## OUR VISIT TO THE COLLINSVILLE AX WORKS.

If the mountains of New England are barren in fields of waving grain, they are prolific with active brains and busy hands. Necessity, the mother of invention, has contributed to stimulate the sons of the mountains in subduing stubborn nature and making the very waters which leap from their rugged rocks minister to their wants. Every stream which pours down through their romantic valleys has been harnessed to the revolving wheel, and with the song of the crystal waters dancing over every cascade, the music of the hammer, the saw, the spindle and loom join in cheerful chorus. A most remarkable feature of this portion of our country is the chain of manufacturing villages which, like gems, are strung from the outlet to the apex of every valley. Last week, we visited one of these busy hives, situated on the Farmington river, about fifteen miles from "Old Hartford," Connecticut, and we were well repaid for our journey to the "land of steady habits." Some persons believe that this State is only distinguished for producing very questionable wooden ware, but a visit to Collinsville will at once dispel all such *wooden nutmeg notions* from the minds of such individuals. This is the place where the famous "Collins' Axes" are made, and with which, our sturdy backwoodsmen have felled hundreds of square miles of forest, and opened up the breast of mother earth to the cheerful rays of the sun, enabling her to bring forth "seed for the sower and bread for the eater." As we consider the ax a mighty civilizer in the hands of our people—it being an instrument of *all* work to them—our visit to these Works was one of no ordinary interest, especially as we had often swung the ax in our frontier forests, in years gone by, and because we found a far greater variety of tools manufactured in this place than we had expected to witness.

About thirty-three years ago, the present village of Collinsville was composed of about half a dozen straggling houses, and a grist-mill, with a splendid water-power. It was then purchased by the Collins Company, whose business had previously been carried on at Hartford, the stamp of which is still retained on their axes. In 1826 new building were erected and the tool business inaugerated, and from that period, the village has borne the name of the company. The amount of business then transacted was very limited, but the tools manufactured soon acquired a high reputation, and the demand for them has gone on with a steady increase until Collinsville has attained to a population of twelve hundred inhabitants, all connected more or less with the company, under whose employ there are about three hundred and fifty mechanics and other operatives. A large capital is invested in the operations, twelve hundred tons of the best wrought iron, three hundred tuns of fine cast steel, and two thousand tuns of coal are annually worked up in conducting the manufactures. Over two thousand tools are finished daily, and these are of such a variety, that Mr. Collins, in passing over the list, hit them all off at one sweep by stating "we make almost every kind of tool which has a handle to it." We saw chopping axes; broad-axes, hatchets, adzes, picks, sledge-hammers, hoes, cane-knives, Spanish-matchets, and a whole host of other tools passing through the different processes, from the rough-bars of iron and steel, until they were polished like glass, finished and packed ready for transporting to the sales office in New York.

On this occasion Mr. Osgood, the gentlemanly superintendent accompanied us and explained all the operations. The main building in which the axes are manufactured is a large stone structure, fifty-five feet deep, by one hundred and thirty in length, and three stories high; and to this, an addition of about one hundred feet is about to be added—thus indicating continued progress in the business. On the ground-floor are sixteen very curious and ingenious machines, for forging axes and hatchets, eight of which are generally devoted to the former operation. These were invented by Mr. Root, a most skillful and ingenious mechanic, now superintendant of Colt's fire-arm manufactory, at Hartford. One of these machines somewhat resembles a semi-rotative octagon box, "rough and ready" for work, and capable of performing wonders in its way. It cuts off a blank for an ax from a bar of iron, punches out its eye, forges it on the face, end and sides, into the proper shape, and completes it ready for being trimmed, to receive its steel edge, and all this in a few minutes. Adjacent to each machine is, a furnace, in which the bar of wrought-iron is heated, and from thence it is taken and laid on a proper bearing at one side; the attendant places his foot in a stirrup and makes the machine clutch with its driver, when it makes a semi-rotation, a punch comes down and cuts off the heated skelp designed for an ax. This is now set on edge, when another touch of the operative's foot brings the machine into action again, a punch descends from above and another from below, approaching and pushing through the solid metal, as easily as if it were a piece of cheese. Their motion, however, is arrested before they meet, and the hole which they have made forms the eye of the ax with a small piece of metal left in the center. An iron handle made for the purpose is now inserted in this eye, and the machine comes right down upon it, forcing out the small piece of iron left in the hole, thus forming an eye as superior to that of the common welded axes as can well be imagined. On the machine itself and anvil on which it strikes, are several dies of the exact size and form for the ax to be made, and by a very few blows, and two heats, it is forged into the required shape. Each machine is under the perfect control of the attendant, and by a touch of his foot he makes it executeevery motion—one man being capable of turning out three hundred and fifty axes per day. After the axes are thus forged in one of these machines, they are heated in a small furnace, their edges then trimmed and cut to the proper curve, ready to be split for receiving their tips of fine cast steel, which operation is executed in another building by blacksmiths. The cast steel for the edges is first cut into pieces of the required size for each tool, and then forged under the trip-hammer into the exact form. Each ax is now raised to the welding heat in a convenient furnace, its edge is split open with a wedge and sledge, and the steel tip at a white heat inserted in the split, after which a perfect weld is received under the trip-hammer. After the steel edges are thus welded on, each ax is hammered off and formed as accurately as possibly can be done under the hammer, when it is fit for the planing or shaving operation. This is executed by an ingenious power shaving-knife, which is under the perfect control of the attendant and is especially adapted for reducing rolling surfaces—not tools with flat sides. There are twenty-six of these shaving machines in the second story of the stone building, and any one of these iron barbers can shave down a rough ax to a pretty smooth face, in less time than the smartest disciple of Monsieur Tonson can scrape the countenance of a city gent. These machines are also the product of Mr. Root's busy brain, and are peculiar to this establishment. Prior to their application the axes were all ground, by which tedious, unhealthy, and disagreeable operation, the surplus metal was all washed away with the grit, but the shavings are now all saved and sold for scrap-iron. For some kinds of work, we think one of these machines would be found very useful in every machine-shop in our country.

