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**UNSUCCESSFUL INVENTORS.**

Inventive talent may exist and yet be utterly useless to its possessor. There are persons whose keen observation detects readily the need of improvement in some crude device, or whose capacity suggests some new thing or better method, but who are unable to devise the one or to give form to the other. Lack of persistence, cowardice in the face of discouragement, want of mechanical experience, ignorance of natural laws, one or all combine to bar the road to success. If the time and talent misspent on attempts to achieve perpetual motion had been directed to some possible improvement, the advance in mechanical art would be greater than it is. There are mechanics who ridicule the idea of discovering the means of perpetual motion, who are not ashamed to employ their time and skill on an absurdity fully as ridiculous. There is a bright mechanic, somewhat of an inventor in a small way, living in an Eastern city, who has been for several months trying to produce a road vehicle that shall run by weight, or by two weights, depending on the motion of the vehicle itself to wind up the weights as they run down.

His idea is that the motion of the vehicle on the road is a gradual accumulation of power—a reservoir of force, like the flywheel of an engine—and that this force may be utilized to give out power sufficient to rewind the weights as often as they run down. His model, which is a very workmanlike toy, runs over a smooth floor with great velocity, and the momentum of its speed does suffice partially to wind up the operating weight, and thus gives it another (somewhat feeble) start from a condition of almost rest. The mechanic hopes to give greater force to the winding-up arrangement, and make his self-propelled vehicle successful over city streets and good roads.

His belief in the power of mechanical devices to develop more power than is imparted is not an uncommon one; the expectation of getting more than is given is a common hallucination—it is the universal desire. But mechanical contrivances can only divert and direct power; they cannot create it.

Some would-be inventors go ahead with their work, and make their calculations with no regard to the element of friction; but with the most favorable appliances this hinderance to motion cannot be eliminated. The writer has seen a top, which was a metallic ring with a thin web connecting the pintle and point, run, after being speeded, thirteen minutes on a plate of glass. In this case, friction was reduced to a minimum, but it was acting continuously from the time the top was started until it finally brought it to rest. The elements of weight, atmospheric resistance, rubbing of surfaces, and imperfection of workmanship combine to produce friction, an obstacle that no mechanical device can overcome.

The inventor sometimes misdirects his efforts; the means employed to compass a result may be inadequate or unfit, or the object may be valueless. There are *bona fide* inventions which are not even improvements. It is useless to waste thought, time, and money on some mechanical device to do what can better be done by hand, yet this is frequently done.

The success of the inventor is more nearly assured when he is a practical workman, able to make a drawing, to construct a model, or, at least, to make a sketch and whittle out his idea; for verbal explanations to the professional model maker are not always clear. It is true, however, that some very valuable inventions have been conceived by men who were not practical mechanics, but how much of the success was due to the intelligent skill of the model maker and the manufacturer of the invention is not stated in the letters patent.

**HARDENING CAST STEEL.**

It is no uncommon event to have a nicely finished tool or other article spoiled in the hardening. This is the more vexatious because the cause of the disaster frequently cannot be discovered. Defective steel can usually be detected by a flaw. Overheating can be guarded against, and there may be invitations to a fracture which are avoidable. Pieces are sometimes lost in hardening because they are not properly prepared for the exacting test of fire and cold water. A piece of greatly varying dimensions will sometimes fly when it touches the bath, even if the heating has been even and "suant." Especially is this the danger if there is a cornered offset between the thick and the thin portion. In such cases, it is better to leave the piece unfinished and more uniform, and afterward finish it by grinding. The writer has been quite successful in such cases by dipping the thinner portion first—when the form of the piece would admit of it—and then the thicker portion, which would half temper the thin portion by its remaining heat before the entire piece was chilled. But articles of very disproportionate dimensions may be casehardened in some instances and be equally durable.

Cast steel articles containing cavities should always be provided with vents. A die block containing a die-sunk depression, not more than five-eighths of an inch deep, was ruined by being cracked in hardening, because the workman carelessly dipped it face downward.

