Application of Heat to Produce Steam or Evaporation.

The comparative effect of heat to produce steam in a boiler depends upon the ratio of the absorbing and transmitting power to the velocity of the escaping products of combustion.—For if the velocity be greater than the absorption and transmisssion of the passing heat to the water, then there will be a corresponding loss of heat. In the locomotive boiler with a rapidly escaping current only from 1-10 to 1-16 of the absorbing surface is by direct contact at ordinary speeds of the engine, and the remainder at right angles to the escaping current of heat. At high velocities the surface of contact will be inereased to about $\frac{1}{2}$ or $\frac{1}{3}$, whilst the velocity of the escaping gases will be also increased, a decreased length of tubes. Therefore as the velocity is increased the economy of fuel is decreased, from the failure of the absorbing transmitting power of the boilers to convey more heat in less time to the water.

The comparative heat transmitted by conduction, radiation, and convection may be tested by alternately placing a thermometer in contact with the flame of a candle, next by its side, then over the top of the flame, and noting the temperature at each of the three positions. Or if the hand be cautiously substituted where a thermometer may not be convenient, the respective differences will be sensibly indicated, and give a clear ideà of the heat lost by convection, when its velocity is considerable, and the absorbing space limited. In this respect long boilers have an evident advantage over shorter boilers, where the diameters of the tubes do not offer sensible obstruction, for the largest portion of locomotive heating surface is on the worst or radi atory portions, at slow velocities, but decreasing as the increase of velocity extends the flames through the tubes. The experiments made by Mr. G. Stephenson, many years ago, showing the comparative evaporative ratio between the fire box and tubes of an engine at rest, as 3 to 1, would scarcely apply to an engine at very high speeds, since the relative conducting or radiating surfaces are not uniform, but vary with the velocity of the engine and heating power of the fuel. With a low velocity these surfaces might be more uniform, if the flame acted only on the fire-box.

The economical evaporation of water into steam depends therefore, first, upon perfect combustion; and, secondly, upon the absorbing and transmitting power of the boiler.

Where the powers are equal, the effects would be in the ratio of the surfaces of conducted and radiated heat, but where unequal, in the ratio of their transmitting power only.—Careful management of the fire to prevent "air holes" burning through in places, a due regard to the air-admission spaces being uniform, and a steady regular supply of fuel, have considerable effects upon the economical results from any boiler. A clear level fire, kept fed by regular-sized pieces of fuel and the fire-grate kept free from clinkers, all contribute to economy, and should be practiced. To aid the fireman or driver in their duties, as well as for the higher objects of research, there should be in every locomotive boiler one glass pane in the fire door, and one in the smoke-box door, that both the fire and the state of the escaping heat might be seen without opening either door, until such was really necessary. The chilly effect of opening the fire door in checking the production of steam is well known, and might be so far avoided whilst the experienced eye would soon detect whether combustion was or was not perfect, and act accordingly. There is no practical difficulty in doing so, for it has been done by our best experimenters, and, of course, could be done in daily practice with good results. A good self-acting feeder of fuel is desirable.—[J. Sewell on Steam and Locomotion.

Underground Telegraph.

During the cold weather experienced in Paris in the latter part of December and in the beginning of the present year, the electro-magnetic telegraphs were much interrupted from snow and ice, while the submarine telegraph rendered uninterrupted service. To avoid these difficulties, the administration have determined to place the wires between Paris and Calais under the ground. The submarine line continues to work well.

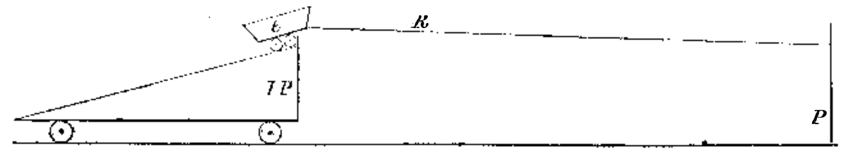
Water Wheels---Article 1.

Two of my correspondents have written to me for an opinion of the answer to your correspondent, "W. A. S.," in Volume 9, page 15. One of them wishes me to give you my views, as I did to him, and says you will be puzzled to find obscurity.

I illustrate it thus: suppose an incline plane, figure 1, 16 feet long, and 4 feet high, be placed on a perfect level railroad, on rollers, thus: I P is the incline plane; *e* is the car of twice the weight of the inclined plane; the car with the rope, R, fastened to the post, P, will hold the car from descending the plane. Is it not an axiom that the incline plane will move 16 feet, while the car by its gravity descends four feet?

