Scientific American.

NEW-YORK, SEPTEMBER 15, 1855.

The Opening of Our New Year.

We begin, to-day, a new volume, and enter upon the duties of a new year, under circumstances both flattering and peculiar. Material interests of every kind are flourishing with unwonted activity. The cries of distress and the sights of poverty, which but a few months since so often met the eye or fell upon the ear, are now no longer seen or heard. No armies of laborers, out of employment, parade our streets, asking for work. Their honest wives and children no longer beg, from door to door, the necessaries of life. No idle shops, vacant and abandoned, attest a general gloom. But, on the contrary, the whole land, from North to South, from East to West, presents one universal scene of industry and prosperity. The ringing anvil, and the clickering loom, join their mixed sounds to songs of hearty joy, from busy operatives. The earth repays the farmer's toil, with over-running measures. Wherever we turn, all is activity and gladness.

In view of these great blessings, how should our hearts swell with thanksgiving and praise toward that All-wise Being "Whose glory and Whose presence the Heavens declare, and Whose handiwork the firmanent showeth forth."

To us, it is pleasing to observe that, amid the bustle of this uncommon material prosperity, the intellectual powers of our people are not left unexercised. Since spring opened, and the prospect of so glorious a harvest became apparent, the student, the inventor, and the thinker, appear to have applied themselves to new tasks, with redoubled vigor. The number of discoveries and inventions which have come under our notice, within the four past months, exceeds, by far, the developements of a similar nature, during the same space of time, in any preceding year. It is also observable that, in the character of the subjects pursued, and the results produced, there is a decided improvement; they evince closer study, and a higher degree of mental effort.

It is this disciplining and stretching of the intellect,—this constant endeavor to exceed in the future, whatever has been done in the past, that our people should ever try to cultivate. In all the new triumphs of mind over matter, the Americans, from this very cause, stand every where pre-eminent. Who does not remember with pride, the splendid victories of our countrymen at the Exhibition of All-Nations in London. Acres and acres of space were there covered over, with rare and brilliant specimens of goods and products, from every clime. Diminutive, compared with the displays of other large nations, the Department of America, away in its lonely corner, became, for a time, the butt of ridicule and contempt. But when, at last, the hour of trial came, her genius and her superior intelligence, shone forth with dazzling splendor. The vast and magnificent display, by which she was surrounded no longer served to overawe and hide her strength, but rather helped to lift her up conspicuous above the whole, "the observed of all observers."

The Parisian Exhibition affords another illustration, in some degree similar. The French, the English, and every other Department, teem with endless displays of riches and beauty: yet there is, throughout them all, a strange absence of novelty. The articles exhibited have, for the most part, long been known, made, and veuded. It is only when the comparatively small Division of the United States is reached, that anything absolutely new is seen: while, among the most striking features of the entire Exhibition, are the marked triumphs which American genius obtains, in every prominent contest.

Such are some of the results that have already attended the efforts of our people at self-advancement. Knowledge, the world over, gives power and fame: this is true in regard to individuals, as well as nations. Let us, therefore, in the future, strive onward. In the new year that is before us, now so propitious of good, let every individual make a new exertion to rise above the level of the past.

For ourselves, in the conduct of our journal, such always has and ever will be, a rulingendeavor. On every side it is allowed that the SCIENTIFIC AMERICAN, in point of vigor, interest, reliability, and influence, stands at the head of all analogous journals; indeed, we can add, as an absolute fact, that its regular weekly circulation exceeds that of all other publications of its kind, in the world, combined together.

These proud positions we shall ever try to maintain. If an increased desired to benefit our readers,—to spread before them the honest truth, to enlighten, to encourage, and in every way to promote their advantage, can do aught to retain and augment the confidence with which they have honored us in the past, then have we no fears for the future. Boldly, therefore, we launch out upon the voyage of a new year, fully believing that, at its termination, not only ourselves, but all who have gone with us, will be found to have made a permanent and a satisfactory progress.

Experiments with Turbine Water Wheels.

We owe an apology to James B. Francis, Engineer of the Corporations of Lowell, Mass., for not noticing at an earlier date his work on the above subject, which does him great credit as a man of science and engineering skill. We had received communications last year from two of our correspondents, in which they stated they were preparing works descriptive of their experiments with turbine water wheels, and anticipating the early publication of these, we waited till now in the vain hope of being able to compare and present some of the peculiar information belonging to each.

