

with an invested capital of \$12,301,830, employing 9,283 persons, to whom are annually paid in wages \$4,636,099. The value of materials used is figured at \$4,829,105, and the value of the products at \$13,863,188. Sixteen States monopolize these manufactures, through nearly half of the invested capital and one-half the value of the products are centered in New Jersey and Connecticut.

But, as said before, the original companies hold the field now as they did before their patents expired. Only four of the principal of these extend their operations over the whole range of work on a sewing-machine, beginning with the proprietorship of forests and getting out raw material, to transportation facilities and a network of agencies for disposing of their machines throughout the world.

LATHE FEEDS.

For many years our tool makers have almost universally discarded other feeds for lathes for the screw. Forty years ago, and later, the chain feed was a favorite for all work on the lathe but screw cutting. It had its advantages. So had the rack and pinion feed. Both these feeds took hold of the tool carriage midway between the V-ways, the proper point to avoid a diagonal strain. The rack protected its teeth and those of its pinion from falling chips and dirt, and it could be instantly reversed without much backlash. With it the carriage could be run from end to end of the bed between the heads very rapidly. In fact, many of the screw feed lathes of to-day have their run-back or traversing movement by means of a gear engaging with the threads of the screw, which thus serves as a rack.

As the best of toothed racks and gears are now cut, there is no need of any backlash; the epicycloidal curve to form the contour of the teeth insures a perfectly free rolling action without looseness. Such a cut rack with pinion or wheel would be just as accurate for the finer qualities of lathe work as the screw; and with properly arranged gearing such a feed could be used in screw cutting. In fact, there would be some advantages for some jobs in having a rack and pinion feed instead of the present screw feed. If there should be fear of sufficient wear of the teeth by use to create a backlash which might affect the integrity of the proposed screw, a double disk pinion would obviate this fault.

MUSCULAR CONTRACTION AFTER DEATH.

Dr. Brown-Sequard, SCIENTIFIC AMERICAN, July 12, maintains that fixed and rigid positions after death, speedily ensuing, are due to the last vital act, which has induced a "tonic contraction," and that causes of death which produce sudden dissolutions without pain or excitement may be the means of such a contraction. Assuming this to be true, still the *modus operandi* by which a vital act can leave such a "tonic contraction" after all vital power has ceased is not suggested by him, and we need one step further in the way of enlightenment. Let us see if we cannot take that step now.

In accordance with the observations of Du Bois Reymond, it has been pretty generally accepted that the normal state of even quiescent living muscle is one of electrical tension, and that during muscular contraction the tension diminishes in such a way that as the wave of contraction moves along the muscle it is preceded by a wave of negative variation. This variation is slight for a single contraction, but in those of great rapidity it may become so great as to completely neutralize the galvanometric deflection due to the normal current of the quiescent muscle.

These views have been attacked and sharply criticised, notably by Hermann in 1867, and as lately as 1877 Engelmann has come to Hermann's aid in Pflüger's *Archiv*. They maintain that normal muscle currents do not exist; and that those observed by Du Bois Reymond were due to the unnatural conditions of the muscles examined by him. He, however, has replied to their criticisms with great ability, and his views are now, as already stated, very generally adopted by physiologists. A consideration of these views may perhaps help us to a clearer idea of the position of the headless soldier of Sedan, as shown in Brown-Sequard's figure.

The conditions required, in order that a limb or the entire body should be in a state of rigidity, are simply that the antagonistic muscles, the flexors and extensors, for instance, should be braced at the same moment to full activity, and the rigidity continues so long as the mutual action remains. If this action is not local, but general, such a figure will continue without motion indefinitely, excepting that gravitation may cause it to fall to the ground, if unsupported. But even such a fall would not affect the limbs; they would necessarily retain their position.

Now Du Bois Reymond has shown us that tonic contraction is the *normal state* of muscle fiber, and that relaxation is due to an accession of vital activity through the agency of nerve force. We know well that commonly when life ceases muscular contractility ceases with it. And we can readily see that when death comes as the result of disease or exhaustion, and is attended with suffering, the perturbation of nerve force and of muscle currents must be so great that such a result will surely follow. And as these include death in almost every form in which we ever witness it, we have naturally come to understand that muscular relaxation is its normal attendant and its immediate result. "He bowed his head" is the fearfully expressive term employed when death came on Calvary.

