IMPROVED WATER WHEEL.

In regard to the wheel here illustrated the inventor says:—

My improved water wheel is designed, and, from practical experience, does use water very economically under varying heads with a given amount of work, and also as well under a constant head and a varying amount of work.

For example, I have a mill with four run of stones, driven with one wheel, all of which can be run during one-half of the year; but for a large portion of the other half, there is no more water than would do a fair business with one run of stones, with a wheel just adapted to the single run and the water. Now, this water that will do a fair business in this way, if applied to the larger wheel—of ordinary construction—would not move the stone, the runner being raised clear of the bedstone. Now, what I want understood is, if one of my wheels were used capable of driving the four runs of stones, one run of stones can be driven by the same wheel with a trifle over one-fourth of the water used to drive the four runs.

In support of the above, I give some data of their practical working. My first wheel took the place of a 4½-feet whirlpool wheel (so called), drawing 228 square inches of water. This wheel would fairly drive a large heavy grindstone, 5-feet diameter, for grinding files; and could be stopped with heavy 1½-inch wide files.

My wheel, which took the place of the old one, is 30 inches diameter, and is limited to 216 square inches of opening. With 40 square inches of water it run the stone, doing a good business, and could not be stopped; the more it is slacked the harder it pulls.

This wheel also ground 10 bushels of meal in an hour, when there was so much backwater as to reduce the head to 3 feet 5 inches; the wheel being over six feet under water.

The second one is used to drive a batting mill, containing the necessary machinery, consisting of two of Calvert's willows, two five-cylinder dusters, a lapper, and 12 old-fashioned woolen cards, with workers and strippers; working off 20 bales of batts perday. There is about one hundred feet of shafting, besides counters and wheel shaft. The head is 8 feet 8 inches. The wheel is 30 inches in diameter, and has 216 square inches of gate opening, which will vent about 160 inches of water. Twenty-four square inches of water will run the shafting and loose pullies up to usual working speed. Twelve square inches will start the same, and seven inches will just barely turn it. One hundred and thirty square inches of water drives all the work up to speed, and is the most I have seen used of late. 21.13 cubic feet of water per second is the solid amount of water used by measurement.

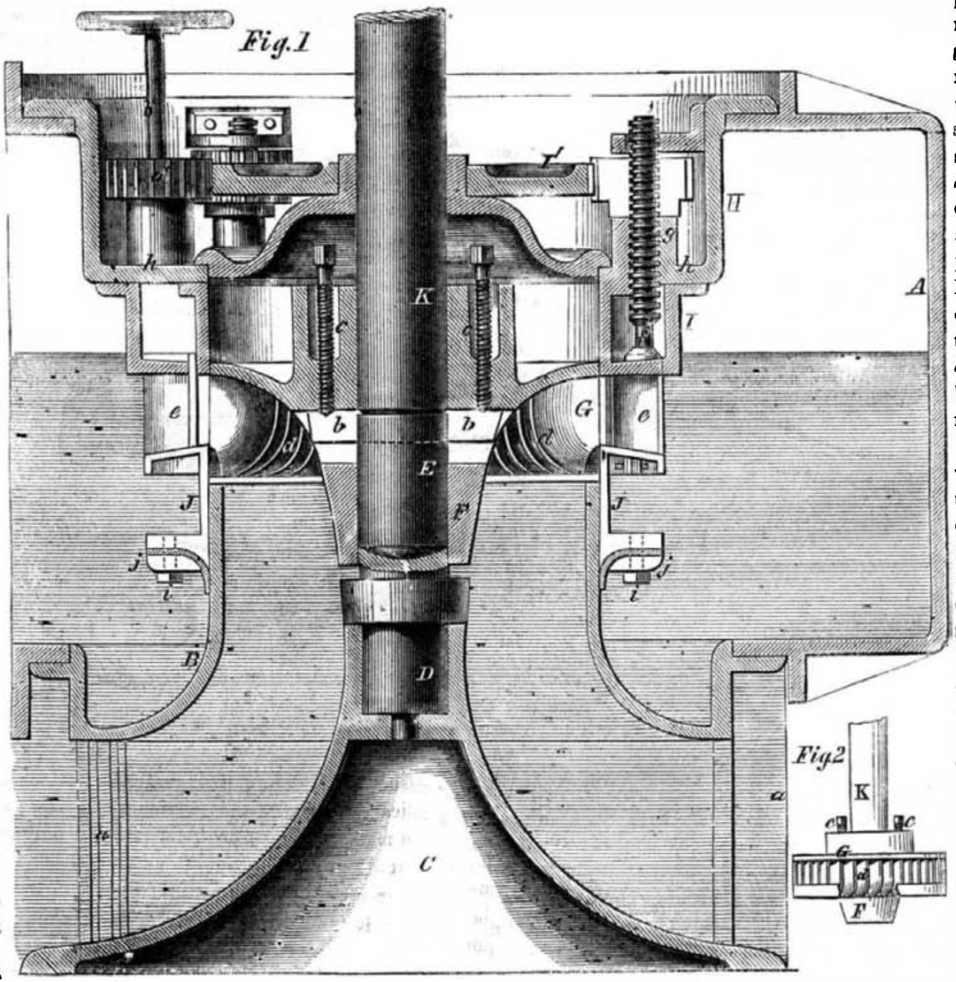
The third wheel drives Messrs. Calvert & Sargent's mill at Graniteville, Mass. Length of mill, 180 feet; width of mill, 50 feet; hight of mill, 2 stories. One end—80 feet in length—is occupied by the owners as a machine shop, in which are planers, engine and hand lathes, and circular saws, giving employment to from 35 to 40 hands.

