

Threads cut by a chaser without some kind of a guide to start them are often more or less crooked or drunken. To correct such threads and in cutting large threads, the doctor, shown in Fig. 13, is sometimes employed.

The most expensive, and at the same time the most desirable, contrivance for chasing screw threads is shown in Fig. 14. A casting fitted to the lathe bed has two ears, which are bored to receive the round sliding rod carrying the tool holder and the tracer.

The lathe is provided with a face plate having a long boss arranged to receive thimbles having leading threads of different pitches cut on them. The tracing arm carries a thin tracing tool which engages the threaded thimbles, and is capable of yielding to admit of moving the cutting tool forward against the object being threaded; but being well fitted to the mortise in the arm it cannot move laterally without carrying the sliding rod and all attached to it.

The operation of this device needs no special explanation. The arm that carries the cutting tool is moved forward until its adjusting screw strikes the horizontal guide bar; the tracing tool at the same time engages the leading screw and carries all forward. When the tool has traveled as far as desirable it is drawn back and returned to its original position.

It is sometimes desirable to form spiral grooves in the face of a disk; this may be accomplished in exactly the same manner as in the case of the cylindrical work. The method of doing it is illustrated by Fig. 15.

Knurls of various patterns are shown in Figs. 16 to 21 inclusive; these are employed in "beading," "milling," or knurling the heads of screws, the handles of small tools, etc. The manner of using this tool is shown in Fig. 22. The knurl is placed between the forks of a holder and upon a pin that passes through the fork, and is held with considerable pressure against the work as it revolves.

The knurls shown in Figs. 16, 17, 18, and 19 are easily made. All that is required is a hub something like that shown in Fig. 3. This is placed between the centers of the lathe, and the knurl blank is brought in contact with it and allowed to revolve in a holder supported by the tool rest. The straight blank is moved up and down until every part of the surface is cut in the same way.

THE HOME OF THE METEORS.

In a recent lecture at Harvard College Prof. Benjamin Peirce put forth, according to newspaper report, a novel hypothesis with regard to the origin of comets and meteors. In the absence of any complete statement of the hypothesis, it is impossible to judge of its scope and pertinence, or indeed whether there is any new hypothesis at all.

An incidental point brought out in the lecture is novel, namely, that the heat which the earth is known to receive from space is to be attributed to the impact of meteors upon our atmosphere. That this meteoric heat is not an insignificant quantity Prof. Peirce shows by computation, by which he reaches "what he calls the unexpected and startling result, that the heat which the earth receives directly from the meteors is the same in amount as that which it receives from the sun by radiation."

Emery Belts and Wheels.

A correspondent says that most users of emery belts and emery wheels do not use glue that is thick enough, fearing it may chill before the sand or emery can be spread. In making an emery wheel or belt, if the cloth has never been glued, it should be sized with glue about as thick as lard oil, and allowed to dry thoroughly before applying the glue which holds the emery.

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AMERICAN AFFLUENCE OF MECHANICAL INVENTION.

Discussing the influence of American rivalry in producing or helping to produce the present depressed condition of the English cotton trade, a writer in the London Times makes the following comparison to show the "startling" difference in the rate of progress in this department of productive industry, characteristic of the two countries.

In the twenty-five years between 1853 and 1878 the average weekly production of English weavers rose from 825 yards in sixty hours, to 975 yards in fifty-seven hours; an increase of 23 per cent in the rate of production, due to improvement in processes. During part of the same period, the decade between 1865 and 1875, the cotton operatives of America, with a numerical increase of 150 per cent, increased their aggregate rate of production 500 per cent. In other words, the progress due to improvement in processes was more than ten times as rapid in America as in England.

This remarkable—from an English point of view, startling—difference in the rate of industrial progress was attributed by the Times writer very largely to the more ready adoption of labor-saving inventions by American masters and the superior intelligence and deftness of American operatives. Still further, the writer notes as a cause of difference the circumstance that for some time American manufacturers have brought to bear upon their processes "an eager spirit of improvement and economy, combined with a remarkable affluence of mechanical invention," in consequence of which they are able to produce many grades of goods at a less cost than their English rivals can.