After planing the axes, the next process through which they pass, in another apartment, is that of hardening. For this purpose, they are placed in a suitable furnace, in which there is a rotating iron wheel to receive them; and here they are heated uniformly, and raised to the proper degree of temperature required. Convenient to each furnace, for this purpose, there is a large bath, containing salt brine, to which a continuous fresh supply is furnished, and in it there is a circular revolving rack, with catches placed around it close to the surface of the pickle. The heated axes are now taken out of the furnace, and set, one by one, on the catches, with their edges left trailing in the hardening liquid. The next process which they pass through is that of tempering. This consists in placing them in an oven (on a rotating wheel, also), the temperature of which is regulated by a thermometer, and here they are kept for several hours, or until the metal is *toned* to that degree of elasticity and hardness which experience has decided to be the best for all practical purposes. These peculiar manipulations, which are exclusive to this establishment, ensure uniformly accurate results.

The next operation which they undergo is that of polishing on emery-wheels, after which their backs are dipped in a solution of asphaltum varnish; then they are hung on revolving frames, in a warm room, until they are perfectly dry, when they are neatly wrapped in a paper and packed for market. A most rigid system of inspecting every tool is pursued after every operation, and each mechanic places his peculiar mark on the article which passes through his hands; so that every defect found can be traced to its cause, whether it be in the metal itself or was effected by the operatives. From the great care exercised to ensure perfect workmanship, no wonder the tools of this company have acquired a very high reputation.

We have thus succinctly described the several processes and operations pursued in fabricating the "Collins axes." We believe this will be of great interest to most of our readers: for where is there a family throughout the length and breadth of the land in which there is not either an ax or a hatchet? We had intended to describe the different apartments in which the separate operations are executed; but we found that this rather tended to confuse the narration.

The Collins Company was the first which manufactured axes ground and polished, ready for use. Previously, most of the axes used were made by common blacksmiths, who used blistered steel for their tips, and who pursued no uniform system. The purchase of an ax in those days was like drawing in the lottery; the temper might be good, but it was just as likely to be either too hard or too soft—there was no uniformity in the quality of the axes sold.

We will now be brief with the description of other tools manufactured by this company, as it would require a volume to describe all the operations. There are several tools, however—such as hatchets—which are made in a similar manner, nearly, to the axes described. Sledge-hammers are made entirely of cast-steel, and great numbers are here fabricated for the miners of California, as well as those of other regions. Picks, in great quantities, for miners and railroad excavators, are also produced, in astonishing quantities. Coopers' tools, scorers for turpentine trees, and a countless variety of Spanish tools and instruments, are also manufactured. We were particularly struck with the great number of Spanish matchets produced. These are long knives—something after the "Roman sword" order. They vary in length, from twelve inches to that of a sailors' cutlass; some are sharp-pointed, some are blunt, some are curved, some straight, some narrow, some broad. In short, they are of all sorts and sizes. With their matchets, the Mexicans and other inhabitants of the same regions clear their paths through the tangled brushwood of forests, kill their cattle, cut down their corn, and sometimes flay one another, when they have nothing else to do. They are forged out of cast-steel, with a tang on each to secure the handle, which is formed of rings of horn or thick leather, placed over the tang, then submitted to severe pressure, by which they are squeezed so closely together that when they are afterwards ground and polished they have the appearance of being solid.

