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THE SCIENTIFIC AMERICAN SUPPLEMENT,

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SHOP REMEDIES.

A series of lectures by resident physicians and surgeons is being delivered in an Eastern city with the object of giving instruction in "first aid to the injured," including accidents by scalding, burning, cutting, bruising, loss of members, and other accidents. The project of instruction comprehends, for its pupils, members of the police force, nurses, drivers of vehicles, superintendents and foremen of machinery establishments, and the public generally. There is a large amount of common sense knowledge, involving some appreciation of the facts of human bodily structure, that is generally accorded to the medical profession, but which should be the common property of all. It is this sort of knowledge that this movement is intended to impart. There can be no doubt that lives have been lost for want of prompt remedies in extreme contingencies, as in suffocation by drowning, asphyxiation in foul air, and syncope in fits. In most cases the spectators are willing, and even anxious, to aid, but have not the requisite knowledge to make their aid useful.

Probably no occupation—saving that of the railroad engineer and fireman—is so liable to serious accidents as that of the machinist; and every shop ought to have its remedies for accidents; and if such instruction as is being given in Hartford, Conn., this winter is available, some authorized men, foremen, bosses, contractors, and ready men should be sent to the lectures, or they should be given elsewhere. The chances of injury in a shop where machinery are used are greater than the opportunities of immunity from injury; machinery has no conscience, no compassion, no consideration; the victim of its clutches is a victim without hope of redemption. If the shop or manufactory is provided with measurably safe appliances, there is still left the possible contingencies of personal injury; for belts, and pulleys, and connecting gear wheels with shearing, tearing cogs, cannot always be covered against ignorant meddling or unconscious contact.

There should be kept in every shop some ready appliances for accidents, when preventives against accidents are not sufficient. Most shops have their own local remedies, better at home than elsewhere, and generally favorably regarded where tested. So it would be improper to advertise any one remedy as better than another. But there are general remedies, of which there can be no question. A tincture of arnica is known, the world over, as a remedy for bruises, burns, scalds, and fresh wounds, as an external application; so is the salve of diachylum used in all portions of the country. There is also a common sticking plaster that may be bought in sheets or rolls, which is very useful in cuts and bruises. This is not the "court plaster" in common toilet use, but a solid basic linen, with a healing spread on it, that may be obtained at any apothecary's shop. Many ghastly wounds that would leave, in healing, livid and offensive scars are reduced and made merely trifling in character by timely application of adhesive plaster. There should be, in every shop and manufactory, some ready means of prompt attention to wounds, and men should be designated to antedate the arrival of the surgeon. There are plenty of such men in our shops, amply competent for the occasion if selected for the work.

CAST IRON FINISH.

Most of the iron castings used in the manufacture of machines are left in their natural state, that is to say, that legs, standards, struts, lengths, connections, entire frames, and all the attachments of machinery that make a machine an entity, are not machine finished or hand polished. As the casting comes from the mould it must be "pickled," to separate the burned-on sand from the iron. Then the casting is either handscraped with wire brush or with a broken file scraper. In this condition of cleanliness the casting goes into the machine shop. After all the machine work has been done, the painter is called in to "give style" to the machine, to "make it attractive," and meanwhile to "putty up holes."

A better way of managing cast iron is that of using it as iron. Brass and bronze, and even copper, from which both are produced, are used as competent metals; whatever is of bronze or of brass is reckoned in mechanics as of a simple metal; it has its acids to change its color, and does not depend on paint for beauty.

Iron has its capabilities as well as bronze or brass has. It is possible to use plain cast iron without artificial paint, as brass and bronze are used, by acid treatment, and produce very agreeable effects. More than this, the preservative effects of acid on iron are not half understood. A piece of cast iron that has gone through the pickling process from the foundry, and has been left out an entire winter, exposed to the storms of our northern climate, is as clean when taken in, in the spring, as though just from the acid bath—more so, as it is cleaned from the half-adhering scale.

