

THE BLACKSTONE AND ELMER WATER WHEEL.

The principal advantages claimed for the improved water wheel, represented in our illustrations, consist in the utilization of the full force of the water, the construction which prevents breakage of the wheel through the entrance of obstructions, the relation of the size of the chutes to that of the issues, so that the water leaves the wheel with the same velocity with which the latter runs, and the arrangement of the buckets to reduce friction to a minimum. Other points of merit will be noted in the course of the description.

Fig. 1 is a perspective view. Fig. 2 shows the apparatus in section, and Fig. 3 the wheel separate from its attachments.

At A are the buckets, B the chutes, and C the gates. D, Figs. 2 and 3, is a horizontal extension of the top of the wheel hub, which is calculated to receive a lifting action of the water entering below, and will largely counteract the downward pressure of the water on the buckets. The projection of the rim of the wheel prevents the water rising up over the extension so as to neutralize the lifting action. The buckets, as shown in Fig. 3, are made to terminate above at the bottom of the chutes, with the exception of narrow extensions left for their more permanent connection with the hub. By this means a clear annular chamber, E, Fig. 2, is formed in front of the chutes, into which the water flows in solid volume, and in better condition for entering the buckets than were it broken by the action of the latter revolving immediately against the chutes.

The construction of the chutes is such that they are tangent to the rim of the wheel or very nearly so; thus, it is claimed, allowing of the employment of the full force of the water instead of only a component of the same. The buckets are made with a radial termination, *a*, and have dimensions between the lines, *a b*, decreasing from the rim of the wheel to the hub, as the radii of circles from the rim to the hub decrease. The curve of the bucket, in brief, is the curve of the quickest descent for a body acted upon by gravity.

The gates, C, which close the mouths of the chutes, are hollowed out on the inner side, leaving only a bearing surface around the edge. They are provided with stems which pass through the gate operating frame, F, and have ample play on their seats. The exterior water pressure holds the gates firmly against the chutes; but should an obstacle be carried into an aperture, the gate thereon will yield, swinging partially open and will not be broken. While the gates are entirely independent of each other, all are operated to open or shut at once, unless one or more be obstructed, in which case it, or they, alone will remain open.

Fig. 2.

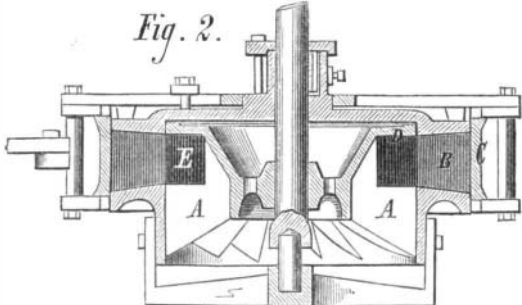
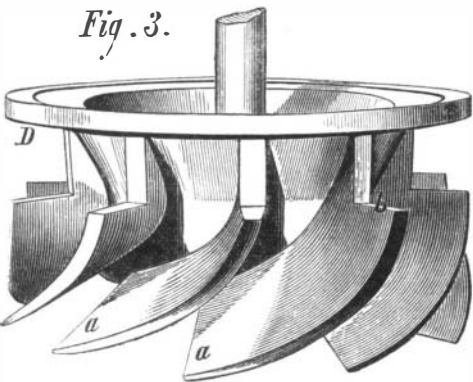


Fig. 3.



The rack and pinion, G, for governing the gates, are placed at a distance from the wheel, to avoid wearing or clogging by sand and debris, and also that the gate rod may not come in contact with any of the pulleys or gears that may be on the wheel shaft. These arrangements do not have to be removed in case a wheel is taken up. The spider is placed on the outside of the case, thus preventing the wheel from being broken in case the step should chance to wear down.

Two wheels are made for each size, No. 1, it is claimed, utilizing ninety per cent of the effect of the passing water, and No. 2, eighty-six per cent.

The patents under which the device is constructed are dated April 8, 1873, and March 24, 1874. For further particulars, address the manufacturer, Mr. C. C. Paige, Eagle Iron Works, Oshkosh, Wis.