The other 100 feet is occupied by the Abbott Worsted Works, with 1,310 spindles, 5 cards, with the necessary combing and picking apparatus, employing 35 hands and using 1,000 lbs. of stock per day.

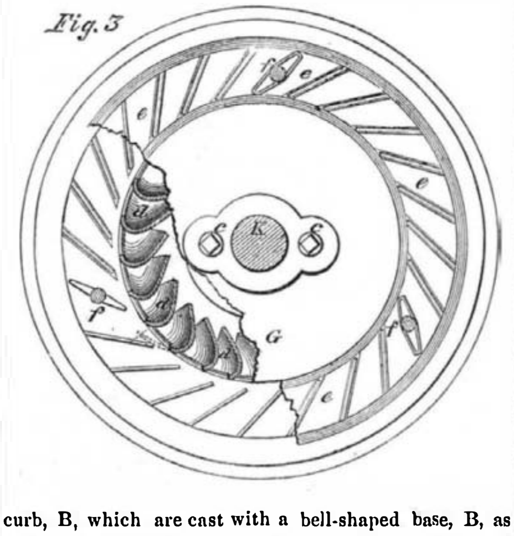
The head is 18.82 feet. Wheel, 30 inches diameter, with a capacity of discharge of 160 square inches. Square inches used, 82. Cubic feet discharged per second, 19.7; being equal to 42.13 H.P. of water used, and a trifle over half the full capacity of the wheel. If anybody can beat this, I should like to see the apparatus.

This wheel was patented May 15, 1860, and was put through by the Scientific American Patent Agency in the short space of six weeks, from the day the specification was signed until the Letters Patent were in my hands. It seems to me that that is about as satisfactory as one could wish for.

This wheel is one of the modifications of the turbine which are coming in such numbers from the busy brains of our inventors. It is represented in the annexed cuts, of which Fig. 1 is a vertical and Fig. 2 a horizontal section. A represents a cast iron case, which encloses the wheel and the parts pertaining thereto. This case is of scroll form, and is supported by standards, *a*, and a curb, B, which are cast with a bell-shaped base, B, as shown clearly in Fig. 1. In the top of the bell-shaped base, C, there is placed an iron block, D, which forms a step to receive a wooden block, E, that is fitted to the lower end of the hub, F, of the wheel, G. Transversely through the hub, F, and block, E, a bar, *b*, passes, said bar having screws, *c*, bearing on it, one near each end. These screws, *c*, pass up through the center or hub of the wheel, and by adjusting them the wheel may be raised or lowered, as desired.



SWAIN'S IMPROVED WATER WHEEL.



The wheel, G, has its floats, *d*, cast of a single piece of metal. The face sides of the floats, *d*, where the water impinges are of paraboloidal form, whose axes are tangents to a circle to which the guides, *e*, are also tangents, as well as to the curve at or near the outer circumference of the wheel. The bottoms of the floats are formed by revolving the curves on their axes. Into the top of the case, A, a curb, H, is fitted. To the bottom of this curb there is attached an annular chamber, I, which may be termed a hydrostatic chamber. The bottom of this chamber is slotted to receive the guides, *e*. These guides are plates attached to or cast with a ring or cylinder, J. Three of the guides, *e*, are enlarged to allow rods, *f*, to pass through, and the upper parts of said rods have screws, *g*, formed on them, said screws passing through a flanch, *h*, at the inner side and bottom of curb, H. Each screw, *g*, has a nut, *h′*, on it, said nuts being pinions, into which a spur-wheel, I′, gears; the wheel, I′, being concentric with the shaft, K, of the wheel, and having a pinion, *a**, gearing into it, the pinion being a shaft, *b**, which is surmounted by a hand wheel.