The work of Mr. Francis is a large volume, illustrated with beautiful plates, and is the only book worthy of the name ever published in our country, or any other, on the subject of "Turbine wheels." The experiments described in this work were made on that hard worked stream, the "Merrimack River," at Pawtucket Falls, where throbs the heart of busy Lowell, the greatest manufacturing city on our continent. The fall, in ordinary low water, is 33 feet, and the proprietors of the locks and canals on the river at Lowell have granted 139, 11-30 mill powers, of 3595·933 cubic feet of water per second, amounting in all to 8965·4 horse power, which is now employed in turning the busy wheels, and giving motion to thousands of spindles, looms, &c., belonging to eleven companies, employing the immense invested capital of $13,000,000 in manufacturing. Much of this great water power is employed on turbine water wheels of a very superior description, as the results of experiments show. At one time breast wheels were exclusively used at Lowell, and until the year 1844 much prejudice existed against re-action wheels. "The attention," says Mr. Francis, "of American engineers was first directed to improved re-action wheels in France, by some articles published in the *Journal of the Franklin Institute*, and by a translation of Morin's French treatise in 1843, by Elwood Morris. The experiments with one of Mr. Morris' wheels indicated a useful effect of 75 per cent., and this being as good as that claimed for over-shot wheels, the attention of our millwrights was directed to their merits." It appears to us that the pamphlet of William Whitelaw, on re-action waterwheels, published in 1840, deserves some credit for bringing the subject prominently before our people, as his water wheel, erected in that year, indicated a useful effect of 75 per cent.

From the detailed experiments of Mr. Francis, we are led to conclude that over-shot, breast, and under-shot wheels should no longer be tolerated, as the very best of them give out no more than 75 per cent of the water power, and are far inferior in efficiency to the most improved turbines.

In 1844, Uriah A. Boyden, an eminent hydraulic engineer of Massachusetts, constructed a turbine wheel for the Appleton Co.'s cotton mill at Lowell, which was found by experiments with the dynamometer to give out 78 per cent. of the water power. This was first rate, but greater triumphs were yet in store for Mr. Boyden. In 1846, he superintended the construction of three turbines of 190 horse power each, for the same company, and by the terms of the contract his compensation depended upon their performance. If the mean power derived from them was equal to 78 per cent. of the water power expended, he was to be paid $1200 for his services, exclusive of patent rights; and if still greater he was to receive an additional compensation of $400 for each per cent. of power gained. In accordance with the contract, the useful effect of two of these wheels were tested by a very perfect Prony dynamometer, and the quantity of water gauged by a wier. The observations on them were put into the possession of Mr. Francis for computation, and he found that the mean maximum of their effective power was 88 per cent of the water expended.—According to the terms of the contract, Mr. Boyden was then fully paid $5200 for his services and patent rights. This was certainly a great triumph for him—one worthy of universal admiration. The experiments upon one of these wheels, and the flow of water over the wiers, are ably and fully detailed, with illustrations, in this work, which should be in the possession of every hydraulic engineer.

There is no subject which has engaged more discussion, and respecting which a greater variety of opinion prevails among millwrights than turbine water wheels. We are convinced that the dynamometer is the only test of the working qualities of each wheel, and no other should be admitted, for it is a positive fact that the effective value of such wheels, according to their construction, varies from 50 to 88 per cent.

We have a letter now before us from Heath & Arthur, of Laurel, Md., in which they state that one of H. Van Dewater's 6 feet Jonval turbines does all the work of their factory, driving 1260 dead spindles, 36 looms, and the necessary machinery and shafting for making No. 6 1-2 yarn and cloth from it, with 20 per cent. less water than three of Parker's wheels. They do not state what the total useful effect of the wheel is, but, that it is a gain of from 25 to 30 per cent over the three Parker's, which it has superseded, for with these wheels the factory never could turn out over 600 lbs. of yarn per day, while with the Van Dewater wheel, it turns out 750 lbs. without difficulty,—sometimes running in two feet of back water.

This information which we have presented, respecting the value of turbine water wheels, should claim universal attention. No other kind of wheel, not the best overshot in the world,—has been known to give out within ten per cent. as much power as the Lowell ones. Turbine wheels then, should be used in preference to all others, not only because of their economy of water power, but also because of their compactness, simplicity, and cheapness. No doubt much depends on the workmanship of each wheel, for the principle of applying the water, on Boyden's wheels—giving the inlet water a whirling motion in the wheel's direction—is that discovered and first applied by Parker. We scarcely expect much further improvement to be made in such wheels, for 12 per cent allowance for friction is very small. Yet in this era of great mechanical skill, and progressive science, we dare not place a limit to improvements on any machine. To struggle for *perfection*, as the standard of effort, is the only way to improve and progress.