Now to apply this to a Parker wheel, we will suppose a helical sluice, figure 2, under a horizontal wheel, 32 inches in diameter, with six

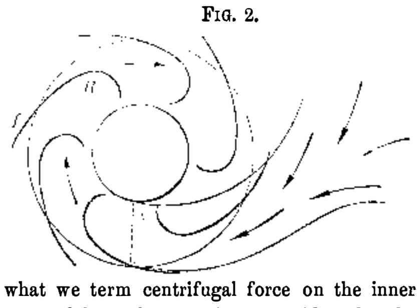
Figure 1.



issues, consequently the bucket (so called) is 16 inches from the end at the issue, I, to the radial curve, R, the issues 4 inches wide radially, (being in proportion to figure 1.)

The circle cutting the center of the issues is the inside of the outer cylinder; the circle within the inner end of the buckets is the inner cylinder. These two cylinders confine the water entering the sluice in the course of the arrows up the helix, the water impinges on the bucket from where the bucket crosses anglingly the inside of the outer cylinder, producing motion to the wheel by its percussive force. Inertia moves the water radially, and produces

FIG. 2.



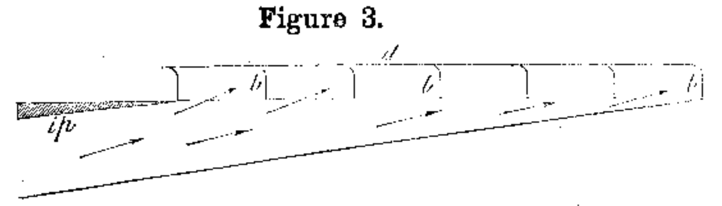
what we term centrifugal force on the inner curve of the bucket; now is it not evident that the wheel must move the entire length of the radial inclination of the bucket, while the water in its velocity passes radially 4 inches? When the wheel is only moving with its own weight the radial motion of the water will be but very little changed. And if we examine the ninth experiment of the third table of the report of the Franklin Institute, we find the water moved 17·76 feet velocity through the issue in one second of time, and the periphery of the wheel moved 26·4355 feet, or 48·85 per cent. faster than the actual discharge, and returned more than 71 per cent. in effect.

Figure 3 is an elevated view of the helix and wheel, supposing both to be extended in a straight line, the arrows represent the direction of the water, and exhibit the fact of each bucket being supplied simultaneously. The inclination of the sluice is in accordance with one for 96 square inches area of issue and inlet. The upper horizontal line represents the edge of the disk or head of the wheel in a line, *d*. The vertical lines with the curve of a quadrant represent the buckets, *b*, that receive the impulse of the water; *i p* is the edge view of the injunction piece, the sharp edge is radially with the dotted line across the sluice, figure 2, which brings the lower and upper currents of the water together, in the most smooth and gentle manner possible. Is it not evident the wheel must run at the periphery faster than the discharge water, to let the water pass radially through the issue? JAMES SLOAN.

Sloan's Mills, Shelby Co., Ky., Feb. 1854.

[The remarks of ours to which our correspondent refers, related to the velocity of a working water wheel like Parker's, running with a higher velocity than the water which propels it. We must say that we want some clearer explanation than any yet furnished. In relation to the question, "Is it not an axiom that the incline plane will move 16 feet while the car descends 4 feet." We say it is not an axiom. If according to the proposition a car of 200 lbs. weight moves an inclined plane carriage of 100 lbs. weight 16 feet, while the car

Figure 3.



descends 4 feet, then we have $16 \times 100 = 1600$ momentum produced from $200 \times 4 = 800$ momentum. Anything that we have said in reference to the velocity of water and the wheel, has been viewed like the question of a free body striking an object. We have never known the piston of any steam engine to move with a greater velocity than the steam which propelled it. We are well aware that the periphery of a wheel may have a higher velocity than the water which moves the wheel, but the periphery of a wheel is only a part of *the wheel*. A water wheel is like a capstan; the handspikes or levers of the latter represent the buckets or arms of the former. The power of the water may be applied at any part of the arms, but will that part of the arm at which it is applied move with a higher velocity than the moving force. That is the simple question. A wheel 32 inches in diameter moving at the rate of 30 revolutions per minute, has a peripherical velocity of 251·32720 feet per minute, but the surface velocity of the wheel at 8 inches from the center is only 125·66360 feet per minute, and at 2 inches from the center it is only 31·41590 feet per minute. Water acting upon the bucket of a wheel of 36 inches diameter at 8 inches from the center, and having a velocity of 125·66360 per minute, if it communicated all its velocity to the wheel would give its periphery a speed of 251·32720 per minute. This is very plain, and no one will dispute it.