But in the very few instances where death occurs sudden-

ly and without suffering, it seems possible that the instantaneous cessation of the nerve force may leave every muscle fiber in its *normal condition*. If that could be, universal rigidity would instantaneously ensue, and the last position assumed in life would be retained in death. Now we know that the one cause of all causes which can bring a death into which the element of time does not enter is a wound which obliterates the base of the brain as well as the commencement of the spinal cord. That there is an interval between the cause and effect is doubtless theoretically true, but practically the interval has no existence, for it is infinitesimal. Such a stroke must necessarily be painless, for life (including of course sensation) is abolished at its occurrence. The two chief cases cited by Brown-Sequard are cases precisely in point.

The cannon ball at Sedan left nothing remaining above the lower jaw. The brain of the soldier at Goldsborough had been swept by a bullet from a Springfield rifle, that struck him in the right temple, while his head was turned toward his right shoulder, and beyond question inclined downward, for his leg had that instant crossed the saddle, and the stock of his own rifle was still on the ground. Following Du Bois Reymond, it is difficult to see how instantaneous rigidity should not ensue in each of these cases; it did ensue, whether our explanation be correct or not. And with each one the state of support was such that he *could not fall* so long as the rigidity continued.

Many questions and conclusions of intense interest are associated herewith, but for the present we must leave them untouched.

W. A. O.

FORMS OF GOLD CHISELS.

The cold chisel is not so often used in the shop as formerly, much of its old time work being done by the planer, the milling machine, and the shaper: but the time will never come when it ceases to be one of the most convenient hand tools ever made and used. There are a hundred occasions when it is better than any and all other appliances, and in emergencies it and the hammer are a whole kit of tools combined. But so much has the art of chipping declined that there are shop workmen who do not know the proper form of a cold chisel. Recently an ambitious machinist—a journeyman just out of his time—exhibited a collection of tools "picked up here and there, and made at odd jobs," and among them were some cold chisels, which were worthless as tools unless they were remodelled. The flat chisels had the bit point wider than the blade, and these and the cape chisels had the bit and blade one—a simple wedge extending from the stock to the edge, with a cross section precisely like that of the blade of a pocket knife. With such a chisel there would be no means of raising a chip, and every blow would merely drive the chisel, like a wedge, deeper into the metal until the bit broke off. The widening of the bit beyond the edges of the blade is a certain source of weakness.

The blade of a flat chisel should be flat, of an equal terminate thickness, one-quarter of an inch thick for a blade one inch and an eighth wide, and correspondingly thinner for narrower blades. At the bit, or point, the blade should be ground off at an angle of 60°. Then, the bit should not be quite so wide as the blade; if the blade is one inch let the bit, or edge, be one thirty-second of an inch less. Still another requisite: the cutting edge should not be straight across, but it should form a convex line, so that the corners shall be back of the center of the edge. The ridge between the 60° edge and the flat blade forms a fulcrum for lifting the chip at each successive blow. The narrow cape chisels should be made by similar rules, except, of course, the uniform thickness of the blade, which is impossible, but observing the same narrowing of the bit and the same "stunt" edge of 60°.

It may be asked: How can a clean job be done where corners are required, as in cutting keyways, if the bit is to be narrower than the blade? Simply by using a narrower bladed chisel for finishing the corners. There is no ordinary job that cannot be finished with chisels with bits appreciably narrower than the blades, using differing widths of chisels. It may be that on a cleaning, scraping finish in a keyway a full width chisel with flush bit may be useful, but even here a narrow finishing chisel with drawn-in corners will make better work going down each corner in succession. These elegant, wedge-bladed, spreading bit chisels are beautiful to look at, but they are not necessarily useful because some manufacturers for the trade send them out in this form.

In the article to which reference has been made composite chisels—wrought iron with steel bits—were commended for certain work. It would be well, also, if, when the chisel is made solid from the steel bar, the head or hammer end be occasionally annealed. The continual hammering on the end of the chisel not only brooms and disintegrates the steel, but it hardens it harder than any fire and water can do it, and from this cause come sometimes serious accidents. The writer suffered for years from a disease in the eyes engendered by a flying particle of glass-lead steel from the head of a cold chisel with which he was working.

Fire at the Emerson Saw Works, Beaver Falls, Pa.

The interior of about one-third the area of these works was burned out on the 23d of July. The walls all being of brick and stone are still standing, and none of the roof fallen in. Are fully insured, and with their accustomed enterprise have already commenced rebuilding, and expect to be in operation again inside of two weeks.

Death of Thomas Dickson.