The picks, hoes, matchets, and most of the tools, after being forged, are ground down on stones, and afterwards hardened and tempered with the same care as the axes described. Quite a number of large buildings are required for all the different departments, and each particular article has its own allotted processes to pass through. We counted eighteen trip-hammers and as many forge-fires in operation in one shop, and a great number of grindstones, varying in size from two feet up to six in diameter. Every article, whatever is its name and character, undergoes the rigid inspection system by skillful mechanics, so that none may pass that has a flaw in it, and that the defects, if any, of every operation may be detected. A very fine finish is put on all the articles, and the emery and polishing-wheels employed are made on the premises.

As the water-power is abundant, and under the perfect control of the company, it is applied, for convenience, on no less than seven large breast-wheels and five turbines, scattered among the different buildings. Everything that can be done by water-power is carried out here in an ingenious manner. The water blows the bellows, turns the grindstones, swings the tilt-hammer, punches, bores—in short, does everything to save manual labor. The number of water-wheels will afford some idea of the extent of the premises and the power required to operate the machinery.

Collinsville is the terminus of the "Canal Railroad" (so-called from being partly laid in the bed of an old canal), which connects by a line of 38 miles with New Haven. The track passes through the village, dividing the shops, and the raw material is brought to the very doors by the iron-horse from New York, and the manufactured articles are as conveniently sent away to the

mart where sales are effected. It is a village of brawny Vulcans, the clink of whose hammers resound from morn till night among the surrounding hills. Its position is somewhat romantic. High hills ascend on the right and left; white cottages peep out from among green bowers on the elevations, and the Farmington river winds through the valley, sometimes sleeping in the sunlight, and again dashing in foam over crag and jutting cliff. A very strong bridge stretches across the waters, and unites both sides of the river by a good roadway. Although confined by mountains, Collinsville cannot be prevented from expanding east, west, north and south; and as the business is a staple in its character—a useful and permanent one—of course, Collins' axes and Collins' hoes will always be required while forests have to be cleared and corn grows.

## PHENOMENON OF THE FROZEN WELLS.

It is not only by her gold diggings that Vermont is just now attracting special attention from the outside world. The frozen well at Brandon is a great natural curiosity. It is situated on a gentle slope of ground, which rising on one side falls off on the other so moderately it may be called tolerably level. The soil is of a hard, compact, gravelly nature. The region round about furnishes marble (carbonate of lime) in abundance. Early in November last, Mr. Alexander Twombley commenced digging a well, and after going down about twenty-five feet without noticing anything unusual in the character of the soil, he came upon frozen ground (the surface earth at the time was frozen but a few inches). Continuing downward through this frozen earth for fifteen feet, he came to water. The soil, just at this point, he describes as yellowish and sticky. The water commenced freezing over soon after it was exposed. The well was stoned up three feet in diameter at the bottom, diminishing two feet at the top. The depth of water is five or six feet, the surface of it forty-one feet from the top of the ground. During the past winter the water froze over it so that it had to be cut by a person going down into the well every day, and some days the descent had to be made several times. The ice in the morning would often be three inches thick. In addition, the sides of the well, for a distance of fifteen feet above the water, would be encased with ice. The water ceased freezing over about the 15th of May last. The condition of the well on the 15th instant, when we visited it, was this: The water in the well is enclosed in a wall of ice six to eight inches thick, inside the stone wall, but not rising above the surface of the water, and affording a good foothold to a person once down there. For six or eight feet above the surface of the water the stone wall is encrusted with a layer of frost and ice, not thick. The water is clear, cold, and tastes well; it is not very "hard." The above facts proven, how shall the phenomenon be explained? The causes lie evidently in some peculiarity of the soil in that locality. Suppose we take into consideration several well-known facts. Chloride of calcium, with snow or ice, forms a powerful frigorific mixture. This chloride is formed by a union of carbonate of lime (marble) with muriatic acid, which is made from common salt. Chloride of calcium exists in solution in ocean waters, and also in certain spring waters, commonly in union with salt and chloride of magnesium. As before stated, the region about the well abounds in marble, or carbonate of lime, and quite likely this water may be from one of the springs saturated with chloride of calcium which snow or ice will form one still more powerful; why may not the chloride, supposing it to be present, with salt, perhaps suffice to freeze water, naturally cold by reason of its depth from the surface? If it is claimed that frigorific mixtures do not solidify, may not the above ideas point the way in which to look for a probable solution of the mystery?—*Springfield Republican.*

