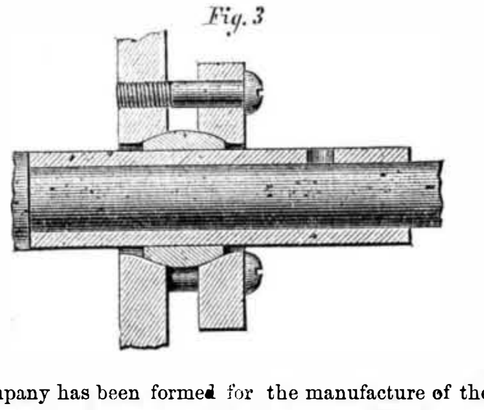
This invention, which we regard as one of much interest, both in a scientific and practical point of view, is covered by two patents, dated, respectively, Oct. 23, 1866, and Dec. 22, 1868. A patent has also been secured in England through the Scientific American Patent Agency. The inventor, Patrick Clark, of Rahway, N. J., is well known in the field of mechanical invention.

Fig. 3



A company has been formed for the manufacture of these blowers, under the name of the "Rahway Manufacturing Co.," at Rahway, N. J., to whom all inquiries should be addressed.

VISIT TO A STEEL MANUFACTORY.

A writer in the *Atlantic Monthly* for March gives a very graphic account of the manufacture of steel by the Bessemer process, which we copy.

"Our entire party thronged the building, some passing directly to the floor of the casting house, while others mounted the high platform of the cupola furnaces, to see the beginning of the famous 'Bessemer process,' used in the manufacture of steel at this establishment. For me, who knew nothing of steel-making except by the old-fashioned, roundabout methods, this new 'short-cut,' as it is fitly termed, possessed a surprising interest. Laborers were casting into one of the furnaces barrow-loads of coal and pig, each fragment of which had been carefully examined, for not every quality of iron and anthracite can be used in this process. The molten metal was run off into a huge bucket, weighed (for precision as to proportions is also necessary), and finally poured like some terrible, fiery beverage, a soup of liquid iron, into the stomach of a monster with an egg-shaped body, and a short, curved, open neck, resembling some gigantic plucked and decapitated bird. In place of wings a pair of stout iron trunnions projected from its sides. Upon these it was so hung that it could be set upright or turned down on its belly. It was down, receiving its pottage, when we first saw it. Presently it was full-fed—five tuns of molten iron having been complacently swallowed. Then, moved by an invisible power, the creature, slowly turning on its wings, sat, or rather hung, upright. 'Now they are going to blow,' said our guide.

"In the casting-room below, immediately beneath the monster, was a semicircular pit, round the side of which was ranged a row of smaller iron vessels, reminding me of Ali Baba's oil jars, each capable of containing a bandit. Or, if we regard the large bird as a goose, these may be called goslings. They were all sitting on the bottom of the pit, with expectant mouths in the air, waiting to be fed. But the mother's food was to undergo a remarkable change before it could become fit nutriment for them. Iron ore, besides containing silicium, sulphur, and other earthy impurities, is combined with a large proportion of oxygen. The smelting furnace burns out the oxygen, and removes a portion of the impurities, but only to replace them with another interloper—carbon, absorbed from the coal. Cast iron contains from four to five per cent of carbon; steel, only about one quarter as much, or even less, according to its quality. To refine the crude cast iron, eliminating the excess of carbon, and yet retaining enough to make steel—or to reduce it first to wrought iron (or iron containing no carbon), and then to add the proportion required for the tougher and harder metal—seems simple enough; yet the various processes by which civilized men, from the time of Tubal Cain, have aimed to produce this result, have hitherto been slow, laborious, and expensive. Bessemer's method of doing this very thing on a simple and grand scale was what we were now to witness.

"The moment the monster was turned upright he began to roar terribly, and to spout flame in a dazzling volcanic jet, which even by daylight cast its glare upon the upturned faces of the spectators grouped about the floor of the casting-house. As we had seen only molten metal enter the 'converter'—so the huge iron bird is called—the appearance of such furious combustion was not a little astonishing.