The pickling process is, of course, the first process for all castings that are to be "cleaned." These pickled castings are to be scraped with wire brushes, and possibly to be scraped with broken-off files or similar contrivances. Then follows a rough filing to reduce small protuberances, and a hand chiseling to clean the surface. When all is done, the surface of the casting is in a very unattractive state; it is full of defects—of contour, of shapeliness, of color—so that the unappreciative observer might wonder what the resultant operations would produce. But paint and putty and deft ornamentation usually conceal defects and heighten attractiveness.

There are better means than paint and putty. Some recent experiments give very pleasing results. Small frames of sewing machines, amateur lathes, and reciprocating saws were subjected to a cleaning process by diluted acid, as in the ordinary "pickling" bath. Then they were either cleaned in the tumbling barrel or by hand, to free them from scale. The surface was then wiped or brushed over with rag or brush containing melted paraffine. This process was an easy and rapid one. If the waxy paraffine "held" on some protuberent places in cooling, the entire surface could be dressed to evenness by means of a piece of pine or other soft wood shaped like a chisel or a scraper. On this surface could be painted or gilded any device required by the conditions, the paraffine not forming an artificial and extraneous coating, but simply filling the pores of the iron so as to make a surface. The result was a pleasant gray base—the iron—on which decoration showed finely.

INSIDE CALIPERING.

Even now, with all the improved means of doing accurate work, the "cut and try" method is much too commonly practiced. During less than fifteen minutes' conversation with the proprietor of a first class machine shop recently, the writer noticed that a lathe man removed and replaced a short length arbor, trying it in the bored hole of a wheel, no less than four times; it is sufficient to say that this handling of the arbor occupied more time than did the actual turning of the arbor. Every machinist knows that such a method of doing work is slipshod, and only an exhibition of the "cut and try" no-system. If the arbor had been six inches diameter and as many feet long, and the wheel had weighed a ton, the frequent trials for fit by handling would not have occurred. And if a fit on a large surface can be made without the actual repeated placing of the parts together, it surely ought to be possible on a smaller job.

There is not care enough taken in the instruction of apprentices in measurements by calipers or its equivalent. The calipers may not be an absolute guide; but if it is not, it is as near as the boxwood rule or the steel scale—if it is properly used. The use of inside calipers, and especially of combined inside and outside calipers, ought to be discouraged. Inside calipers is a very deceptive tool; half a dozen measurements may be taken by it from the same hole. Perhaps this uncertainty is owing to the fact that the points of contact and the handling portion form angles with varying proportions as the tool is handled. And yet bored holes must be measured in order to make turned fits.

There is a very simple means of making this measurement—so simple that some readers may smile at it derisively. The method has, however, the merit of tested, practical usefulness. To get the diameter of a bored hole, use a piece of iron wire—a straight wire of about the hole's diameter—and point each end on the grindstone. Hold this wire inside the hole across its diameter. If it is too long, it will bind, and it cannot be readily moved; if it is too short, it will fall if left standing or placed across the diameter. In the one case it may be shortened by filing, and in the other be lengthened by a few light hammer raps. When the two points of the wire engage, and possibly a faint gleam of light may be seen between one and the side of the hole, the diameter is obtained, and by setting the calipers to these points the stud, arbor shaft, or crank pin can be turned to size. The same method is applicable to small holes, and there is no danger of a misfit if the measurement by the pointed wire be well done.

TREATMENT OF STEEL.

Methods of using steel are as many and diverse as are its users; at least, there are few steel using mechanics who agree in all the methods of forging, shaping, hardening, and tempering a tool. The writer was told, recently, by an old, experienced mechanic, that no turning or planing tool for iron should be drawn to temper; they should be left as hard as fire and water could make them. This was news to one who forty years ago used Sanderson's and Jessop's steels, and always drew the lathe and planer tools down to, at least, a straw. But on seeing the process of the older mechanic it was noticed that he permitted the steel to become only a dull red in the lead bath before cooling it. It is probable, also, that the steel was not so high as Sanderson's or Jessop's; it was an American steel that has come into favor within a few years.

