Science and Art.

The Power of Falling Water.

We often recieve communications requesting information relative to the power of water falls, and sometimes the propositions are so carelessly stated that it is very difficult to understand the exact answers desired. Most of such questions involve considerable calculation and time to work them out, although simple enough in themselves, when understood. The mistake of a figure also, such as a 3 for a 5, in a correspondent's letter, or on our part, makes a very great difference in the answer given. We often refer correspondents to the rules given for estimating water power in the articles on "Hydraulics," pages 296, 304, and 392, Vol. 6, Scientific American, but as a great number of our present subscribers do not possess that volume, such reference is inapplicable to their case. We purpose, therefore, to present some useful general information on the subject, in two or three short articles, to which reference can be had in the future.

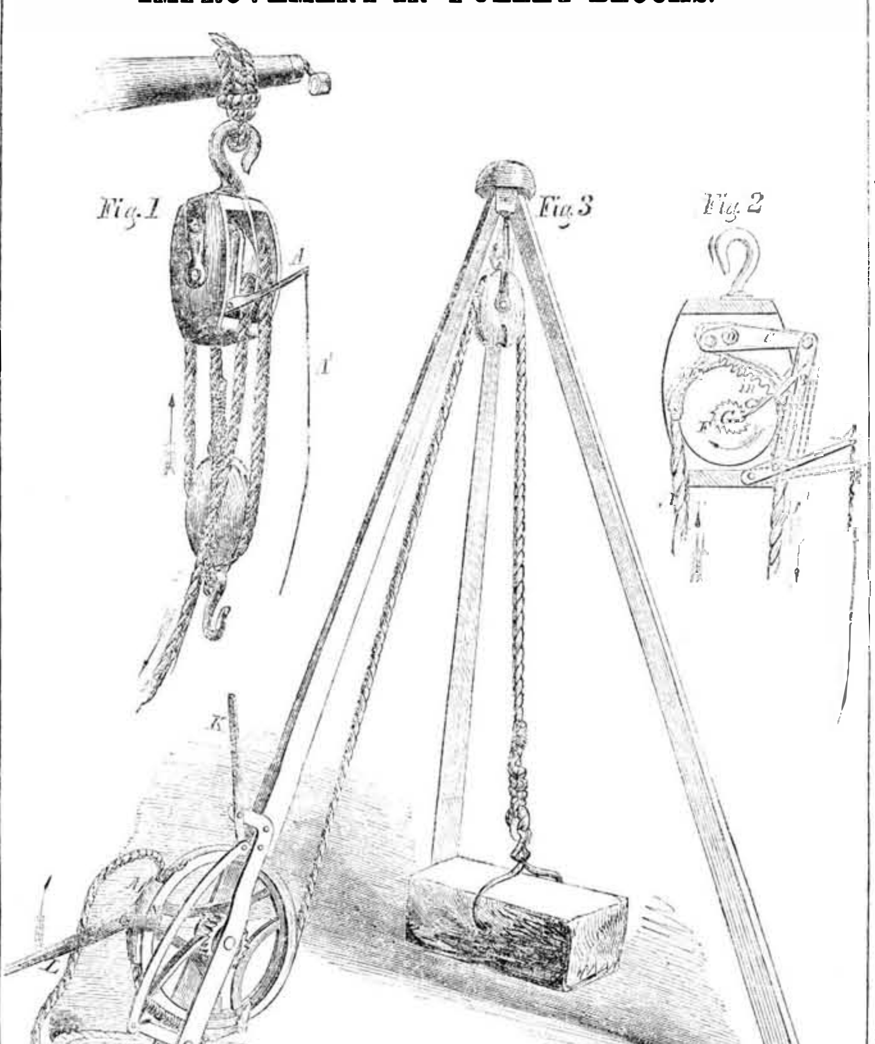
Horse Power—The general dynamical unit of motive power amounts to 33,000 lbs. lifted one foot high in a minute, and is called "a horse power," and was first applied by James Watt to his steam engine. It is estimated by the pressure of the steam in pounds exerted on each square inch of piston, multiplied into its velocity. Nothing can be more dissimilar than the action of steam and water; also the action of a steam engine and that of a water wheel; and such a unit applied to hydraulics, at first sight, appears inapplicable. It is, however, a very useful measure applied to estimate the power of all kinds of machines, and we cannot dispense with it until we get a better one.