"'In the bottom of the converter,' said our guide, shouting to make himself heard above the roar, 'there are tweers which admit a cold blast of sufficient force to blow the molten iron all into spray. This brings the oxygen of the air into contact with every minute drop of the metal, and what took place in the smelting-furnace is reversed; there the carbon helped to burn out the oxygen of the ore, now the oxygen comes to burn out the carbon.'

"'But what,' we shouted back, 'prevents the oxygen from playing the same trick the carbon played before?'

"'That is just what it will do if the blast is continued too long—the iron will oxidize again. But the oxygen has a stronger affinity for the carbon and other impurities than it has for the iron, and doesn't begin on that till those are burned out.'

"'I see: you shut off the blast at a moment when just enough carbon remains to make steel.'

"'Not exactly, though that is what Bessemer spent a great deal of time and money trying to do. But he found it impossible always to determine the time when the blast should be stopped, and often too much or too little carbon left in would spoil the product. So he changed his tactics. You will notice that we first burn out all the carbon; that is done in about fifteen minutes. You see that man in green glasses, on the little platform over in the corner, watching the flame from the converter? The instant he sees it lose its dazzling colors and become pale, and decrease, he knows the last of the carbon is burning, and the blast is shut off.'

"Meanwhile it seemed very wonderful that molten metal should contain fluid enough to make so furious a fire; nor was our astonishment diminished when we were told that the cold-air blast actually raised the temperature of the mass from 3,000° to 5,000° Fahrenheit during the brief process.

The blast shut off, the converter was turned down on its belly again, in order to prevent the metal from running into the tweers, now that the pressure was removed. 'The iron,' said our guide, 'is left by the blast decarbonized, and in a slight degree reoxidized. It also contains a little sulphur, after all its doctoring. Now we add a certain quantity of pig iron of a peculiar quality—either Franklinite or Spiegeleisen will do—containing a known percentum of carbon and manganese.' The dose was poured into the monster's throat, and a violent commotion in his stomach ensued, accompanied by a copious outpouring of smoke and flame. After a minute or two all was quiet. The new ingredients had burned out the oxygen and sulphur from the mass—just enough of the freshly introduced carbon remaining unconsumed to take up its permanent lodging in the metal and make steel.

"The contents of the converter were now poured into a huge ladle swung up under it by the long arm of a crane worked by invisible power, and afterwards discharged into the open mouths of the smaller monsters in the pit. These were, of course, merely molds; and into each was cast an ingot of steel weighing some six hundred pounds. The metal was discharged from the bottom of the ladle, and thus kept separate from the slag, which floated on its surface and was retained until the last. In twenty-five minutes from the time we entered the building we had seen five tuns of pig iron 'converted,' and cast into six hundred-pound ingots of steel.

"Having given one glance at Bessemer's method of lining his ladles and converters, to enable them to resist the intense heat of the charge, and another at the hydraulic machinery by means of which a lad on the little platform in the corner could rotate the converter, and lift ladles and ingots, doing the work of fifty men, we passed on to the rolling mill, where each ingot is heated and hammered (the enormous steam hammer coming down upon it with a resounding thump), then reheated, and rolled out into a rail, to be sawed off red hot at the right length (twenty-five feet) by a pair of shrill circular saws that do their work neatly and swiftly, as if the steel were soft pine, and the pyrotechnic spark-showers thrown out mere sawdust. Lastly, we saw the strength of a rail tested under repeated blows from a V-shaped tun-weight of iron dropped upon it from a hight of eighteen feet; and came away inspired with a high respect for Bessemer, both as an inventor and a public benefactor."

Soft Solder Silver Plating.

The art of plating metal upon metal, or, so to speak, metallic veneering, is very widely practiced, and is of great utility, both in the industrial and ornamental arts. The variety of metals capable of being plated on to the surface of other metals is very great, and the methods of applying them differ accordingly. Silver is the most universally applied metal in plating, and I propose to give a short, practical account of two of the least known methods of silver plating.