A certain forger makes a practice of dressing a tool, after he has forged it to form, by light hammering as long as the hammer can make an impression on the metal. This hammering is continued after the color of heat has left the steel. He insists that this dressing "fines" the steel, that is, that it packs its particles and makes the grain closer. But when he tempers the tool, he is careful not to heat above a dull red, and then draws to a straw color.

A manufacturer who uses mills (milling machine cutters) in his work continually will not have a mill that has not been well forged from a bar. He prefers the drop forged blanks, which are usually made from a cut-off "chunk" from a bar of square steel. He insists that the tool must be forged to form and not cut from the merchantable bar, however well adapted as to size the bar may be.

Yet another takes a bar of three inch steel, or perhaps three and a half inches diameter, and cuts off a disk of the proper thickness for the mill he wants, chucks and drills it, mounts it on an arbor, finishes it to size, cuts the teeth, and hardens and tempers it. There is not a particle of forging in the work. The same man makes taps and reamers from the bar, choosing a bar to size, and refuses to subject the steel to the hammer. He claims that even the bar commercial steel is overworked in getting it into shape.

INVENTION AS AN ART.

To the popular mind the inventor, like the poet, is born, not made. Genius, it is thought, independent of education or practice, is its sole prerequisite. In some mysterious way Nature endows some men with power to conceive and produce new things and processes, which the world consciously or unconsciously needs, but, in the absence of the inventor's genius, is unable to get. Without a born capacity to invent, invention is deemed impossible, and rightly enough; but—herein arises the popular error—it is assumed that the faculty of original creation is a rare one, possessed by few, and not to be attained by others, however earnestly they may strive for it. On the contrary, the faculty is one common to the majority of men, more or less, and always ready to be made more under favorable conditions.

The singers in any community are relatively few; yet the most experienced teachers of music, who have had much to do in teaching music to large and unselected classes, unite in asserting that all men can learn to sing if they want to, and most men to sing fairly well.

It is much the same with invention. The innate capacity is common; its practical and profitable development is much less common, for the reason that comparatively few try to develop it, the multitude believing that the fundamental "gift" is not theirs. Accordingly, it is only by accident, or through the stress of special circumstances, that most inventors discover that there is any chance for them in that field of productive effort. Once enlisted in the work, successfully or unsuccessfully, they are pretty sure to discover that invention is an art which must, for the most part, be mastered as other arts are, by diligent study and patient effort. Unlike other arts, however, its boundaries are not limited to any one field of thought or knowledge or action, but are in every direction limitless, though practically bordered on the hither side by what men have already discovered and done.

Practically bordered; for while the reproduction of an old device may, from the inventor's standpoint, be as perfect an act of invention as the newest and most original invention might be, the field for profitable invention lies mainly in regions new and unexplored. An invention must be novel to be patentable; and, except for practice, it is only patentable inventions that are worth making. Knowledge, therefore, specific, positive, and comprehensive knowledge, of what has been done in the field in which the inventor's work is to be done, and a clear apprehension of something that remains to be done, are important elements in the successful inventor's outfit. The wider his range of such knowledge, the more numerous his opportunities to invent must naturally be, provided the manner in which his knowledge has been gained has not unfitted him for independent thought and action. A man may load himself with so many tools that he cannot work with any of them. In like manner overmuch learning may spoil a man for doing. The pack mule of an explorer's train is not likely to make many novel observations or discoveries.

To succeed in the art of invention it is commonly the rule that a habit of inventing must go hand in hand with observation and study. Sometimes a lucky hit may be made by an inexperienced inventor, just as men ignorant of minerals have stumbled on valuable mines. Nevertheless, the man who has trained himself to invent, and is in the habit of regarding every new fact or experience from the standpoint of its possible utility as a basis for invention, will excel the untrained inventor as surely in the long run as the practiced prospector will the unintelligent and inexperienced "tenderfoot." And the case in favor of the practiced inventor is even stronger, for the ability to recognize the need of an invention, though of primary importance, is less important than the ability to see how the need may be supplied and demonstrate the solution of the problem by doing it.

