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NEW YORK, SATURDAY, OCTOBER 22, 1859.

HYDRAULIC SCIENCE.

HYDRAULICS, although one of the oldest, is still one of the most imperfect of the sciences. This opinion refers only to its practical application for purposes of utility, not to the principles upon which it is founded, as these are well known and established beyond dispute. The principal hydraulic machines employed in the useful arts may be divided into three classes, namely, the motors by which the force of falling water is applied as a power to drive machinery; pumps for lifting and forcing water; and pumps for operating through hydrostatic pressure. Among the practical men engaged in constructing and applying hydraulic machines there exists a wide difference of opinion on many subjects connected with their pursuits.

Pumps are about the oldest hydraulic machines in existence, and their number and modifications are endless; yet who can tell which is the best among all the improvements of the present inventive age? As there is but one right way in everything, there must be but one right pump. This idea naturally suggests the question, has a perfect pump, so far as science is concerned, yet been invented? Another question also arises in this connection, namely, the circumstances of application, as a pump which operates perfectly in one situation will not do so in another of a different character. It is well known to our readers that many different opinions have been expressed through our columns, regarding the practibility of drawing water through a pipe half a mile long and then raising it 30 feet high; see page 85 of the present volume of the SCIENTIFIC AMERICAN. As the pressure of the atmosphere can sustain a column of water over 30 feet high and as water will flow into a vacuum of this altitude, if practice is equal to the theory of hydraulic science, water can be drawn such a distance and elevated to such a height. Some of our correspondents—good engineers—assert that this is impracticabl·, while others as positively express contrary opinions. So far as the practicability of accomplishing the result is concerned, the question should be, what is the best method of conveying water long distances by pumping? The custom among engineers who employ large motors for suppling cities with water, is to place the engine near the level of the water source on a short suction, and force the water the longest distance. This is a better method than drawing the water the longest distance; but for some situations the inferior mode, as a measure of necessity, may be carried out successfully. In all such cases the circumstances must determine the best measures to be employed.

There is little or no difference of opinion as to the application of the hydrostatic press, and nothing requires to be said on the subject. It is very different, however, with that ancient class of hydraulic machines—water-wheels, more especially, the modern species of turbines in which the water acts by pressure in passing through the buckets. Scores of such wheels, modified in different ways, have been brought before the public, and yet who can tell which is the best, or what is the principle which renders one superior to another. The oldest kinds of such wheels gave out only about 45 and 50 per cent of the water-power; now it is asserted that most of those constructed according to modern improvements give out over 75 per cent, and Mr. Boyden's (of Boston) over 90 per cent of the water-power. A proper method of testing the power of wheels, has been a desideratum. The friction brake applied to the shaft of the wheel is one way, and the lifting of weights by the wheel another. A series of interesting experiments are now going on at the Fairmount Water-works, Philadelphia, under charge of Chief-engineer Birkenbine, for testing the qualities of turbine wheels. The method pursued is to measure the quantity of water which passes through the wheel during the period of time it is raising a certain load. The water is measured by a box of known capacity in cubic feet, and gaged accurately, and all the apparatus is arranged to obtain fair and correct results. Two model wheels have already been tested; one—a center-vent—gave out only 52.10 per cent. Tests are also being made in relation to the capacity of the wheels at different velocities, and the quantity of water which passes through them when standing still, and when in motion, Several days are devoted to each, and quite a number have yet to undergo the testing operation. As some new wheels are required for the Philadelphia Water-works, these experiments were undertaken to determine whether turbines are superior to the breast wheels which are now used, in order to adopt them, if the tests proved favorable. There is one large turbine now in operation at these works, but it is held to be somewhat less efficient (so we have been informed) than the old breast wheels; and all the experiments thus far do not promise much for the new class of wheels. We know manufacturers who have substituted turbines for overshots, and have failed to get as much work from them as from the old motors; on the other hand, turbines have superseded breast wheels at Lowell, Mass., and with the most favorable results. How can we account for these things? Practical science, is simply the best method of securing the best results; and by this rule, hydraulic science is certainly not very generally understood, or why such different results, by different parties? We hope to be able to present the details of the experiments at Philadelphia to our readers, when they are completed. We commend the method pursued by Mr. Birkenbine for conducting them, as we have little confidence in the accuracy of the friction brake by which other parties have tested their wheels. This is a subject of vast importance to thousands in the community, and it deserves wide-spread attention.

STEAM-ENGINE REGULATORS—GOVERNOR CUT-OFFS.