The origin of the "affluence of mechanical invention" which has done so much for the American cotton industry, the Times writer does not attempt to trace absolutely. He discovers, however, one important source of American inventiveness in "the simplicity, cheapness, and efficiency of the method by which inventions are protected (in this country)—methods which offer a lively contrast to the cumbrous and costly devices by which England contrives to strangle the inventiveness of her people."

These are strong words; but they are by no means without parallel in many English publications of recent date. Every earnest and appreciative student of American industrial progress, whether native or foreign, has been equally impressed by the superior efficiency of the American patent law, in promoting industrial improvement through mechanical invention; and not a few foreign statesmen have urged the necessity of similar laws for their own countries, in several cases with no small degree of success. We must infer as an inevitable result that the competition of such nations for the control of the markets of the world will henceforth be increasingly intelligent and severe. The affluence of mechanical invention which has brought us to our present stage of prosperity must not be diminished—indeed, must be steadily increased—or our position in the industrial race will be forfeited. If we have caught up with, or surpassed, our older rivals through the encouragement of invention, we must encourage inventors still more, or those who have lately entered on the same course of industrial advancement, and thereby lessened our relative advantage, will beat us at our own game. This is as inevitable as gravitation.

In view of these indisputable facts, does it not seem strange that any one having the prosperity of American industry at heart—or even professing to have it at heart—can seriously advocate the abandonment of the principle and practice to which our industrial progress has been so largely and so manifestly due?

Whatever may be the faults and deficiencies of the American patent system they certainly do not fall on the side of over-encouraging invention or over-guarding the inventor's right to the proceeds of his own thought and labor. If any change in the system is advisable, it certainly does not involve any additions to the inventor's inevitable burdens; nor any increased privileges to those who would like to appropriate his inventions without his consent or due payment therefor.

JADED HEADS.

The school of popular morality which ruled a generation ago is responsible for no little mischief; and its teachings have not yet quite gone out of fashion. It knew but one virtue—unceasing application to work or study; but one sin—the neglect of business for recreation. For a man to stop work to rest himself or to play was a symptom of inherent laziness, or worse, an inclination toward moral, mental, or physical dissipation. Untiring industry, even when unnecessary, was raised to the topmost pinnacle of social virtue; and to say that a man "died in the harness," was to pronounce the highest eulogium.

A reaction has taken place; yet the fashion of overdoing still compels many a man to toil on unnecessarily after the physical and mental strain has become all but unbearable; and too often, by the time a man has trained a young family to life conditions which only a large income can sustain, he breaks down and leaves his children to bear the brunt of a poverty made tenfold more severe than it otherwise would be by the daintiness of their previous living. And even when the broken down merchant or professional man leaves his family a competence, they are very apt to inherit an ill-balanced and ill-nourished nervous system, which makes a positive and sustained enjoyment of life an impossibility.

In a recent lecture in this city, Dr. C. R. Agnew said that if there is more nervous disease in this country than elsewhere, it is because the average American youth is supposed to be able to do anything. Men should know on what points they are ignorant, and so escape many damaging strains.

Mental application does not weaken the brain. It strengthens it, if not carried to the length at which wholesome food and plenty of sleep fail to refresh it. Never in any age, said Dr. Agnew in another connection, have man's faculties been so taxed as now; and the great problem is for each man to do his share of the world's work and keep well. The civilization of to-day does not call for any faculties that a man does not possess; but it calls upon him to use in the best manner the faculties he has and learn how to bear the strain of living.