A workman made a hollow mill for turning fixed studs on a casting. The hole in the mill was three-quarters of an inch diameter and two and a quarter inches deep. The mill was made from a round bar, two and a quarter inches diameter, as the radial teeth on the end were to face up a bearing more than two inches diameter at the bottom of the stud as well as to turn the stud. All around the hole there was three-quarters of an inch of solid metal. The piece was heated over an open charcoal fire, and dipped perpendicularly in the bath to a depth of about three-quarters of an inch, the remaining heated portion being relied upon to draw the hardened end. But the tool cracked more than half way around. A second mill shared a similar but worse fate, for on withdrawing it from the bath a broken portion was left behind, the mill having cracked entirely around. A pinhole was drilled in a third tool near the bottom of the hole and the hardening was successful, the minute hole being a vent.

Sometimes a piece of cast steel is so massive that while it may be heated clear through—the heating being a gradual process—the hardening, being sudden cooling, chills the outside while the inside is still at a considerable degree of heat. In such cases, a fracture may be expected, caused by the expansive force of the interior heat on the chilled and brittle exterior shell. Such an instance was afforded by the breaking of a solid steel tap, three and a half inches diameter, in hardening. The tap was cut to a pitch of eight to the inch, and finished. A piece from the lower end, two inches long, broke square off in the bath. The appearance of the fracture indicated that absolute hardening had extended slightly beyond the bottom of the teeth, the interior portion being apparently unchilled. The remedy in this and in similar cases is to drill a hole from end to end through the center of the piece.

**Electric House Lighting by Primary Batteries.**

Numerous attempts have been made to obtain a successful incandescent electric light by means of secondary storage batteries, charged from dynamos, but, owing to the small amount of electricity obtained in comparison with the power required, these batteries have so far, we believe, not been proved to be a commercial success.

One of the latest improvements in this direction has been the production of a primary battery, named the "Aurora," which is really an improved bichromate solution battery, having a power which is remarkable for its size, and the advantage of not polarizing, heating, or evolving any deleterious gases. Each cell holds about a gallon of the exciting fluid, which, we are informed, is made by a peculiar patented process, and is the important factor in the success of the battery.

Two large carbon plates are placed outside of the porous cup, and in the latter is inserted the zinc, of a special form to expose a large amount of surface. In the porous cup is put water, which in a few hours becomes charged with the exciting fluid from the outside jar. The zincs are well amalgamated to prevent local action. We recently attended a private exhibition of a complete system of house lighting by the use of this battery, as introduced into the residence of Mr. Henry V. Parsell, of this city, and were agreeably surprised to notice the power of the battery in sustaining with beautiful brilliancy several incandescent lamps, and the facility with which they could be lighted.

In a room adjoining Mr. Parsell's laboratory, together with a fine large screw-cutting geared lathe and other highly polished steel tools, were located on shelves twenty-eight cells of battery. None of the tools were corroded or in the least damaged by reason of fumes emanating from the battery.

In addition to its use as a lighting battery, it was shown that it could be employed as a motive power for driving the large lathe, by means of a small Cleveland electric motor, developing a force equivalent to one-third of a horse power.

A special switch was provided, which enabled the operator to utilize at once the force from one to twenty cells, as might be needed. No difficulty was experienced in rapidly boring, with large sized drills, through blocks of the hardest wood, two inches thick.

Many novel uses of the lamps were shown; half a dozen six-candle lights placed in a cabinet of minerals, when turned on, instantly lighted it perfectly. In a dome in the ceiling of the laboratory, painted blue and decorated with gilt stars, were hidden from view a group of small lamps. These when lighted produced a very soft, radiant effect, giving a light similar to that of a full moon on a clear night.

A special small Edison lamp of 40 candle power placed in a magic lantern was next lighted, and the pictures in the lantern thrown upon the screen. The brilliancy of the light compared favorably with the lime light.

A peculiar dark room ruby light, for photographic purposes, was shown, and also the perfect adaptability of small lamps for illuminating safely dark closets. Adjustable lights with neat porcelain shades mounted