[If the conclusions of our cotemporary are correct, the fact can be demonstrated to perfection by an analysis of the water. But without taking the trouble to do so, it is our opinion that the chloride of calcium in the soil is not the cause of this ice phenomenon in the frozen wells of Vermont, because, if this were the case, the waters could not be used on account of their intensely bitter taste. The chloride of calcium has a very great affinity for water and is very soluble; now, as our cotemporary makes the statement that the waters of this well are not bitter (they taste well) and not very "hard," they surely cannot contain much, if any, chloride of calcium—not enough, we think, to produce this freezing phenomenon. It has been reported that Dr. Jackson, of Boston, has visited this well, and will make a report of his examination at the next meeting of the American Association for the Advancement of Science.—EDS.]

WILCOXSON'S STEERING APPARATUS.—We have to state, in addition to what we published last week, that the above apparatus is made with one screw as well as two for smaller ships, and the captains of some lake schooners, who have them in use, say they are the best steering apparatus they have tried.

## TUNGSTEN STEEL.

We have noticed a paragraph in the columns of several of our cotemporaries to the effect that the German metallurgists have discovered that the metal "tungsten" mixed with steel, in the proportion of eighty of the latter and twenty of the former, forms a very valuable alloy, *harder* even than steel itself. They also state, that in consequence of this discovery, old tin mines that have been worked out will be again brought into use for the sake of their tungsten ores, that were heretofore considered valueless.

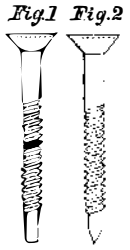
It is not stated who the metallurgists are that have made this discovery, but we suspect it is not of so much importance as is stated. When it is said that tungsten makes an alloy harder than steel itself, the expression is too indefinite, because steel can be made quite soft, and from that point made to every degree of hardness, up to engraving on glass, like the diamond itself. To make steel harder than can now be done is scarcely a desideratum, and unless tungsten imparts to it some other qualities, it will never be much employed as an alloy.

The ores of tungsten are very scarce in our country. In combination with iron it is called *wolfram*, and is found in Monroe, Conn., and one or two other localities. No use of this metal has hitherto been made in the arts.

## A BRAD-AWL SCREW.

Alexander Pilbeam, of London, is the inventor of the screw which the accompanying illustration represents, Figs. 1 and 2 are side-views of the screw, the ends of which terminate like a brad-awl; in use it merely requires to be stuck with the hammer to drive the brad-awl fast into the wood, and then the screw-driver, applied and it will be found to enter the wood as quickly, if not quicker than the ordinary screw (which requires a hole to be made for it first) and is much more secure. As the fibers are broken away by the brad-awl part, they arrange themselves between the threads of the screw; and it will also be seen that, by being able to use the screw direct, one half of the labor is saved. They can be made of all sizes, and applied to hooks, studs, and rings, and anywhere that a screw is necessary.

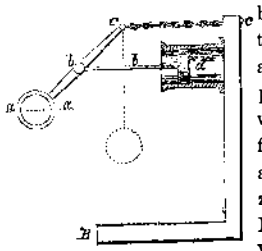
*Fig.1* *Fig.2*



## PHOTOGRAPHIC PORTRAITS AS SIGNS.

The following interesting decision was lately given in England:—A Mr. Mills was charged with wilfully destroying two portraits and the glass of the case in which they were exhibited on the street; damage, two guineas. One of the portraits was that of defendant's wife. The defendant expressed his annoyance at his wife's portrait being exposed to public view; and added that he had protested against it, and requested it might be withdrawn. His request was not noticed, and he certainly did destroy it, as stated. Mr. Broughton, magistrate, gave judgment. Whether an artist, an ale-house keeper, and any other people, all being alike to the law, might, after notice, seek to attract customers by hanging up a portrait of his neighbor's wife as a sign, was at least very questionable; but even if the exhibition was a nuisance, which the law would abate, it was clearly unlawful for the defendant to redress his grievance by violence. He must, therefore, pay for the the damage done; but, inasmuch as the exhibitor was entitled to no sympathy, the amount must be limited by a rigid estimate.