One of the first and most imperative symptoms that the strain of living is becoming too great is the jaded head, which Dr. Agnew described as one that cannot be depended upon for a long stretch of work, that grows weary prematurely, that has to be coaxed from the pillow in the morning, and that does not force the work of the day cheerfully. "There are more of such heads than might be supposed. They are found in every rank of life; but chiefly among persons of sedentary pursuits and among both sexes and almost all ages above fourteen. Generally the early symptoms of the malady is discomfort during headwork in the back of the head and in the upper part of the spinal region. He is a happy man who meets this symptom with rest, and seeks in sunlight and fresh air some fresh investments for his nervous system, and drops every habit that does not do him positive good. If he takes to artificial stimulants for relief, he will begin a career which, soon or later, will place him among the incurables or bring him to an untimely end. Alcohol and all sleep-producing drugs are dangerous in the highest degree; for they mask the malady, without curing it. No organ in the human body is so abused as the brain, and no organ is so well fitted for daily use. Still, the brain is not so susceptible to disease as some suppose. It was probable there was not a man present who had not during the day abused his brain by overwork, anger, tobacco, alcohol, fuss, hurry, too little sleep, too much sleep, by indolence, by not studying to be quiet, by not doing his own business, by attempting to do something beyond his reach, by attempting to do something for which he had not been sufficiently educated, by carrying an evil conscience, or by the unmanly strain of trying to outdo his neighbor. The remedy of the jaded head is the giving up of all habits which cannot be defended by the highest kind of reasoning; the careful determining of each man of his ability to stand work; the avoidance of doing anything for which a man has no adequate education; rest, recreation, and the keeping up of the tissue-building powers by wholesome food."

#### WOMAN THE PRIMITIVE POTTERY-MAKER AND DECORATOR.

In an interesting article by the late Professor Hartt, reprinted in the *American Naturalist*, the author, after copious extracts from the writings of those who have traveled among the various savage tribes of the globe, shows that among such peoples generally the art of pottery making is, at first, exclusively practiced by women, the reason being that the fabrication of earthenware is primarily and essentially a branch of culinary work—the latter everywhere falling to the lot of the gentler sex. Among savages, man is the hunter, fisher, and warrior; while the woman takes care of the house and the culture of the field. When, however, in the progress of the tribe in culture, the practice of the art of pottery comes to be a trade or profession, and to interfere with the household work, it passes naturally into the hands of man, and it will be found that in every case where men make earthenware the tribe has advanced considerably beyond the savage state.

But savage woman not only makes the vessels of clay, she also ornaments them, and if the fictile art has originated with her, and has grown up under her hands, it seems no less probable that the ornaments she uses should have originated with her; and the probability is increased by the fact that to her falls the work of spinning and weaving, and of making and decorating personal ornaments and clothes, and of making baskets, mats, etc. She is everywhere the primitive decorative artist, and to-day it is the exception that man occupies himself with ornamental art, even in civilized countries. Woman covers with ornament everything her hand touches, and the lady in her boudoir industriously embroiders, on some article of mere luxury, the same series of frets and scroll borders that, on the Amazons, the savage unclothed squaw as diligently and with as firm a hand traces with a spine on the damp surface of the clay vessel she is fashioning. It is as if they both sang the same simple song. The ornaments are in both cases identical, and not only of wholly independent origin, but it may be of very different age. Those of the savage are the mere embryonic beginnings of art life, while those of the boudoir are archaic forms, persisting through the ages, still flourishing unchanged among the varied wealth of derivatives by evolution from the ancient primary forms.

#### WIRE IN WHEAT.

The difficulty with regard to the presence of bits of iron wire in wheat after it reaches the mill, due to the use of harvesters binding with wire, seems to be in a fair way to satisfactory solution.

At the late meeting of the Millers' Association at St. Paul, a method of extracting wire from wheat was tried with encouraging success. Two gangs of common horse-shoe magnets were placed in a spout, through which wheat was passed after having been mixed with particles of wire, varying from the size of a pin head to pieces an inch in

length. In every trial all the pieces (which had been counted) were found upon the magnets.

The committee appointed to test the matter more thoroughly have reported that magnets had been placed in the Pillsbury, Washburn, Arctic, and Holly mills, and used for several days. The opinion of the committee was that the wire was chiefly, if not wholly, removed by the magnets, and that by their use the evil attending wire bands can be lessened. The resolution of the millers against wire binding has been substantially withdrawn.

The device employed in the tests at St. Paul and Minneapolis was not patented. A patented invention for the same work is described as consisting of a revolving iron cylinder, through which the wheat is passed. During each revolution of the cylinder, it is twice, automatically, connected with and disconnected from an electric battery. Inside this cylinder an endless apron is run lengthwise. Each time the "circuit" is broken, the cylinder is, for a moment, demagnetized, and the particles of iron it has picked up drop upon the endless apron and are carried out. There would appear to be an attractive field here for the exercise of inventive skill.