"Practice, practice, practice," said Demosthenes, is the first requisite for success in oratory. Equally is it necessary for sure success in invention. It does not follow that the would-be orator must get his practice wholly in the forum; no more need the inventor get his practice in absolutely new inventions. The numerous preliminary failures which have led up to the great success of many greatly successful inventors, while they emphasize the need of practice in this art, quite as clearly indicate the wisdom of not confining practice to what promises to be patentable. The work of the novice in invention may be, frequently is, valuable in itself; but if large success in the art is aimed at, it will not pay to suspend practice for the lack of novelties to work on. The resolution of old problems affords excellent and useful practice for the beginner, who may find a ready test for the value of his work by comparing its results with those exhibited in the perfected inventions of more practiced minds; and the habit thus gained of independently rebuilding and critically examining existing inventions will furnish admirable training for original work in fields entirely new.

The time may come when a systematic training in the art of invention, with practice in reinventing machines of greater or less complexity and the standard devices and movements of practical mechanics, will form a part of every first rate machinist's education; and similarly in other departments of productive industry. But until then those who wish to fit themselves for the cultivation of this most inviting and profitable art, the art of invention, must be their own guides.

Not the least advantage in purposely reinventing for the sake of practice comes from the circumstance that such practice-work cannot lead to loss or disappointment, while it cannot fail to lead the student to a practical working knowledge of the materials and methods employed by the most successful inventors.

Such self-training is sure to pay. Much as our inventors have already accomplished, the art of invention, as an art, is yet in its infancy; and it is safe to say that the prizes offered for its successful cultivation in the future are vastly greater and more numerous than those it has awarded to its votaries in the past.

HAS ELECTRIC LIGHT ANY EFFECT ON THE GROWTH OF PLANTS?

In conversation last week with Mr. Isaac Buchanan, one of the best known florists of New York, this question came up, and he stated that his observation inclined him to believe that when plants were used for decorative purposes in rooms where the electric light was used instead of gas, they seemed to have all the health and vigor as if growing under the light of a conservatory. He furthermore said that he had long ago observed that on moonlight nights there was always a better development of the flowers of camellias and roses during the winter months than when there was no moonlight. Hence he inferred that light, no matter how obtained, was beneficial to the growth of plants. This opinion from such an authority as Mr. Buchanan, who is well known to have had nearly half a century's experience, and who has always been a close observer, is certainly worthy of great attention.

Not long ago a French savant made extensive experiments with the use of the electric light to assist in forcing flowers during the dark days in winter, and from which wonderful results were claimed; but unfortunately the experiment was not a comparative one, being made with only one conservatory in which the light was used. To make the value of such an experiment certain, the only way would be to use two greenhouses, both growing the same kind of plants, in the same temperature, and the same soil and moisture—one to be lighted with electricity for three or four months at night, and the other left in the dark, and the results noted.

It is well known to all cultivators that the greater the amount of sunlight, the greater will be the development of the flowers. We all know that in the dark days of December and January the growth development of rosebuds, carnations, etc., is less than half of what it is in the months of March and April, when the days have lengthened, and the increased sunlight gives nearly twice the amount of light. Few commercial florists have the means or time for such expensive experiments as would be necessary to determine whether the use of the electric light in forcing flowers and fruit in greenhouses during winter could be profitably employed. It is a matter of sufficient importance, it would seem, for the Agricultural Department at Washington to take hold of. Certainly thousands of dollars have been expended by that department, in the past, on experiments which would have been of less general interest even had they proved successful. For be it known that the greenhouse industry now in the forcing of vegetables, fruits, and particularly flowers, has millions of capital invested in it throughout the land, and gives employment to tens of thousands of men; and if nature can be aided by this wonderful electric light, it will be a leap forward that the discoverer might well be proud of.

PETER HENDERSON.

Jersey City Heights, N. J., Jan. 30, 1885.

Progress of Gas Engineering.