Scotch energy, capacity, and thrift, no less than the manifold opportunities presented to every industrious young citizen of America, were well illustrated in the life of Thomas Dickson, who died July 31, at Morristown, N. J., of heart disease. He was born in Berwickshire, Scotland, in 1822, his parents removing to Canada in 1832, and to Susquehanna County, Penn., in 1834, where Thomas, quarreling with a schoolmaster, hired out at the age of thirteen, to ride a mule in the mines. He then engaged as a clerk, and subsequently became a porter in a country store, afterward purchasing an interest in a foundry and machine shop at Carbondale. In 1856 he took the initiative in starting the Dickson Manufacturing Company at Scranton, Penn., a firm which has been eminently successful in the manufacture of steam engines and mining machinery. Since 1860 Mr. Dickson has been connected with the Delaware and Hudson Canal Company, of which he has been President since 1869, and had become one of the principal owners of coal and iron lands in the country. The output of coal of the company when he took charge was not more than 500,000 tons yearly, while now it exceeds 4,000,000 tons.

The mining operations have been extended over an area of about 44 miles, and, step by step, control has been acquired of a very extensive railroad system. In 1873 Mr. Dickson organized a company with \$1,500,000 capital, purchased 23,000 acres of iron land on the shores of Lake Champlain, and erected furnaces, which are producing pig iron and Bessemer. Mr. Dickson was also director in 20 or 30 gas, iron, banking, insurance, and other companies, many of which were planned and organized by himself. In 1872, with his wife and son, he made a trip around the world. He was a member of the Presbyterian Church, and was highly esteemed by a wide circle of friends and acquaintances.

Ready for Any Honest Work.

A recent writer defines "worry"—a trouble which makes many people sick, and even some to die—to be labor done without faith. He means by this, efforts made without confidence in the success aimed at. There is a world of truth in the saying, Courage, always courage! A successful man who overheard a less sanguine person draw out, "I wish I could," turned upon him suddenly with the words, "Say I will, and you can!" That is what the energetic man had proved in his own experience, and what many a languid individual might prove too, if he would only once wake up. "Our doubts," the great poet has it, "are traitors."

The passengers and idlers in a certain street in New York were once upon a time amused by the proceedings of a poor fellow whom the police did not interrupt, though his movements gathered crowds, who stopped to look on and inquire. They went their way, admiring a persistence which almost argued insanity. The man had applied at the door of a store for assistance. "You are strong and able," was the answer, "why don't you go to work?" "Work! I would gladly, if any one would give me work to do." "Will you do a day's work if I give you a day's wages?" "Try me," was the answer. "Well, take that brick—put it on the curb at the corner of Nassau Street. Pick it up again and carry it to the corner of the Park. There lay it down. Take it up again and carry it back. Repeat the walk until working hours are over, and I will pay you a day's wages." If the man who gave this apparently senseless direction imagined that the other would refuse the arrangement, he was mistaken. The man took him at his word, plodded on through a long summer day, and received not only his money, but the applause of the crowd, quite as well bestowed as those upon the victor in any walking match.

If he had "worried" over such questions as "What is the use?" he could not have done it. His aim was to honestly earn a day's wages, and he accomplished it. It was not, to be sure, a very ambitious purpose, or a very dignified employment of muscle without mind. But it was done without "worry," and he survived that day and provided for himself food for the next. And it is safe to say that man got around all right in other employment. He was a philosopher in humble attire, capable of teaching many a more pretentious individual, with ample means, one great secret of life. We have only one day at a time to live in, and it is never worth while to shorten the work of that day, while we lengthen the hours in weary speculations as to the utility of any honest pursuit, or in doubts as to results. "Meeting trouble half way" is, in the timid sense, even more foolish than "dropping buckets into empty wells, and growing weary drawing nothing up." The world and its doings are made up of trifles, any way—some sad, some glad, and others foolish. But any honest folly which *pays* is better than worry, which is usually only compensated, when the best comes, or the worst is over, with the reflection, "What a flat I was!"—*Phila. Ledger*.

The Venerable Captain Ericsson,

The inventor of the *monitors* which did such useful service during our war with the South, and the author of the sun motor, the hot air engine which bears his name, and scores of other inventions, reached his eighty-first birthday on the 20th of July. Captain Ericsson does not look or appear to be a man much past sixty years of age, and he seems as hale and hearty as he did a quarter of a century ago. Captain Ericsson is very methodical in all of his ways, abstemious in his habits, and is always at work; he begins immediately after an early breakfast, and is so busy with tools or pen for sixteen hours of every twenty-four that no one ever finds him at leisure.