The four principal methods of silver plating, placed in the order of their cost and durability, the first being the cheapest and least durable, are (1) electro plating, (2) rolled-metal plating, (3) close plating, and (4) hard solder plating.

Electro plating is generally so well understood, that it would be superfluous to enter into that subject here. Rolled metal plating can be dismissed in a few words, it being simply brazing together a thin ingot of silver and a thick ingot of the metal desired to be plated, and rolling them out in the usual way of rolling sheet metals. Close plating, or soft solder plating, is an art which is very little known or understood beyond the trade itself and its immediate connections. The work is of such nicety, and requires such a high degree of manipulative skill, that not more than four out of every ten who are apprenticed to it make thoroughly good workmen. Silver plating is not an unhealthy occupation, although until of late years the workmen were not remarkable for steadiness and sobriety; several attempts have been made to establish a provident society among them without success, but it is to be hoped that this will soon cease to be a matter of reproach to them. The principal seats of the plating trade are Birmingham and Walsall, the operative silver platers in London not numbering more than fifty. The tools required are few and inexpensive, and the workshop space limited in extent, but the materials, of course, are very expensive.

The articles plated by the soft and hard solder processes are now confined mainly to coach and harness furniture. Cutlery and spoons were plated by these processes formerly, but the introduction of electro plating took that part of the solder plater's trade almost entirely away.

The article intended to be "soft" plated, termed the rough, is first prepared from the forging or casting (as the case may be) by means of files of successive degrees of fineness, which produce a smooth surface. It is next "tinned" by being immersed for a short time in a solution of sal ammoniac in water, or diluted muriate of zinc, and then dipped into a melted amalgam of tin and lead, taken out, and smartly shaken, a little finely powdered sal ammoniac being sprinkled over it the while, which "flushes" the tin, and causes it to have an equal thickness all over the article, which is next dipped as suddenly as possible into clear cold water. This completes the tinning process, and it is now ready for the silver.

The silver used is usually in the form of sheets 4in. or 5in. wide, and of an indefinite length, which, being very thin, cannot be measured by mechanical gages; the thickness is, therefore, determined by the length per ounce, assuming the sheet to be 4in. wide; so that a piece of sheet silver, 18in. long by 4in. wide, and weighing 1oz., is No. 18 gage.

This is cut out with scissors to the proper size and shape, and "stuck" to the article, by passing a well-tinned heated copper bit over it with a slight pressure; the heat passing through the silver, melts the tin, and thus causes it to "stick." It is then hammered with a leaden hammer, clothed with kersey or woolen cloth, called a madge, which lays it closer to the article, and next skillfully worked into the crevices of the work, great care being required in this stage to avoid cracking or splitting the silver; when it is sufficiently worked down, the heated copper bit is rubbed closely and evenly all over the parts of the work that the silver is applied to. This finishes what is called the "getting on," that is, supposing the work to be one-sided, or plated on the front only; but if it is required to be plated all over, this operation has to be repeated on the back, and the two edges of silver neatly brought together, forming what is termed a joint. This "all-over" work is only intrusted to the best workmen, it being much more difficult than the "one-sided."

The next process is "soldering," and is effected by the work being held over a clear coke fire, and plentifully sprinkled at intervals with powdered black resin, first removing it from the fire for that purpose. As soon as it is sufficiently hot to cause the resin to ignite, it is rubbed with a cotton rag, saturated with oil, care being taken to rub from the lighter toward the heavier portions of the article; this rubbing is continued, with gradually increasing pressure, until the article is sufficiently cool for the substratum of tin below the silver to solidify. The effect of the soldering is to equalize the thickness of the tin, and to expel the air, thus insuring the "soundness" of the work.