The chamber, I, is made tight, with the exception of the slots, to receive the guides, *e*, the water entering and forming a complete stuffing box, by means of which adjustable tapering shutes are obtained, these shutes being formed by the bottom of chamber, I, guides, *e*, and top of cylinder, J. The ring or cylinder, J, encompasses the top of the lower curb, B, the lower part of the cylinder being provided with packing, *i*, which is secured to the bottom of the cylinder by a ring, *j*.

From the above description it will be seen that, by turning the shaft, *b**, the wheel, G, and pinions, H, will be turned simultaneously, and the guides, *e*, raised or lowered, as desired. These guides, in connection with the lower and upper surfaces of J J, form shutes which direct the water properly to the buckets, and by raising and lowering them, the volume of water admitted to the wheel may be increased or diminished at will, and the capacity of the wheel regulated as occasion may require. These adjustable shutes also form a gate by which the water may be entirely cut off from the wheel.

The floats, *d*, may occupy one-third the radius of the wheel, and have a depth of three-sixths of the same. The width of space occupied by the guides, *e*, may be the same as the floats. The sum of the shortest distance between the guides may be nine-fifths the diameter of the wheel. This, together with the number of the guides, determines the narrowest section of each guide, and also the angle at which the water strikes the float, and also determines, in a measure, the paraboloidal curves of the floats.

The inner and lower edge of the chamber, I, and upper edge of the ring or cylinder, J, are turned true, so that, when J is drawn up, it will make a complete water-tight joint, and keep all water from the wheel. When J is lowered the water strikes the floats with all the velocity and force due to its head directly under the rim of the wheel, which is so curved as to force the water down rapidly on the lower curved parts or bottoms of the floats, the water not leaving the wheel until its force has been properly expended on it. The water is discharged down between the curb and wheels and lower curb, H, and is turned outward by the base, C.

The particular angle which the guides, *e*, have in relation to each other is the same as that which the bottom of the chamber, I, and the top of the cylinder, J, bear to each other; to wit, about 13½° and not more than 15°. Whatever the size of the wheel may be, no less than 24 guides and not more than 27 are used. The number of floats used will depend on the size of the wheel, but never less than 23 and not more than 4 inches apart for a wheel of any diameter.

The advantages claimed for this wheel are, 1st, The wheel has not a great weight of water bearing on it to wear the step away; 2d, The wheel may be readily raised without removing it from its proper working position; 3d, All parts are very accessible for repairs and removable at pleasure; 4th, It is very light, and may be started with little water.

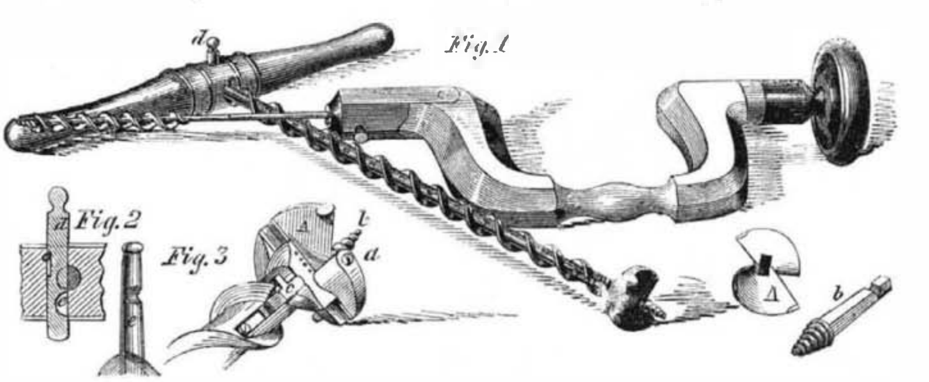
Further information in relation to this invention may be obtained by addressing the inventor, A. M. Swain, at Lowell, Mass.

IMPROVED COMBINATION AUGER.

Augers with adjustable cutters, by which holes of different sizes can be bored with a single tool, are no new invention, and the one here illustrated claims to be only an improvement on those heretofore in use.

