which is a large constituent of the brain and nerves, has been synthetically produced. Inorganic chemistry is attracting increased attention, and theoretical chemistry is receiving a new impulse from the labors of Sir Benjamin Brodie and the discussions arising from the publication of his late work, the "Chemical Calculus."

In physiology, Pettenkofer and Voit, with the celebrated respiration apparatus, at Munich, are throwing light upon the mystery of sleep, by showing that animals during sleep store up oxygen.

To the sciences of geology, paleontology, and microscopy many important additions have been recently made, which we cannot now allude to in detail, while in the other sciences which we have forborne to mention, the march of intellect keeps step with the general progress of the age. Would that we might also add that the moral progress of the world was also in keeping with its advances in knowledge.

OBITUARY.—GEN. CHARLES G. HALPINE.

General Halpine, known under his *nom de plume* as "Miles O'Reilly," died suddenly at the Astor House, New York city, Aug. 3d, from an overdose of chloroform administered by himself while suffering from illness. He occupied the positions of city register and chief editor of the *Citizen*. As an official he was capable, honest, efficient; as a writer, energetic, terse, vigorous, and talented. Socially he was generous, genial, and honorable. General Halpine was born and educated in Ireland. He came to this country in 1851. When our civil war broke out he went to the field as second lieutenant and rose successively through the different grades to the rank of Brevet Major General. His death at the early age of 39 is regretted by a large circle of friends and acquaintances and by the public at large.