We now come to the "rubbing," which is a sort of burnishing with a rough burnisher, called a rub; the tool offers rather a singular illustration of wearing out giving value to an article, a rub being simply a half-round, smooth file worn down so much as to be useless for filing, which, if worn equally in all parts, and not nicked on the edges, is worth three or four shillings, the original cost being sevenpence. The use of the rub is to smooth and harden the silver. The work is next "dressed" by rubbing with leather thinly spread with pumice powder moistened with oil, which removes the coating of tin left on the outside surface of the silver by the "getting on" and "soldering" processes, and, at the same time, smooths the surface, and prepares it for the final polishing with leather, slightly dusted with powdered rotten-stone.—*English Mechanic.*

Nickel Plating.

The following is from some remarks made by M. Dumas upon this subject before the French Academy of Sciences.

"In the numerous experiments attempted heretofore by M. Becquerel, Sr., M. de Kurlz, and others, they have succeeded in depositing upon objects a coating of nickel, but the means of which they made use had not the certainty and regularity necessary to an application really practical, which qualities are particularly marked in the method of Dr. Isaac Adams, of Boston.

"The Academy will notice with interest several of the results obtained by Mr. Adams. The coating of nickel is very uniform. It adheres perfectly. It is susceptible of any desirable thickness. It has a remarkably brilliant polish, which is very easily obtained. When the article comes from the bath it is only necessary to rub it with a cloth impregnated with a little metallic powder to give it all its luster. This electro-deposit of nickel can be well used for covering articles of saddlery, cutlery, plumbing, clockmaking, tools, fire-arms, decoration, etc.

"It may be used, and this is a valuable application, for covering plates designed for reprinting engravings; and on account of the very slight abrasion of the nickel covering, a perfect drawing can be repeatedly procured.

"Nickel is white, and possesses the property of resisting the action of the air, acids, and any substance with which it may come accidentally in contact. Its hardness is superior to that of untempered steel, and its cost is little. So much for the useful and industrial side of the question. From a scientific point of view, continues M. Dumas, the researches of Mr. Adams are of a nature to throw great light upon many of the phenomena displayed by electro deposits. When one wishes to separate the oxide of nickel by a fixed alkali from one of its solutions, there remains either potash or soda combined with the nickel, and nickelate of potash is formed accidentally. It is precisely this difficulty of obtaining the oxides and the carbonates of nickel free from potash or soda, which has defeated, until now, other experimenters.

"The discovery of Mr. Adams consists above all in having observed that when a solution of nickel contains the slightest traces of potash, magnesia, etc., the metal, instead of being deposited pure, will be found mixed with little particles of peroxide of nickel, which take from the adherent plating all its cohesion and its beauty. Further, the American chemist employs nickel salts entirely free from a fixed alkaline substance, such as the double sulphate of nickel and ammonia, or the double chlorate of nickel and ammonia. From this moment the operation is made with the greatest ease. The salt is decomposed in the bath, the nickel is deposited on the object placed at the negative pole, and the solution keeps neutral.

"The invention or discovery is no longer under trial. It has been shown to be practicable, and we may say that the new process belongs henceforth to the arts. It is a new and excellent victory, which it is permitted to us to chronicle."

AN INTERESTING REVIEW OF THE AMERICAN PATENT SYSTEM.

GENERAL SAMUEL A. DUNCAN.