#### APPLICATIONS OF CELLULOSE.

An excellent illustration of the industrial and commercial benefits that may arise from new products, whether gleaned from the unused stores of nature or created by the skill of the inventor, is furnished by the wide and various utility of the compound of cellulose and camphor known as celluloid. Though scarcely ten years have passed since the Hyatt brothers suspected that this compound might be used profitably in the arts, and only five years since they began to manufacture it successfully, it has become the basis of several thriving industries, and novel applications of it are being made almost daily.

As now made celluloid is a composition of fine tissue paper and gum camphor, treated with chemicals by a patented process. When crude it looks like a transparent gum, and its color is a light yellow brown. It can be made as hard as ivory, but is always elastic, and can be readily moulded into every conceivable form. With equal ease it can be colored in any tint desired, the dye running through the entire substance, and being, therefore, ineffaceable.

A writer for the *Evening Post* has taken pains to collect a large amount of information concerning the manufacture and use of this material; and wide as the range of its application has become, the business of preparing the crude material and shaping it into novel and useful forms is thought to be only in its infancy. According to the *Post* writer, all the celluloid used is made by a single company, having factories at Newark, N. J., who sell the crude material to the parties undertaking the production of finished goods. No one can buy it unless the producing company decides to give him a license, which is granted only for the purpose of making some new article that will not interfere with the trade of the companies already licensed. A number of large corporations are now engaged in the various branches of manufacture for which celluloid can be employed. Most of these have their factories in Newark, but there is one large establishment in Center street, this city.

The cost of the crude article to the buyers is regulated by the producing company according to the use to be made of it and the competition met with in other materials. For instance, \$4 or \$5 per pound are charged for celluloid which is to be made into jewelry, while only \$2 are charged if it is designed for umbrella handles, though there is no difference in the quality of the substance.

As a close imitation of ivory, celluloid has made great inroads in the business of the ivory manufacturers. Its makers assert that in durability it is much superior to ivory, as it sustains hard knocks without injury, and is not discolored by age or use. Great quantities of it are used for piano and organ keys, to the manufacture of which one company is devoted.

Billiard balls are made of celluloid at half the price of ivory, and are said to be equally elastic, while more durable. Large amounts are used for combs, for the backs of brushes and hand mirrors, and toilet articles; a fine tooth comb made of celluloid is twenty-five per cent cheaper than ivory, while in large pieces, such as the backs of hand glasses, the difference in price is enormous. Among many other articles in which celluloid takes the place of ivory or India-rubber are whip, cane, and umbrella handles, every kind of harness trimmings, foot rules, chessmen, and the handles of knives and forks. Its use in cutlery is said to be especially desirable, as it is not cracked or discolored by hot water.

India-rubber, as a general rule, holds its ground against celluloid, as the latter cannot be sold so cheaply. The celluloid is said to be much more durable, however, and it is superior for pencil cases, jewelry, etc., where gold mountings are used, as it does not tarnish the metal, whereas the sulphur in India-rubber tarnishes gold which is less than eighteen carats fine. The freedom of celluloid from sulphur, and the natural flesh color which can be imparted to it, have caused it to be extensively substituted for India-rubber in the manufacture of dental blanks, or the gums and other attachments of artificial teeth.

Celluloid can be mottled so as to imitate the finest tortoise shell, and its elasticity renders it much less liable to breakage. In this form it is used, like the imitation ivory, for combs, card cases, cigar cases, match boxes, pocket books, napkin rings, jewelry, and all sorts of fancy articles. The substance is employed for similar purposes as a good imita-

tion of malachite and also of amber. It is made into mouth pieces for pipes, cigar holders, and musical instruments, and is used as the material of flutes, flageolets, and drumsticks. For drumheads it is said to be superior to parchment, as it is not affected by moisture in the atmosphere.

As a substitute for porcelain, celluloid is used for the heads of dolls, which can be hammered against a hard floor without danger of fracture. Beautiful jewelry is made of it in imitation of the most elaborately carved coral, reproducing all the shades of the genuine article.

