garden of Eden was so happily planted, and Adam was so perfect, that all his wants, as soon as felt, were satisfied, and he had no use for an inventive faculty. But a change came, and the garment of fig leaves was invented—an invention the first among men—and the rude prototype of all the strangely fangled notions of tailors and milliners. When the human family increased beyond the narrow limits of a tropical climate, or perhaps in Eden, when winter came on, they invented for themselves more perfect garments from the bark of trees and the skins of animals. The arts of preserving food and building houses must have been very early learned, and the improvements in food and raiment must soon have culminated in the invention of roast beef and breeches, which may still be received as symbols of our greatest perfection and of our exaltation above the brute creation.

Many people think that if they only had enough to eat and to wear, and at the same time had nothing to do, they would be happy. These are foolish people, for they do not understand how and why nature exacts labor. It is only after laborthatbread tastes sweetest, and raiment is most becoming. Some of our paupers are practical illustrations of these do-nothings; they incapacitate themselves for labor by the practice of laziness, and the State gives them enough to eat and to wear, and they have nothing to do!

Besides the necessities of victuals, clothes and labor, there is perhaps a necessity of amusement or recreation for the senses; the ear needs music; the nose, fragrant odors; the eye, gay colors; the tongue, spices, &c. These wants open a wide field for invention; they call into action the talent of such as Beethoven, Piesse, the French milliner, and the great and lamented Soyer.

A New Instrument for Taking Horizontal and Vertical Angles.

Mr. Abel Ware, of Athens, Maine, recently obtained letters patent on a new surveying instrument, one of which he exhibited at our office a few days ago. As a piece of workmanship it is exquisitely fine, and the improvements which the patent secures appear to be of much importance in furnishing a cheap and portable instrument, which are both *desiderata* to the practical surveyor. The object of the invention is the production of an instrument which is adapted to the measurement of both vertical and horizontal angles, and is much more simple in its construction and less expensive than the theodolite, while it is capable of performing the work of the transit and of the circumferentor, though its cost does but slightly exceed that of either of these instruments, thus meeting a long-felt necessity for an instrument which shall be cheap, compact, portable, and sufficiently correct to supply the ordinary requirements of the land surveyor in taking both vertical and horizontal angles. To effect this purpose, the several parts of this instrument are combined in such a manner that by the use of but one graduated limb or circle and rotating vernier plate or carriage with its sights or telescope, both horizontal and vertical angles can be taken. The inventor will be happy to give further information in regard to his instruments upon being addressed as above.

Americans at Sevastopol.—When this city was besieged by sea and land, a few years since, the Russians sunk a large fleet of war vessels in the river and harbor, to prevent them falling into the possession of the British and French, and also to render the river unnavigable. After the Crimean war was concluded, our countryman, Colonel Gowan, made a contract with the Russian government to raise the sunken vessels and clear the channel of the river. For several years he has been engaged in fulfilling his contract, and has, by the latest news, rendered the river once more navigable. He employs daily about 200 men, who, with his clerks, &c., occupy the naval arsenal, which was converted into a rendezvous specially for them. The operations connected with the raising of sunken ships, &c., are on a large and grand scale; by the improved apparatus which Colonel Gowan uses, his principal divers being able to remain in 22 fathoms of water for the space of four hours; and though the operations have extended over four years, only one accident has happened, and that was the drowning of one of the divers in consequence, of one of the air pipes bursting under the pressure of the air, which was being pumped into it. It is supposed that Colonel Gowan's operations will yet occupy two years.

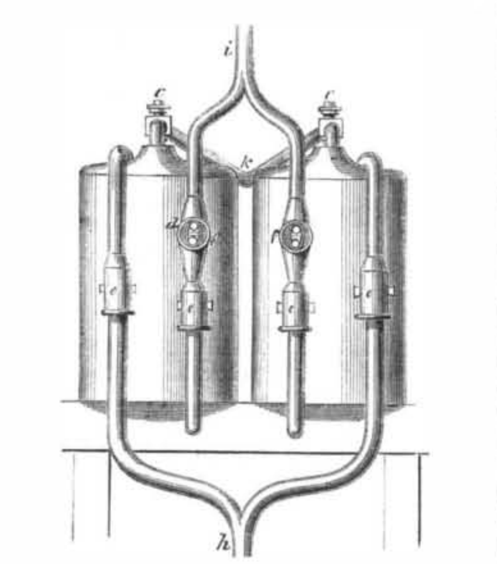
ROMANCE OF THE STEAM ENGINE.