Sir F. J. Bramwell, in his recent inaugural address as president of the Institution of Civil Engineers, made some interesting references to coal gas as a source of light, of heat, and of power. Dwelling upon the improvements that have been made in the application of gas as a prime motor, he pointed out that, whereas in the gas engine as originally introduced, 74 cubic feet of gas per hour were required to generate one indicated horse power, in the engines now made that consumption was reduced to less than one-third, each indicated horse power being the result of a consumption varying from 20 to 23 cubic feet of gas per hour. Further, that at the current low price of gas in England the cost of that hourly consumption was only about seven-eighths of a penny; and that this would compete on favorable terms with the use of coal (at ½d. per hour), on account of the attendant saving in other other directions, and consequent advantages in the abatement of smoke and reduced risk of explosion. In reference to the use of coal gas as an illuminant, Sir Frederick compared the two years 1862 and 1884; and showed that whereas in the former year 5 cubic feet gave a light of 12 candle power, at the price of 4s. to 5s. per 1,000 cubic feet, at the present time 16 candle gas costs but 2s. 10d. per thousand. Moreover, the improvements effected by regenerative burners and other modes of burning gave promise of a large increase in the candle power per cubic foot, even to the extent of more than double.

The Bell Telephone in Canada.

The Minister of Agriculture has delivered a decision in the case of the Bell Telephone Company, of Canada, declaring the patent void for the reason that the company or its representatives had imported the patented articles after twelve months from the date of the patent; also for not having manufactured in Canada such articles to the extent required by law after two years of existence of their privilege, and also for having refused to sell or deliver licenses to persons willing to pay a reasonable price for the private and free use of the patented invention.

On September 2 a petition was addressed to the Hon. J. H. Pope, Minister of Agriculture, asking that A. G. Bell's telephone patent be declared invalid. Counsel for the appellant based his claim on the failure of the Bell Telephone Company to comply with section 28 of the Patent Act of 1872, which provides as follows:

"That every patent granted under this act shall be subject, and expressed to be subject, to the condition that such patent, and all the rights and privileges thereby granted, shall cease and the patent shall be null and void at the end of two years from the date thereof, unless the patentee or his assignee or assignees shall within that period have commenced, and shall after such commencement carry on, in Canada, the construction or manufacture of the invention or discovery patented in such manner that any person desiring to use it may obtain it or cause it to be made for him at a reasonable price at some manufactory or establishment for making or constructing it in Canada, and such patent shall be void if after the expiration of twelve months from the granting thereof the patentee or his assignee or assignees for the whole or part of his interest in the patent imports or causes to be imported into Canada the invention for which the patent is granted, and provided always that in case disputes arise as to whether a patent has or has not become null and void under the provisions of this section, such disputes shall be settled by the Minister of Agriculture or his deputy, whose decision shall be final."

This decision will not make so very much difference with the company, as they are in possession of the field, and doing about all the business there is to do, having a well established plant in every town of importance in the Dominion.

Carbon for Electric Arc Lights.

Carbons for arc lights may be made, says a well informed writer, by thoroughly incorporating a mixture of finely divided carbonaceous material, such as the purer forms of coke or gas retort carbon, with some liquid substance, such as oil, tar, or sugar sirup, that, when subjected to a high temperature, is capable of being carbonized. The finely divided ingredients are thoroughly mixed and made into a stiff paste with the carbonizable liquid, and then forced by heavy hydraulic pressure through circular apertures in plates. The continuous cylindrical rods thus obtained are cut into suitable lengths, carefully dried, and then heated to incandescence in ovens while out of contact with air. By this process the carbonizable liquids are reduced to a carbon, which thoroughly binds together the various ingredients. Experience has shown that the higher the temperature and the greater the length of time during which the carbons are subjected to the baking process, the greater their hardness and the higher their electrical conductivity. In order to insure freedom from slight porosity, in most cases the carbons are subjected to a rebaking. After removal from the oven they are soaked in strong sirup, and again placed in the oven and heated to incandescence as before.