One of the large manufacturing companies is employed exclusively in the making of optical goods, using celluloid in place of tortoise shell, jet, etc., for the frames of spectacles, eye glasses, and opera glasses. The material is extensively used for shoe tips, protecting the toe as well as metal tips, and having the appearance of patent leather. By shoemakers it is also used for insoles. Large quantities of thimbles are made of it, and it is said to be the best material known for emery wheels and knife sharpeners. As a ground for paintings, celluloid has all the advantages of ivory, and photographs can be taken on it which are alleged to be superior to ivorytypes.

Within the last year and a half another branch of celluloid manufacture has been developed which promises to reach enormous proportions. This is the use of celluloid as a substitute for linen or paper in the making of shirt cuffs, collars, etc. It has the appearance of well starched linen, is sufficiently light and flexible, does not wrinkle, is not affected by perspiration, and can be worn for months without injury. It becomes soiled much less readily than linen, and when dirty is quickly cleaned by the application of a little soap and water with a sponge or rag. For travelers and for wear in hot weather this celluloid linen is especially convenient. It has lately been much improved by the introduction of real linen between two thicknesses of celluloid. Shirt fronts have been made of it, as well as cuffs and collars, and it is believed that these will prove equally desirable.

Celluloid has been experimented with as a material for neckties, and although the trials have not yet been very satisfactory, it is thought that they will eventually be successful. For hat bands and hat sweat bands it is a trifle more expensive than the materials commonly used, but it is said to be better, as it does not become rusty or greasy. It has also been used lately for watch cases.

There is a large export trade in celluloid articles to Cuba and South America, and this is constantly increasing. They are not sent to Europe, as the right to manufacture and sell them there has been sold to a foreign company, which has a factory in France.

#### Photography in Banking.

The *London News* reports that the Bank of France has for some time past employed a photographic detective to examine suspicious documents; and more recently has placed an invisible studio in a gallery behind the cashiers. Hidden behind some heavy curtain the camera stands ready for work; and at a signal from any of the cashiers the photographer secures the likeness of any suspected customer. It is also reported that in the principal banking establishment in Paris several frauds have lately been detected by the camera, which under some circumstances exercises a sharper vision than the human eye. Where an erasure has been made, for instance, the camera detects it at once, let the spot be ever so smoothly rubbed over, while a word or figure, that to the eye has been perfectly scratched out, is clearly reproduced in a photograph of the document.

#### Seaboard Pipe Line.

The long talked of project of extending a pipe line from the oil producing regions now seems in a fair way to be realized. We are informed by one of our correspondents that the Tide Water Pipe Line Co. (Limited) are progressing with their line of oil conducting pipe, which reaches from the Bradford oil region to Williamsport, Pa., a little over 100 miles. The pipe is 6 inches internal diameter, 27-100 inch thick, and weighs 19 pounds to the foot. It is tested to 2,000 pounds to the square inch. The lengths are screwed together dry. The pumps are being made by the Holly Manufacturing Co., of Lockport, N. Y. They are single acting plunger pumps, 6 inches in diameter, set in batteries of three, and are to be driven by a slide valve engine 20 x 30.

There will be two pumping stations, 50 miles apart. The minimum amount of oil to be delivered in twenty-four hours is 6,000 barrels of 42 gallons. The pumps will deliver the oil to the pipes at a pressure of 400 pounds to the inch. A large portion of the work is done. It is expected that the line will be in operation in May.

#### Alligators Taught by Experience.

The alligator season begins to open, and these ugly monsters may be seen stretched out on the wharfs dead and alive. Every man that is fortunate enough to kill a good sized alligator puts it down among his memoranda and feels as proud as a Bengalee who makes conquest over a royal tiger. But these saurians have become more wary and watchful, and the sound of the steam whistle, the noise of the paddlewheel, or the dip of the oar is to them a signal of danger, so that the first approach of an enemy causes them to disappear. To secure a large alligator now requires an expert who knows their habits. There is a great waste of powder and ball by inexperienced parties who go hunting and find nothing.—*Pittsburg (Fla.) Herald*.