Article VI.

SAVERY—SHIP'S INDICATOR—STEAM FIRE-ENGINE.

After the Marquis of Worcester, the next steam inventor of prominence who appeared on "the stage of time" was Captain Thomas Savery, also an Englishman. This was about thirty years after the noble Marquis had been laid to rest at Ragland Castle. Very little is known of Savery as a man, but he published a pamphlet in which we have a record of his mechanical and inventive abilities. It is certain that he possessed considerable wealth and that he had acquired a thorough practical knowledge of mechanics. In 1718, no less a personage than the great Sir Isaac Newton made a report to the government on the practicability of a machine invented by Savery for measuring a ship's way at sea, which, from the description, appears to have been principally composed of a set of blades placed on a vertical spindle set down under a ship's bottom, and which was revolved by the water. It communicated motion to an indicator through a train of gearing, like that of a gas meter. Captain Savery also constructed a fire-engine and exhibited it before King William, at Hampton Court, and the monarch was highly pleased with its performance. At this period Newton was president of the Royal Society, and all matters of science and mechanics were treated before that body with profound respect. To this institution Captain Savery carried his invention, and in its transactions is a record of an experiment made with it before its members, in their apartment. It is stated to have been quite successful, but we are not left in doubt as to what the engine was, as the accompanying engraving is a representation of it, taken from the printed volume of proceedings for the year 1699.

In the illustration, *k* is a pipe which conducts the steam from a boiler, left out of the figure to render the



explanation more clear. The steam passes into two receivers similar in form to retorts. A pipe, *i*, branching from each of these vessels is inserted into their bottoms; *e e d f* are valves opening outward and preventing—by their action—the return of any water that may have been forced through them. A pipe, *h*, proceeding from the cistern also branches to both receivers, and is inserted into the top of each. Valves are placed at *c c*, by which a communication may be opened or shut off with the boiler, alternately, accordingly as they may be adjusted—one being open when the other is closed.

Steam from the boiler being permitted to flow first into either of the receivers, the water which that receiver contains is forced by the steam pressing upon its surface, up one of the branches of the pipe, *i*, and when the vessel is thus emptied ofthe water and filled with steam, the valve, *c*, is closed, and communication with the boiler cut off. Cold water is then suffered to flow over the surface of the vessel, which thus condenses the steam within and forms a vacuum. The pressure of the atmosphere now forces water from a cistern or well below up the pipe, *h*, into the empty vessel. At the instant steam was shut out from one receiver it was admitted into the other, by turning the other steam valve, and then the water was forced from it up the pipe, *i*, during the period that condensation was being effected in the other vessel, and so on, as has been described. In this manner, by the employment of two close vessels standing in the same relationship to one another as the two cylinders of a common fire-engine, first by the pressure of steam and then by its condensation alternately in each vessel, a constant column of water was raised from a cistern and forced to an elevation proportionate to the pressure of the steam. This was certainly a direct steam engine, and was recommended principally for raising water from mines. It would, and did, do this, but not economically, although it exhibited much ingenuity. Its inventor was rather despised than appreciated by the owners of English mines, for whose benefit it was chiefly designed. Subsequently he added several improvements to this engine, which will be illustrated in our next article on this subject, together with a further account of this very worthy inventor.

MECHANICS, ATTENTION—TURNING TOOLS.

The proper shape of a tool employed for turning metal can only be determined by experience, aided by a philosophical knowledge of the laws which govern motion. The relation of the curve or straight line to the ends desired to be attained must be as carefully considered as that of any motive agent whose action is correspondingly valuable to man. A tool which has merely a very sharp and hard edge will not accomplish the same useful results as one which is constructed upon philosophical principles, with respect to its shape and position. It would save a great deal of time and expense in machine shops if a more correct knowledge generally prevailed among those who forge tools, so that they might form them as nearly right as possible while "the iron is hot." Much valuable time is wasted in grinding down tools to the proper shape after forging, a great deal of which time might be economized.