SCIENCE is the trunk of a mighty tree, the roots of which penetrate into the unknown, and the branches flourish in the useful arts.

Rat Science vs. Alligator Strength.

"A wholesale drug store on Magazine street is the happy possessor of a young and domesticated alligator. This little crocodile has become quite the pet and plaything of the establishment; he is of an amiable disposition, fond of music and dinner, and quite submissive, shedding tears and showing repentance whenever it is found necessary to correct him. It was resolved by the clerks in the establishment—as the alligator had reached his third birthday and increased to three feet in length—to utilize him, to put him to some other employment than that of a mere pet. It was concluded to make

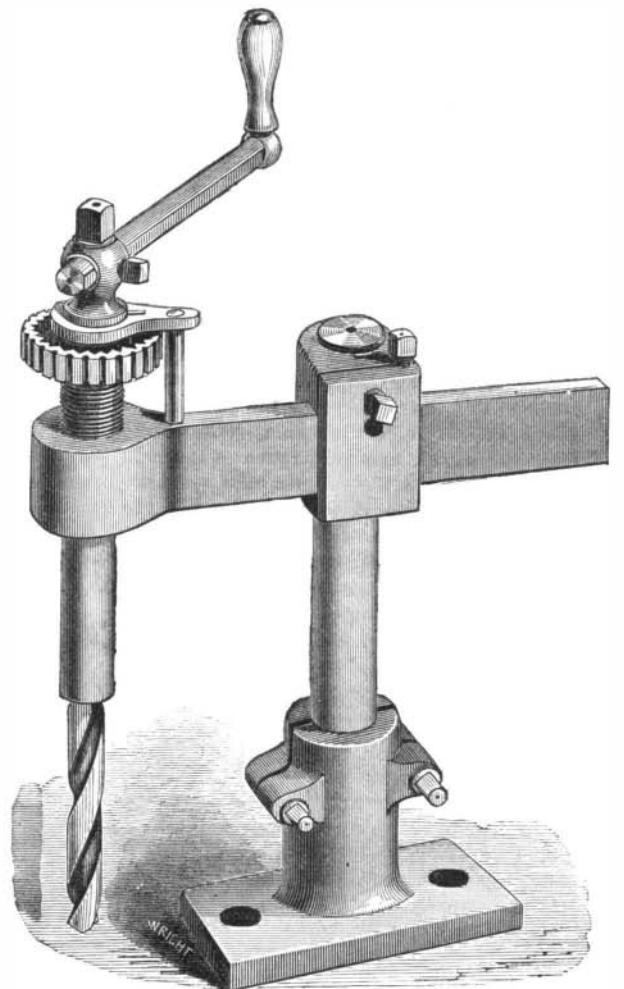
themselves from almost certain death. The branches that thus suddenly snap are as verdurous as any of the others, and there seems to be no other defence than to avoid "the elm tree's shade" as much as possible. It was from just such an accident that the Queen was saved by the promptitude of her attendant; and there have been several very narrow escapes recorded, from a similar danger.

IMPROVED HAND CRANK DRILL.

Many a superintendent or foreman of a shop has, doubtless, wondered at the extreme slowness with which his hand drills penetrate metal when operated by certain workmen. The metal does not appear unusually hard, the tool seems in excellent order, and the man even, when the boss is at the other end of the shop, turns away at the handle with exemplary rapidity, and yet the hole is an astonishingly long time in getting through. The trouble lies in the simple fact that while it is a very easy matter to keep turning a drill around and around in the same hole, it takes considerably more labor to rotate the instrument and, at the same time, force it down into the metal. This truth once through the cranium of a lazy workman, he utilizes it to his advantage, by neglecting to screw down his feed whenever the foreman's back is turned. Further explanation as to why the hole progresses slowly is unnecessary, but we may, instead, proceed to describe an invention which is excellently calculated to disgust lazy individuals who practice such systems of shirking.