PROBLEM IN DYNAMICS.—A correspondent takes the accompanying figure from the London *Engineer*, and puts this interrogation to us:—Suppose the piston, *d*, to be pressed by a force of two tuns, and the lever raised to an angle of 45° from its perpendicular, what will be the weight of *a a* to balance the force in the cylinder, and also the forces on the horizontal lines *a a*, *b b* and *c c*; B being the base? *Answer:* Weight, two tuns; force on line *a a*, one tun; force on rod *b b*, two tuns; force on line *c c*, one tun.



THE Fourteenth Annual Fair and Cattle Show of the Chenango County Agricultural Society will be held at Norwich, N. Y., September 20th, 21st, and 22d.

## AN INTERESTING ESTABLISHMENT.

During a recent visit to the great metropolis, we had occasion to admire the elegant fire-proof building whence issues the New York *Daily Times*. Adjoining this superb edifice is an immense brown-stone structure, one of the finest in the city, which forms a sort of religious, scientific, literary, and political center; as from it issues weekly the *New York Observer*, the *Century*, and that well-known and deservedly-popular journal, the SCIENTIFIC AMERICAN. It also contains the editorial-office of that excellent Democratic journal, the *Daily News*.

We were very much interested in visiting the offices of the SCIENTIFIC AMERICAN, which are the finest of the kind in the world. Here we found Messrs. Munn & Co., with a large corps of scientific persons around them, preparing matter for their journal, and executing drawings and specifications for new inventions previous to taking out Letters Patent. We had no previous idea of the extent of their business in this line. They have the finest collection of mechanical models outside of the Patent Office. It is altogether a curious and interesting place, and is well worthy of a visit from every one. These gentlemen have recently issued a very neat pamphlet of advice to inventors, which they circulate free.

[We clip the above item about ourselves from the Hartford (Conn.) *Daily Post*. We have to thank our friend Scofield for discovering us while on his visit here; we enjoy such notices very much.—EDS.

## SLEEP OF PLANTS.

Plants sleep as well as animals; the attitude that some of these assume on the approach of night is extremely interesting to those who delight to study the beautiful phenomena of vegetable life. Some plants exhibit signs of sleep more marked than others. The leaves of clover, lucerne, and other plants close as the sun approaches the horizon; and in the honey locust this characteristic is particularly striking and beautiful. The delicately formed leaves close in pairs at nightfall, and remain so until the rising of the sun in the morning, when they gradually expand to their fullest extent. It is in common garden chickweed (*stellaria medica*) that the most perfect exemplification of the conjugal love and parental care of plants is observed. At the approach of night the leaves of this delicate plant, which are in pairs, begin to close towards each other, and when the sleeping attitude is completed these folded leaves embrace in their upper surfaces the rudiments of the young shoots; and the uppermost pair (but one) at the end of the stalk are furnished with longer leaved stalks than the others, so that they can close upon the terminating pair and protect the end of the shoot.

STOCKS OF RIFLES.—A patent has been taken out in England, by G. P. Evelyn, for an improvement in gun-stocks, called "the under-arm gun-stock," which we think deserves the attention of our gunsmiths, as it is an application of art in a direction which has been overlooked in a great measure. The new gun-stock is capable of being modified to suit various descriptions of fire-arms, and its object is the attainment of the following results: First, it is adjustable, so that persons of various hights, length of arm and neck, are enabled to use the same weapon with equal facility; second, it is arranged so as to avoid lowering the head in taking aim, and thus it ensures greater accuracy. Our gunsmiths seem to have no fixed principles to guide them in the construction of gun-stocks. This is an inviting field for improvement.

LONDON TRICKS OF NATURAL SCIENCE.—It is stated in one of our London cotemporaries that a number of persons in that city earn their livelihood by painting common birds to represent some rare and foreign sort, or who invent non-existing breeds. The more outlandish a bird is made to look, the more chance there is of selling it. A vulgar rat was once transformed into an elegant microscopic dog for a lady's pet; for a few weeks the little quadruped enjoyed the care and caresses of the admiring mistress, till the growth of its claws enabled it to take a promenade by means of the curtains to the ceiling.

RISING IN THE WORLD.—As an evidence of what industry and perseverance will do, it may be stated that the Hon. Solon Borland and Hon. Jere Clemens have risen, by successive stages, from United States senators and ministers plenipotentiary until they have reached the editorial chair; and they are now associated in the management of the *Memphis* (Tenn.) *Enquirer*.