If we consider the first principle of a cutting tool, we shall find it to be that of the wedge, and that in its performance it separates the atoms comprising a whole by cleaving them asunder with more or less force, as its shape is correct or incorrect; but the way in which the action of that wedge is to be applied is the secret of the whole art of tool making. Speaking of tools, we do not in this connection recognize any but roughing tools.

Let us suppose a round shaft to be in the lathe, and the tool applied to it; the first consideration is whether the one in hand is such as to act with economy, and produce good workmanship. The surface of the shaft is to be turned down one-fourth of an inch, and it is a well known law that all revolving bodies throw off at a tangent with their circumferences whatever is loosely attached to or detached from their surfaces. In obedience to this law, the object to be attained is to turn the surface of the iron so that its refuse will run in a tangent. Now, supposing the tool to be moving laterally, as it does in operation; if the edge be inclined at an angle of 45°, the "chip" will first endeavor to pass off at a tangent, but, as it meets with resistance from the cutting edge and the surface, it will deviate from that direction, and, running down the angle of 45°, a corrugated and very brittle chip is produced. If we alter the edge of the tool so that its point reaches high above the "centers" of the lathe, and set its angle sloping partially, instead of arbitrarily to the right, while its cleaving edge forms a tangent (or nearly one) with the circumference, the chip produced will run off the tool in a true spiral, and vary but slightly from the path we claim it should travel. In the first mentioned instance, the turning produced, although apparently even and true, is not and cannot be so even and perfect as that produced by the second tool set forth. The fact of the cutters being high above the centers of the lathe prevents the work from rolling upon and "chattering" it, as it is called. Moreover, by testing the heat of the two chips, produced as described, as they leave the tool, it will be found that the last-mentioned is not so hot—consequently the tool worked with less friction on the metal, and therefore less power was required to drive the work. When we consider this fact, we directly recognise its great value; for, if we admit that one instrument is more economical of power than another, we must admit that the freest working one will remove more iron in a shorter space of time. From this recognition, the pecuniary value of the instrument becomes evident.

But in discussing the quality of tools which have keen edges and cut "clean," we do not allude to "fancy tools," made merely for experiment. It is only the practical advantages to be derived from an experiment that makes it valuable ; by the form of the chip taken in working his lathe, we can, in some measure, judge of a craftsman's skill.

A revolution in the shape of cutting tools is gradually taking place in our best machine shops ; ten years ago the "diamond point" was regarded as the *ne plus ultra* of roughing tools, but those now in use are very different in shape, and are difficult to describe without illustrations.

Every man, of course, makes his tools to suit himself, but as each handicraft is improved by individuals composing it, we ask the attention of our workmen to their cutting tools, and try what progress can be made in this direction.

CAN WATER BE USED AS FUEL?

It is quite a common belief that water thrown on a fiercely raging fire acts as fresh fuel to the flames, and makes the fire hotter. A little consideration of the nature of water, and the laws of combustion, will show that this belief is an error.

Water, for neutralizing heat, is far more efficient than any other substance. Thirteen pounds of water, at 212°, in changing into steam, will practically extinguish all the heat from the burning of a pound of coal ; a thermometer placed in the steam will not be raised a single degree, although, in fact, heat enough is generated by the burning coal to melt nearly ten pounds of cast iron. Nothing will put out a fire so quick as water.

But it is said that water may be decomposed when thrown on the fire, and that then it will burn ; this is nearly the truth. The water may be decomposed, but not in such a way that the oxygen of the water can assist in the burning of its hydrogen. The separation of the elements of water requires and consumes a great heat ; the oxygen of the water combines with its equivalent of carbon, and so much carbon is, in effect, taken from the fire and produces no heat. When the water is thus decomposed, an equivalent of hydrogen simply takes the place of its equivalent of carbon, and gives out in burning precisely the same amount of heat as is attainable from the carbon. Of course, as hydrogen is a gas and carbon a solid, the decomposition of water in a charcoal fire would give a flame where otherwise there would be none.

Now, if these facts be put together, we arrive at the practical conclusion that if water be thrown on a fire, in the first place a great deal of heat will be consumed in converting the water into steam ; and, in the second place, that if any of the steam is decomposed, the hydrogen set free will be at the expense of its equivalent of carbon, and can, in burning, produce no more heat than the carbon.