The device, as represented in the annexed engraving, is a patent crank drill which is provided with an automatic feed, that is, whenever the handle is turned, feeding must take place. At the upper extremity of the feed screw is a horizontal hollow wheel, the inner periphery of which is suitably notched. On the drill spindle which passes down through the screw is an eccentric block, not shown in the engraving. This is so arranged that at each turn of the handle a projection, to which it imparts a to-and-fro motion, enters a notch in the wheel and carries the latter and, consequently, the screw around for a certain distance, thus feeding the drill downward. It is impossible to rotate the handle without causing the above described action, and hence a continuous and regular feed is kept up, independent of the workman.

The remainder of the apparatus is readily understood from the engraving. It is constructed entirely of cast steel, with the exception of the handle and the castings to receive the standard. Two of these castings are furnished, one with its foot at right angles to the drill, the other parallel.



A change of spindle can be made almost instantly to suit drills of different shanks, and if desired a hand feed can be used. The arrangement for holding the standards is such that, with any reasonable degree of care, it will not be marred.

The instrument works easily and efficiently, and is, in general construction, a thorough and substantial tool. It is manufactured by the New York Steam Engine Company, of No. 98 Chambers street, New York city.

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use of Crocky, the alligator, as a cat, and it is well known that alligators have a special and inestimable hatred toward rats. A rat to practice on was caught the other day.

Rat and alligator were put together in a box, and a numerous audience crowded around to get the front place. The two enemies soon awoke to an appreciation of the case. The rat safely and snugly ensconced himself in a corner. The alligator hesitated a second, scratched his head (metaphorically), and, having made up his mind as to the mode of attack, advanced slowly towards the rat with wide open jaws. The rat trembled; there was no escape, nothing but the wide open mouth of the alligator before him. Without hesitation, like Curtius, he jumped straight into the yawning gulf, and, getting a good hold on the lower lip of the alligator, swung himself to the ground. The 'saurian' gave a squeak and swung himself around, the rat finally letting go, victor in the first round.

The alligator, however, was not daunted, and advanced with the same tactics. The rat this time, by a most agile movement, leaped entirely over the alligator. Getting behind him, he now proceeded to chaw and gnaw away. The unwieldy animal could not get around to defend his hind legs. By a good use of his tail, the alligator again got free and advanced desperately, though with flagging courage, at the daring rodent. With equal success the rat again sprang into the air, alighting on the alligator's back. The fight was over then. The alligator could not shake his enemy off, could not dislodge him; and finally gave up the fight, laying himself down on his belly in a submissive attitude. The rat was set at liberty and given the run of all the drugs and medicines, while the poor alligator was doomed to disgrace and ridicule."

A Squirrel's Leap.

Recently, says the *Bangor (Me.) Whig*, a little red squirrel, having been pestered considerably by the lads above the saw mill of Eben Webster & Co., on Marsh Point, Orono, took refuge for life by running up the large brick chimney near the mill. By clinging to the corner, he kept foothold so well that he succeeded in reaching the very top. Here he found himself upon the iron cap, 105½ feet from the ground. As more and more of the waste stuff from the mill was added to the furnace, the chimney grew hotter and his situation became more and more disagreeable. He tried to descend upon the side of the chimney, but after getting down a few feet gave it up, turned about and went back. By this time the chimney top had become so hot that he must leave it; so after looking about carefully for a few minutes, he evidently made up his mind that he must leap to save his life, and this he did, spreading out his legs and balancing himself so that he struck the ground about fifty feet from the base, uninjured, and immediately scampered off and secreted himself under a pile of boards a little distance away.

Dangers of Elm Trees.

It is a character of some trees, of the species of elm in particular, to drop large branches during the hot months, without any external warning beyond, perhaps, a preliminary crack or two. An accident of this nature lately occurred in Kensington Gardens, London, when an immense branch, about twenty yards long, fell with a crash like thunder, and more than a score of children had a narrow escape for their lives. Three, who were sitting below the bough, alarmed by the second crack, ran away, and thus saved