The Tribune and the Scientific American on Air Pressure.

The *Tribune* of the 6th inst. contains another article in answer to ours in No. 51, last Vol. It says "the SCIENTIFIC AMERICAN now admits the existence of the law that atmospheric resistance increases in the duplicate ratio of a moving body." This is an insinuation which does no honor to an honest man. It is intended to convey the idea that we had denied the existence of such a law, while the fact is we did no such thing.

The first article of the *Tribune* which led to this discussion was grandiloquent about disembodied spirits and planets moving with awful velocities, and about railroad trains being whirled through space swift as cannon balls, and very economically, by the removal of atmospheric pressure. Being silenced on the latter point, it now proceeds to rush packages through a vacuum tube—with an accelerated velocity of thousands of miles in an hour by some constant force. Although we explained the action of gravity in the article alluded to, and showed that the conditions of a package moving in a vacuum tube, were entirely different from those of a falling body acted upon by gravity, the *Tribune* has such obtuse ideas of the law of gravity, that it mistakes our description of its effects for a mere statement of what the law is, and its own statement of what the law is, for a description of its effects. It thus confuses itself.

A cannon ball falling from an elevation will acquire a uniformly accelerated velocity. The same ball projected upwards will have its speed uniformly retarded. If the same ball be placed in a vacuum tube, it will not move a single inch. What produces these different results? Gravity, which is ever constant; but the conditions of the three cases are entirely different. The *Tribune* seems sublimely regardless of conditions, hence, it talks of a vacuum tube as if it were to be placed vertically, and receive packages from the uttermost boundaries of the atmosphere, instead of being laid horizontally on the ground, and its packages propelled by the simple pressure of the atmosphere.

On the day the *Tribune's* article was published, a correspondent—J. O. Gilvie, No. 54 State street, this city—saw at once through the absurdity of its positions, and sent us a short article on the subject; we cannot do better than quote his remarks.

"The problem to be solved is simply this, 'what is the velocity of a stream of air flowing through a given aperture into a vacuum by the ordinary pressure of the atmosphere, the capacity of the vacuum being also given to find how long time will be required to fill it?' It is very plain to me, that if the body impelled by the stream of air accelerates its velocity, the original motive power would become null, because the air would not follow it up faster than the uniform pressure of the atmosphere forces it into the tube. Insert a pipe into the bottom of a reservoir of water, and the stream which commences to flow through it will not increase in velocity with the increase of distance though the horizontal pipe were a thousand miles long."

This is pointed and clear. The maximum velocity of the water is to be found at the bottom of the cistern, and the maximum velocity of the air at the entrance of the vacuum tube; it cannot be otherwise, according to the law of gravitation. The velocity of air rushing into a perfect vacuum on the surface of the earth, is very great, but it is not uniformly accelerated in the tube. If such a law prevailed, it would be the easiest thing in the world to increase the power of water for a wheel, independent of the hight of the fall, by simply increasing the length of the water flume.

Prizes.

We wish it to be distinctly remembered, that although the new volume of our paper begins to-day, the opportunity of competing for the cash prizes which we offer, continues until the first of January nezt. This will afford all those of our friends who desire to immortalize themselves,—and, at the same time time, get well paid for the labor—ample time to extend the field of their canvassing, and thus to swell their lists of subscribers.

Names should be sent in, with the funds, as fast as received, in order to make sure of commencing with the volume. We will keep correct accounts with each competitor, of all names forwarded. It matters not whether they come to us singly or by dozens. They will be credited as fast as received, and the gross amount footed up on the appointed day.

SPLENDID CASH PRIZES!

The proprietors of the SCIENTIFIC AMERICAN will pay in cash the following splendid prizes for the fourteen largest list of subscribers sent in between the present time and the 1st of January, 1856; to wit:

For the largest List	$100
For the 2d largest List	75
For the 3d largest List	65
For the 4th largest List	55
For the 5th largest List	50
For the 6th largest List	45
For the 7th largest List	40
For the 8th largest List	35
For the 9th largest List	30
For the 10th largest List	25
For the 11th largest List	20
For the 12th largest List	15
For the 13th largest List	10
For the 14th largest List	5

Names can be sent in at different times, and from different Post Offices. The cash will be paid to the order of the successful competitor immediately after the 1st of January, 1856.—

MUNN & CO., 128 Fulton st., New York.

☞See prospectus on the last page.