A steam engine having a piston possessing an area of 20 square inches, steam of 20 lbs. pressing on each inch, and moving with a speed of 82·5 feet per minute is a "one-horse power," $82{\cdot}5\times20\times20=33{,}000$. To find out the horse-power of a water fall, the quantity of water in pounds which falls in a minute, is simply multiplied into the hight of the fall, and the resultant divided by 33,000—the quotient is the answer, giving the amount of horse-power. "Thus 550 gallons of water falling 6 feet in one minute, is equal to a horse-power, (550×10 lbs. in a gallon$\times6$ feet of fall$\div33{,}000=1$.) In this way of estimating the power of water, it is considered that the quantity which falls from a certain hight in a given time, is equal to elevating a like quantity of water to the same point, in the same time, according to the laws of mechanics. No motor like a water wheel gives out the same amount of power as that applied to it by the water; there is loss from friction, resistance of surface in the flume, and leakage. The more perfect a wheel is, however, the nearer does it come up to returning the whole power of the water. It used to be a rule to deduct one-third of the theoretic power of the water from the actual power of the best wheels, and the best overshot wheels were allowed to exercise only 67 per cent. of the power of the water. Great improvements have been made in constructing water wheels and applying the water properly, within the past few years, and it is now a common practice with some to allow only 25 per cent. for loss, instead of 33 1-3, and this on turbines, while the Lowell wheels of Seth Boyden have been calculated to give out 82 per cent. of the water power.

It is a very easy matter to calculate the horse power of a falling column of water, when we know the quantity which falls in a given time, and the hight of the fall. What is the horse power of 40 cubic feet of water falling per second, over a fall six fet high, $40\times62{\cdot}5$ (weight of a cubic foot of water) $\times6$ (hight of fall) $\times60$ (seconds in a minute) $\div33{,}000=14{\cdot}181$ H. P. If we deduct 25 per cent. for loss when applied to a good wheel, the actual horse power given out by it under such a fall will be 10,636—a little over 10 1-2 horse power. This shows us that where water is abundant, a very small fall gives out a great deal of power.

The most difficult and troublesome questions connected with hydraulics, relate to ascertaining the exact quantity of water which falls through orifices of given areas, or over wiers, in a given time. How can the quantity of water which falls in a second over a certain fall be ascertained?—and ascertained it must be, or we cannot calculate its power. Measure it, some one answers. This, no doubt, is the only sure and positive method, and could easily be done on very small streams, but not with a gallon measure on large streams, nor by any plan without incurring more expense than nine-tenths of those who run water wheels can well afford to expend. The measurement of effluent water will therefore form the subject of another article.

IMPROVEMENT IN PULLEY BLOCKS.



Whipple's Patent Nipper Blocks.

This invention consists in the attachment of a brake apparatus to the common pulley block, in such a manner that the sheaves can only revolve in one direction, unless freed by the pull of a lever. The weight is thus always prevented from slipping back, and may be held suspended for an indefinite time at any desired point.

In the lifting of heavy weights by means of the common blocks, there is always more or less danger of the slipping of the ropes and the running back of the burden. For example, on ship board, in discharging cargo, the horses employed to work the ropes sometimes become exhausted when the burden is only partially drawn up. For want of some safety checking apparatus like the present, the weight is perhaps dashed down again into the hold, endangering both life and property. The common blocks are also objectionable for want of some means of holding the weight in suspension, at any particular point or moment. All of these difficulties are remedied by the improvements herewith illustrated in figs. 1 and 2, while many other advantages, which we have not space to mention, are obtained.

Fig. 1 is a perspective view of a tackle furnished with the improvement, a section of the same being shown at fig. 2.

The lever, A, it will be observed, is pivoted to the shell of the block, and also connected by means of a rod, B, to the upper brake lever, C. The latter is pivoted at D to the shell of the block, and to its extreme end the clamp piece, E, is attached. The clamp piece, E, is made with a curved, concave surface, and rests upon the rope, I, which passes over the sheave.

The sheave, F, is provided with a ratchet wheel, G, the teeth of which receive the pall, G'. This pall is attached to lever, C, and is held in contact with ratchet wheel, G, by the spiral spring, H. When the parts are in the position shown in fig. 2, the sheave, F, can only move in one direction, indicated by the arrow

If the weight is attached at I, and power applied at I', the weight will rise, but it cannot go back. The pall, G', being attached to lever, C, tends, when there is a weight on the rope, I, to lift the lever, C, and so press the clamp piece, E, down upon the rope with a force that is equivalent to that of the weight, which is being lifted. Under all common circumstances, therefore, this is a safety block, the bight of the rope being always held secure by a self-acting contrivance; and the greater the weight lifted, the greater will be the pressure applied to hold the rope; therefore it can never slip.