Decimal Weights and Measures.

A petition, drawn up by M. Vattemare, has been addressed to the American Senate. Its purpose is to induce that body to examine the French metrical decimal system for weights and measures, and adopt it, or a similar one, in the United States. In France, the monetary system is decimal, and has been since the revolution of '93; the thermometer is decimal, since Napoleon established the centigrade; and measures of length, surface, solidity, capacity and weight, have been obligatory decimal since 1840.

We hope Congress will give the subject the attention it really deserves.

Breakage of Mills.

An unusual number of mills have been broken down within a few weeks. One of the machine works in this city had seven mills to repair at once last week. These breakages are probably owing to the sudden changes in the temperature, affecting the nice adjustment of heavy machinery. A great number of railroad axles have also broken in the same time.—[Providence Journal.

H. R. Serrell, C. E., of this city recommends securing a wire gauze screen in a cast-iron frame, to the outside of every railroad window. This is to prevent passengers from thrusting out their heads or arms, many accidents having occurred from doing this, in spite of printed cards of warning. The recommendation is a good one.

Consumption of Fuel in Steam Engines with Single and Double Cylinders.

M. Farcot, machinist, at Port St. Ouen, has made experiments upon two machines made by him for the plate-glass manufactory of St. Cobin, which may serve as a basis for a rigorous comparison between machines of one and two cylinders. The experiments were made under the direction of M. Laforet, engineer of the glass-works at Chauny. The first machine, with two cylinders, has a nominal power of 30 horse, and makes 28 revolutions per minute.—When tried on the 26th October, during 5 hours, at 38 horse-power, under a pressure from 4·75 to 5 atmospheres, it consumed less than 1·15 kil. ($2\frac{1}{2}$ lbs.) of common charcoal per horse-power per hour. Afterwards tried at 49 horse-power, it worked with the greatest ease

The second machine is horizontal, has but one cylinder, working at 42 revolutions per minute, and is also nominally 30 horse-power. Tried for 5 hours on the 28th October, it consumed only 1·106 kil. (2·4 lbs.) per horse-power per hour. Afterwards tried at 49 horse-power, it gave no evidence of injury to any of its running parts. These two machines have now been in regular service for several months, and work usually with a force of from 40 to 45 horse-power.

It has been hitherto admitted, that the double cylinder machines expended less steam and fuel than those with but one cylinder. The preceding experiments show that when well constructed, the expenditure is the same in both systems. If it be true, theoretically, that the double cylinder machines work more regularly, it is now certain, that practically, the one-cylinder machines of M. Farcot work with a perfect regularity. Horizontal (oscillating?) engines, for instance, drive spinning machinery, and paper works more regularly than the hydraulic motors which they replace, and actually leave nothing to be desired. Their price, for equal force, is less than that of fixed machines, and their velocity is in better adjustment to that of the shafts which they drive.

Our readers will observe the low rate of consumption in these two machines; it is much less than that required for the best engines turning an axis, hitherto known. The arts have therefore realized, in this respect, an immense progress of 2 or even 3 kilogrammes ($4\frac{1}{2}$ to $6\frac{1}{2}$ lbs.) per horse-power per hour. This advance is especially due to the Society for the Encouragement of National Industry, for they have always excited, proved, sanctioned, and recompensed it.—"Cosmos;" translated for the Journal of the Franklin Institute.

[The above, we infer, relates simply to the connecting rod of one piston driving a single shaft, and the connecting rods of two pistons, also driving a single shaft. In theory there can be no difference, and we do not see how in practice any could be expected. We should like to see the results of experiments on the fuel used by engines with one cylinder exclusively, and one with two cylinders, a high pressure and an expanding one—the latter taking the steam from the former; such a set of experiments would be valuable. A saving of fuel has been claimed for such engines, but we like the single cylinder ones the best, cutting off at an early part of the stroke; they are more simple, compact, and less expensive.

Scarcity of Common Sense.

Barnes, formerly editor of the London "Times," said to Thomas Moore, that the great deficiency he found among his writers, was not talent but common sense. Not one of them, he said, could be trusted to write often or long on the same subject, as they were sure to get bewildered with it, and he included himself in the remark.

Balance Valves for Locomotives.

We have received a letter from Robert Gray, engineer in the Machinery Department of the Crystal Palace, who states that he has invented a balance valve for locomotives, which can be worked with the greatest ease under any degree of pressure. This will certainly be a great relief to locomotive engineers.