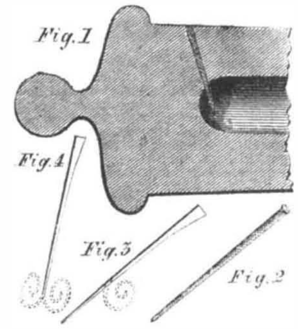
Manufacturing Iron Ship Plates.

The following graphic description of manufacturing the iron plates for the English war steamer *Warrior* is from the London *Engineer* :—

The tests which were applied to the plates furnished by the builders of the *Warrior* were of the most trying character. Some plates were fired at with 68-pounders, at 200 yards' range, and were literally cut in halves by balls fired one after another on a line drawn on the surface, each ball striking immediately below its predecessor. Upon some other plates the balls made a circular indentation upon the surface, nearly as deep as the plates, exactly of the form of the projectile, and as though a mold had been taken of it in some soft and yielding substance. It was only after repeated trials that it was decided that the plates should be of annealed scrap iron. The labor involved in building up these plates is enormous. In the first instance, small scraps of iron are thrown into the fires, and, when in a state of red heat, are subjected to severe hammering, under the steam hammer, until the whole is beaten and amalgamated into a solid mass of about half a tun weight. This lump is then placed on the top of a similar mass, the whole made red hot, and hammered and welded together. Repeated additions of this kind are made until about five tuns of metal are thus welded together in one huge shapeless body. This is then brought to a glowing white heat, and placed under the huge hammer, the thundering blows of which gradually reduce it into shape. Again and again the enormous slab is put into the furnace and hammered into one piece of 15 feet long, 3 feet wide and 4½ inches thick. From ten to a dozen men are engaged in the work of moving these ponderous masses of iron, which are moved about apparently with the most perfect ease. Powerful cranes swing the molten mass from the furnaces to the hammer ; a nicely adjusted balance is provided by a massive iron lever, one end of which is welded into and forms part of the metal, and this is provided with a dozen or more of horns or handles, by which the iron can be turned in any direction ; for the plates are not only hammered on the broad surface, but at the sides and at the top and bottom. The plates, after having been roughly formed into shape, are completely planed and squared. Planing machines of enormous size hug these plates in their resistless arms, and bear them slowly and silently under the sharp cutting edges of the tools, and thin shavings of the metal, which, as they are cut, coil up in long bright ringlets of iron, attest the tremendous power of these noiseless and all but omnipotent machines. When the edges and surfaces are made perfectly smooth, like the finest work of the cabinet maker, the plates are placed on an end, gripped firmly by a mortising machine, and, as they travel slowly backward and forward in the framework against a small tongue of steel, a groove of about one inch in width and depth is formed, into which the corresponding projections formed on the side of another plate will fit with the most perfect accuracy, the plates all being made to dovetail on each of the four sides.

Mode of Spiking Cannon.

From the number of inquiries which which have been put to us since Colonel Anderson spiked the cannon at Charleston, as to the way "spiking" is done, we are led to believe that a large majority of persons are ignorant of the process. To enlighten such, we have had the annexed views engraved to illustrate the plans most usually adopted. Fig. 1



represents a longitudinal section of a cannon, with its priming hole spiked with a small rat-tail file, as shown in Fig. 2. The steel is driven hard down, as far as it can go, and then broken off even with the surface of the barrel. The steel is so hard that it cannot be drilled, and so rough that it cannot be forced out, and is, therefore, the best material used. Figs. 3 and 4 show two forms of wrought iron spikes, which assume the position shown by the dotted lines when used, and thus cannot be withdrawn without much difficulty.

The Mechanism of the Horse's Hoof.

The hoof of a horse is considered as an epidermic appendage—similar to nails and claws of other animals, and scales of fishes, which are produced, in the first instance, by the growth of cells, the contents of which gradually evaporate, so that the walls of ths same gradually approximate each other.

In the upper part of the hoof—near its matrix (mother)—these cells are to be observed; they are somewhat flattened against each other, but still retain a rounded form.

The hoof, nails and scales, are not traversed by nutrient vessels nor absorbents, as is the case in regard to the sensitive tissues; and the flattened cells, when fully developed, undergo but little change.