The shaft is constructed of a solid cylinder, cast of malleable iron, and the flange that surrounds it is made sharp on its edge, as seen in Fig. 1, in order that it may cut in pieces any chips that, if left whole, might choke either the entrance of the auger or the escape of the chips. Said flange, as will be seen, runs the whole length of the shaft, so that it can be bored in the whole length if desired, without taking it out to clear it. The number or measure in inches is put upon the center column of the shaft, so that the user may know the exact depth of the hole without otherwise measuring it. The cutter, as represented in Fig. 3, is made round and flat, with two cutting edges which project below the body of the cutter, similar to the iron or cutting part of a plane, and having projecting spurs or lips similar to other augers. By this shape of cutter, all the chips are drawn out when the auger is withdrawn, so that, if it is necessary to bore deeper, there are no chips left at the bottom of the hole to hinder the feed screw and cutter taking hold readily. The cutter is held to the shaft, as seen in Fig. 3, by a dovetail tenon made upon the shaft, and a dovetail groove made into the cutter. It is made to extend or not. When not made to extend, the cutters are made with simply a square hole in the center for the end of the feed screw, *b*, to pass through; in which case a different sized cutter must be put on for each sized hole required. But when the cutter is made to extend, there is a set screw, *a*, that runs through one shoulder of the cutter, which screws against a shoulder made upon the shaft adjoining the dovetail tenon, and points are made into the shoulder for the point of the set screw to enter (see Fig. 3), so that it is held firmly wherever placed. Upon the opposite shoulder of the shaft (as will be seen in Fig. 1) is marked a guide or measure, and the other shoulder of the cutter runs against this shoulder as it is slid upon the dovetail, so that the cutter is readily set to cut any sized hole required. The hole in the cutter for the feed screw is elongated to allow the cutter to slide when the feed screw is in. When the cutter is in a central position with the auger, the tool bores the smallest hole within the limits of its capacity, and when moved the distance of one mark, it will cut—supposing the marks divided into 1-64 of an inch—a 1-32 of an inch larger hole, and so on to any desired size. Different sized cutters are put on, so that it is only necessary to have two augers or shafts and five cutters to bore from half an inch to a two-inch hole; and if each hole is 1-32 of an inch larger than the other, they will bore no less than 49 different sized holes. But if not made to extend, the same number of augers or shafts, with seven cutters, will be required, allowing the difference in the holes to be ¼ of an inch, the same as is usual with a set of common augers; making this a very cheap and convenient set of boring tools. The feed screw is made movable, not only to allow the taking off and putting on of the cutter; but different threaded screws can be put in to bore, if in very hard wood, very slow—if in soft wood, very fast. In common augers, if one cutting side or the feed screw breaks it is good for nothing, and must be replaced at the expense of a whole augur; but if such an accident should happen to this auger, a few pennies will purchase a new cutter or feed screw, and then it is as good as when new. The augers and cutters can be made to cut any size from ¼ of an inch to 12 inches, or if necessary, a six-feet hole; in fact, no round hole need hereafter be cut out with a chisel. A shipbuilder can bore for his anchor chains, his port or cannon holes, through the side of a vessel, or bore through the decks for the smoke pipe.

Fig. 2 represents an improved mode of fastening handles to augers, secured by a separate patent to the same inventor. The portion, *e*, of the shank which enters the handle is made round, and being turned, is of course in exact line with the rest of the auger. A semi-circular notch is cut in the side of this part of the shank to receive the pin, *d*, Figs. 1 and 2, and when the shank is passed into its place in the handle, this pin is pushed down so as to enter this notch and hold the shank from either turning or drawing out of the handle. In order to admit the shank without removing the pin entirely from its hole in the handle, a semi-circular notch is made in the side of the pin similar to the one



HATHAWAY'S COMBINATION AUGER.

in the shank of the auger, so that, when this pin is drawn back sufficiently to bring this notch opposite the hole in the handle, the way is clear for the admission or withdrawal of the auger shank. The pin is kept in place by making a short flat place on the side of it, as seen in Fig. 2, and a screw runs through the handle against this flat place in the pin, which prevents it from falling out, at the same time allowing the pin to be shoved in sufficiently to fasten, or if withdrawn, to release the auger.