When it is desired to allow the weight and ropes to run back, the lever, A, is pulled down by means of its cord, A't his throws pall, G', out of contact with its ratchet, G, rendering the block operative like the common kind.—If the lever is released the parts resume their previous safety position.

Fig. 3 is a modification of the apparatus just described, showing its application to one of the legs of a tripod, used by stone cutters. When thus arranged the advantages of a double geared winch are obtained, besides other important conveniences. The sheave, J, is provided with a ratchet wheel, pall, and rope clamp, similar to those described in fig. 2; the sheave, J, can therefore only turn in one direction, unless relieved from the ratchet by the lever, K. The lever, L, is used for turning the sheave, and, consequently, to lift the stone.—Lever L is attached to a rope clamp, M, and this latter is combined with the sheave by means of the sliding claws, N, which bend around the inner edge of the sheave, J. When the lever, L, is pulled up, in direction of the arrow, the clamp, M, binds on the rope, which, with the sheave, J, is carried partially around, and the stone is correspondently lifted, the bight of the rope being held by the ratchet and clamp, in the manner shown in fig. 2.—When lever L is pressed downwards, the clamp, M, is released, and slides back into position for a new lift. The only difference between the contrivances shown in fig. 3, and fig. 2 is in the attachment to the former of the extra lifting lever, L, clamp, M, and claws, N.

We are informed that the expense of these Patent Nipper Blocks does not much exceed the cost of the ordinary kind. The parts are quite simple and cannot very well get out of order. Stone cutters, quarrymen, and others, will understand and appreciate the advantages presented by the improved tripod.

The above improvements are the invention of Jonathan Whipple, Jr., and form the subject of two patents, the last of which bears date May 22, 1855. For further information address Whipple & Co., Hopedale P. O., Milford, Mass. [See advertisement in another column.]

Literary Notices.

Familiar Science—Or the scientific explanation of the principles of natural and physical science, and their practical and familiar applications to the employments and necessities of common life, illustrated with upwards of one hundred and sixty engravings, by David A. Wells, A. M., Editor of "Annual of Scientific Discovery," "Year Book of Agriculture," etc., Childs & Peterson, Publishers, Philadelphia. The contents of this work is divided under sixteen distinct classifications, viz:—Laws and Properties of Matter, Mechanics, The Phenomena of Fluids, Acoustics, Heat, Meterology, Light and Actinism, Electricity, Galvanism, Magnetism, Inorganic Chemistry, Philosophy of Manufactures, Agricultural and Rural Economy, Geology, and Mineralogy. Each of these subjects is explained in the most familiar manner, by a series of questions and answers, easy to be understood by every class of mind. There is no ambiguity in the use of terms, and all the subjects are invested with an interest which captivates the reader at once, and impresses his mind with the sublime yet beautiful theories of natural science. We have felt much pleasure in the perusal of this work, and can heartily commend it to the use of families and schools. The work is really the "Science of things familiar," and pours a flood of light upon the science of hundreds of subjects externally familiar to all, yet whose cause and effects are never inquired into by the multitude.

A word about the author of this work. Although Mr. Wells is a young man, comparatively, yet he already occupies a most enviable position as a scientific man. His ability and zealous industry in the practical sciences, as evinced in the various works edited by him, have brought his name prominently forward as a successful and truly reliable author and guide. The Annual of Scientific Discovery, commenced in 1851, is, we believe, the first work put to press under his authorship. It has since appeared annually, and has met with the highest commendation from the newspaper press of this country and Europe.

On the first day of February Mr. Wells became a partner in the well-known publishing house of Putnam & Co. No. 321 Broadway, and will now devote his energies to the book business generally. He will give special attention to the purchase of scientific books, and from his known familiarity with such pursuits and subjects, we are satisfied that those of our readers who desire to purchase large or small quantities of books upon sciences, will find the house of Messrs. Putnam & Co. to possess superior facilities for this branch of the trade. We give unusual prominence to this feature of their business, for the reason that our readers are often troubled to know where they can best procure such publications.