The chemical analysis of the constituents of the hoof are as follows;—

Carbon	52 parts
Hydrogen	7 "
Nitrogen	17 "
Oxygen and sulphur	14 "
Total	100

—*American Stock Journal.*

Water Gas and the Emperor's Heart.—Baron Gudin, the French marine painter, describing to the Liverpool Social Science Association a gas and water apparatus, happened to say: "The Emperor is my friend, and I know the very bottom of his heart." At these words, Lord Brougham, who was in the chair, smiled and shook his head ; and, at the conclusion of the Baron's remarks, whileeulogizing his talents as an artist, added: "But, with reference to this great discovery—I don't mean that of the bottom of the Emperor's heart, but of the gas and water apparatus—I hope we shall soon hear more." These words, delivered in the noble Lord's dryest manner, excited roars of laughter, which seemed to puzzle Baron Gudin immensely.

Professor Newbury thinks that artesian wells cannot be bored to any advantage in Ohio. The well in the State House yard at Columbus has reached a depth of 2,775 feet (or over half a mile), and yet the water will not rise above the surface ; and even if water shall be got, the Professor says it will be warm and salt, and so unfit for use.

Our Correspondence.

A Sign of Prosperity.

Messrs. Editors:—In your issue of last week, you say "the mechanical and manufacturing industry of the country is at a standstill." This is no doubt the case to a considerable extent, more especially your way, but much less this way.

The factories are all quite busy in the "City of Spindles," having just made up their accounts and declared good dividends (payable on demand), and are buying large invoices of cotton at a low figure. Some of them have immense orders on hand. Our mechanical establishments are, as a general rule, doing more now than they were one year ago ; indeed, several of them are doing more than double. Some of them run three nights per week until 12 o'clock.

I learned of one business firm in your city who received, within a week or two, the largest order they have ever got, and find no difficulty in doing business except in the stringency of the money market. It seems to me that all ought to endeavor to do all in their power to restore confidence. The country was certainly never in a better condition—want of confidence alone excepted. Our farmers all through this section have raised unheard of crops of wheat, corn, rye, oats, potatoes, and fruits of nearly all kinds. Wages have been good, and are good now. Farmers are advertising for help, and everybody about here seems to be busy. A. M. S.

Lowell, Mass., Jan. 1, 1861.

[We are glad to learn that dullness in trade is not supreme in all sections of our country. If our political differences could be composed, joy would fill the hearts of all our people, and prosperity would crown the labors of all. Confidence will not, however, be restored until our national affairs are settled in some form.—Eds.

Prospects in Mississippi.

Messrs. Editors :—Inclosed I hand you $10 for five years' subscription to your valuable paper, which I cannot do without, even if the Union is dissolved. I was pleased to see the stand you took in regard to taking the notes of suspended banks in payment of subscriptions and money due you, and I shall tell everyone that I sent such money to you for five years' subscription. The Southern banks are as solvent as ever, and in a short time exchange on New York will be drawn at its usual rate, say from par to one cent discount, and I hereby proffer my services to you, if I can aid you, in getting such money as you may take converted into exchange on New York, at living rates, of which time I will advise you. Pardon me for intruding a long letter upon you ; but knowing that you do not dabble in political matters, and believing that political newspapers generally do not represent the true feeling of the people, is my excuse for writing thus much. The South is comparatively easy, being an agricultural people and raising enough to eat, an ample cotton crop selling at good prices, and, as a people, nearer out of debt than they ever were, they are snugly fixed up to secede from the Union without feeling it much.

Your friend and ob't servant, W. J. L.

Okalona, Miss., Jan. 1, 1861.

[It does us good, in these exciting times, to receive such solid and cheering evidences of kindly good will from our Southern friends. So long as the peace of the country is secured, our resources are ample and our people will be happy.—Eds.

The First American Locomotive.

Messrs. Editors:—An inquiry is going the rounds in relation to the first railroad built in the United States. A locomotive was placed on the eastern portion of the road from Carbondale to Honesdale, Pa., previous to 1830 ; but when the road was built, I do not know. I was there in the summer of that year, and saw the locomotive, which had been taken off on account of the road being so slenderly built. It was not a passenger road. A. H.

Schenevus, N. Y., Jan. 2, 1861.

At the Augusta (Maine) bridge, a novel mode of transit for winter teams has been adopted. A track is laid the entire length of one carriage way, and a large platform car placed thereon, so constructed that a loaded sled can be driven upon it and easily drawn over.