This mode of fastening is equally applicable to the fastening of bits in braces of all kinds; also drills in chucks for lathes, and all socket tools whatever. It is as applicable to ordinary square-shanked tools, as to those which are made round. It will readily be perceived that one handle is all that is necessary for a whole set of augers. By making augers with round shanks a great saving of time and trouble to the manufacturers will be effected. Besides the manifest advantages spoken of which this auger has, we will name another which is by no means a small one, and that is its portability. A carpenter having to go a long distance from home to do a job of work, which is very often the case, and not knowing the exact boring tool he will require, instead of loading himself down with the common augers and handles so as to be certain of having the right size, he can simply take his handle and auger shafts and, wrapping them up in a piece of paper, put them under his arm or into his overcoat pocket, if he wears one, and putting his cutters into his breeches pocket, he goes prepared to bore any sized hole he can possibly require.

The patent for this combination auger was granted Sept. 4, 1860, and the patent for the mode of securing the auger to the handle and bits into braces, &c., was granted Aug. 21, 1860.

Further information in relation to them may be obtained by calling on or addressing the inventor, J. M. Hathaway, No. 169 Center-street, corner of Canal, New York, second floor, corner room.

Oiled silk is manufactured by coating it with some quick-drying boiled oil, and drying it in a warm room. Two or three successive coats are sometimes put on, each being perfectly dried in succession.

CUTTING PILES UNDER WATER—AN INGENIOUS APPARATUS.

To obviate the necessity of constructing a coffer dam in the Schuylkill, so as to build a pier for the Pennsylvania Railroad bridge, an ingenious contrivance has been put in operation to prepare the foundation of the pier. The water, at the spot where the pier is being constructed on the west side of the river, is about 17 feet deep, and after driving the piles, they have to be cut off level with the mud at the bottom. To do this, a long iron shaft is firmly secured to the uprights of the machine that drives the piles, and is driven by the steam engine ordinarily used for the pile-driver. This shaft, which is hollow, has secured to its extreme lower end a circular saw, 4 feet in diameter; the entire shaft being suspended by a rope passing over a pulley at the top of the uprights. Another rope, which passes around a drum, regulates the precise hight at which the shaft must be secured to saw the pile accurately at the length desired. The driving pulley on the shaft is made movable, so that at each change of the elevation, as required by the rise and fall of tide, its position is changed to suit the line of belting from the driving engine. The precise elevation of the shaft, and consequently the saw, is fixed for every pile by instrumental observation, taken from the shore with a spirit-level; and, with all the difficulties, it is surprising to witness the rapidity with which the work is done—some 60 piles being cut off on Saturday last. In one instance, by accident, the elevation of a pile head, after being cut, was found to be 1½ inches too high. The saw was again applied, and the 1½ inch neatly taken off in one slice, as was proved by the piece floating to the surface. Yesterday the whole number of the piles were cut off and made ready to receive the stones for the pier. The management of the scow on which the apparatus rests is under the superintendence of Mr. Vanhorn, and great care and skill are necessary to prevent accidents. By guy ropes anchored from different points of the scow—each with a man to attend to it—the position of the scow is regulated nicely, and, at the same time, works the feed for the revolving saw. This work of sawing piles is sometimes attended with great difficulty, and is only well adapted for rivers where the surface is not much disturbed, as a heavy wind, or even the passage of our river tug-boats, interferes with the operation, as the scow upon which the machine is erected should be held quietly in position during the process of sawing; otherwise, a fracture of the saw would result. Mr. Vanhorn has endeavored to counteract, to some extent, the effects of a light wind or slight undulation of the water surface, by attaching to the side of the pile-scow, two flat-boats heavily laden with stone; but still, when steamboats pass, the operation of sawing ceases. The whole work is well worth witnessing.—*Philadelphia Ledger.*

A New Discovery in Egypt.—A Paris correspondent writes that a letter received there from Mons. Aug. Mariette, the eminent Egyptian antiquarian, states that a very important discovery has been made in Egypt:—"The excavations made at Memphis have brought to light a metal founder's workshop. We have already discovered his tools, about 40 pounds of unrefined silver, gold medals, 20 silver medals never seen before, and other objects destined to the crucible."

The Polytechnic Association.—The meetings of the Polytechnic Association, during the fair of the Institute, were suspended, chiefly for the reason that the president and several of the prominent members are occupied in their duties as managers. The fair closed on the 6th inst.

Something Interesting to Come.—In our next number we shall commence the publication of Professor Faraday's six lectures, on the various forces of matter. They are exceedingly interesting and instructive, and will be fully illustrated by spirited engravings.