When a steam-engine is employed to drive various machines, such as spinning-jennies in a rope factory, looms in a cotton-mill, burrs in a grist-mill, or lathes in a machine shop, it should be provided with a device for regulating the supply of steam to the cylinder, so as to adapt its power to variations in the machines driven. Thus, in a rope manufactory, if one or more frames are thrown out of operation to mend a broken sliver, or for any other purpose, unless the steam is cut off to the extent of power required to drive these machines, the rest of the machinery will be driven at an undue velocity, much steam wasted, and fuel consumed only to do evil. The old "throttle valve," and the common positive cut-off, are not perfect regulators of the steam power. The "Crumbie & Briggs Cut-off," manufactured by Duryee & Co., No. 177 Lewis-street, this city (which was illustrated in the first number of this volume of the SCIENTIFIC AMERICAN), is an invention designed to admit the exact amount of steam behind the piston during each stroke, to do the duty necessary—no more and no less. It is a self-acting, variable cut-off, by which the puppet-valve in the steam-box is operated by the governor, and it is applicable to all engines in common use. Last week we took the trouble to examine two engines, in separate rope manufactories in Williamsburgh, N. Y., to which this cut-off has been applied, and we received information as to its practical efficiency from the engineers in charge. The first examined was that of Messrs. Wall & Sons, Bushwick-avenue, on which it has been working for several months. This engine is 125 horse power; its cylinder being 24 inches by 5 feet in dimensions, and transmitting the power 1,100 feet before it is applied to drive the machinery in the factory. Even at this distance, the cut-off acted with great regularity, and the engineer said it was saving at the rate of about 500 tuns of coal per annum, and, at the same time, it enabled the engine to do more work.

The other cut-off which we examined was in the adjacent factory of Mr. Lawrence; it was quite new, having been in operation but four days, on a cylinder of 20 inches in diameter and 3½ feet stroke. With this very short trial of its qualities, the saving in fuel effected was about one and a half tuns of coal per day. Besides this great saving in fuel, we were more particularly gratified with the perfect regulation of the steam power for the work to be done, as we are well aware that much breakage and injury of machines in factories are caused by the want of a good regulator.

ONE HUNDRED THOUSAND SUBSCRIBERS!

We believe there is not one reader of the SCIENTIFIC AMERICAN who will not say that it justly deserves a circulation of at least *one hundred thousand copies a week*. We believe there is not a single family in the United States that would not directly receive benefit from the perusal of its pages for one year; as the household recipes in every volume are worth, in cash value, at least ten times the subscription price. We believe there is not one mechanic in the whole country who would not find its visits, during twelve months, equivalent to the gift of twenty years' subscription in gold. We believe there is not any man whatever, who—while professing to read the newspapers and to desire to keep up a proper knowledge and familiarity with the actual progress of the best interests of the nation—thinks it possible to obtain, from any other source, more solid and valuable information than that derivable from the careful reading of one volume of the SCIENTIFIC AMERICAN. A single yearly subscription to this journal is only $2. For six months the paper can be had for $1. Now, we ask, without disparaging any other journal in existence, where can the same amount of useful information be obtained elsewhere for the same small investment? We also say, and we feel justified in asserting it, that the same general information cannot be obtained in any other periodical now published, at any price.

At least twenty journals, each professing to occupy the same field, have come and gone during the fifteen years in which *this* journal has had existence; all of them had no other than a puerile and feeble being, and not one of them possessed the elements essential to success or permanency. The SCIENTIFIC AMERICAN has gone on steadily progressing, and has now a larger subscription list than at any other former period, by several thousands. It will still go on; and as it progresses, it will gather strength and material by which its utility will be more and more apparent.

We ask the friends of the SCIENTIFIC AMERICAN to consider that, for $2, this journal furnishes a yearly volume of between 800 and 900 pages, and from 500 to 600 engravings *never before published*. When ten persons join in a club, the paper can be had for $1.50 a year, or less than three cents a week. This barely pays the cost of publication—a fact which, we apprehend, few of our readers appreciate; and but for our large professional business conjoined in one establishment, we could not publish this journal in any way equal to its present substance and style, and at the present low price.

Reader, we ask your earnest consideration of this article; and when you have finished its reading, do us the favor to take up your hat and a subscription-paper, and see if you cannot form a club of five or ten names at the rates published on another page. If you cannot do this, get a single yearly or half-yearly subscriber; and you will do us a favor which we can and will appreciate.

Our subscription list should be at least *fifty thousand before the first of January next*; and it can be increased to that, and even to *a hundred thousand*, if our friends will aid us. Who will send the first club of ten subscribers?

ANNOUNCEMENT.—We shall commence the publication, in our next issue, of a brief series of articles upon the rise, progress, and present condition of the manufacturing industry of Paterson, N. J., carefully prepared for the SCIENTIFIC AMERICAN by an experienced and competent writer. We believe there is not one of our own readers who will not follow these articles as they are contributed, for three or four weeks, with much interest and profit.

A tooth of some extinct monster was found near Lafayette, Ind., a few days since; it weighed over two pounds. A similar discovery was made in Fountain county about the same time. A portion of the jaw-bone of a mastodon was found, which measured three feet long and one foot wide at the widest part.