The fourth of the Lowell Institute lectures, under the auspices of the American Social Science Association, was delivered on the 4th inst., by Gen. Samuel A. Duncan. He said: The wonderful progress in the arts and sciences during the last four centuries, especially during the last hundred years, is the combined result of various influences. The invention of the art of printing, by multiplying and cheapening the means of knowledge, and placing within the reach of every seeker after truth the accumulated experience and wisdom of the race, stimulated the mind into unwonted activity. The development of the laws of steam, and their practical application to the purposes of locomotion, and in all the industrial pursuits of life, has made that wonderful mechanism, the steam engine, one of the most potent instrumentalities in molding the civil, the social, and the political institutions of the world. The Reformation, too, operated to release the human mind from the galling bondage under which it groaned; when its fetters were broken, then came freedom of thought and liberty of conscience and a larger spirit of inquiry. But, all other reasons aside, the changed condition of affairs is largely the result of the liberal encouragement which enlightened governments have extended to persons who have been the discoverers and introducers of new and useful inventions. Recognizing the great and lasting benefits that naturally accrue to the State from the creation within its limits of a new branch of industry, or the introduction of any improvement in trade or manufactures, the legislation of every country in Christendom, with a solitary exception, has provided a system of patents with a view to encouraging the spirit of invention. When our own Government was founded this source of national prosperity was not overlooked. Wisely judged the wise men who framed the fundamental law of the Republic, when they incorporated therein a provision conferring authority upon the National Legislature "to promote the progress of science and the useful arts by securing, for limited times, to authors and inventors the exclusive right to their respective writings and discoveries."

Conformably with the power conferred by the Constitution, Congress has placed upon the statute book various laws, designed to secure the contemplated protection to inventors. The first law relating to patents for inventions was passed by the 1st Congress in 1790. This was repealed in the act of 1793; and this, again, with subsequent amendments, was superseded by the legislation of 1836. The act approved July 4th of that year, entitled "An act to promote the progress of the useful arts," as variously amended and supplemented, forms the basis of our present system of patents.

Much has been said about the inherent natural right of property in the products of one's brain, and it is upon this ground that frequent attempts are made to justify the granting of patents. Wherever thought and time and ingenuity have been expended, and valuable results produced, the full benefits thereof, it is argued, should accrue to him whose brain and hands have done the work—just as the capitalist possesses full control over his stock dividends and the interest upon his bonds, the farmer over the products of his land, or the laborer over his hard-earned daily wages. It is doubted whether this be the correct theory. Man undoubtedly has a natural right over everything of his own creation, and which at the same time he has the power to monopolize; but only to the extent and so long as he can monopolize it. When it goes beyond that, and the individual calls upon the State to interpose its strong arm for his protection, the State responds only when in its judgment it is for the interest of the whole to do it. In things material, as houses, and lands, and beasts of burden, the world is agreed that society derives advantage from their exclusive ownership by individuals. They are capable of individual appropriation; and hence the State recognizes and protects the right of property therein. But ideas are incapable of appropriation. So long as an idea remains in the breast of him with whom it originated, it is his, because he can control it; when once it is communicated, it is beyond his control forever. Driven from a material possession, a man may recover it by physical force; but recovery of exclusive possession of an idea which has once passed to others, is beyond human power. If there be a natural right of property in ideas, so as to control, not simply the idea itself while it remains a secret, but all the various embodiments of it by which it has become disclosed, why shall not that right be held in perpetuity? But against such a proposition the sense of the whole world revolts. If its adoption were possible, it would check progress forever.

In the case of a given application for a patent, it being primarily decided that there is invention displayed, the questions then to be determined are: Is it new with the applicant, and is it useful? To decide these questions properly is a work of labor and extensive research. It involves an examination of the entire body of American patents, now numbering more than 100,000, a large mass of rejected applications, the patents of foreign countries, numerous text-books, encyclopedias, reports of scientific associations, and a long list of rapidly multiplying scientific and technical journals. Many legal questions are also involved which require an acquaintance with the entire body of judicial decisions in this branch of jurisprudence.

The question of novelty is usually found to be the most difficult one, because of the labor required in ascertaining the facts upon which it is to be settled. The question of utility divides into three branches: 1. Is the machine or process operative—i. e., theoretically? 2. Is it trivial or frivolous? 3. Is it pernicious? How these various questions are practically managed may, perhaps, best be illustrated by a few examples. For instance: An application was recently filed for alleged improvement in the mode of propelling vessels. A screw is projected into the water from the prow of the vessel, and the shaft, running back, gears with a transverse shaft carrying paddle-wheels; masts are provided and sails erected; the wind gives motion to the vessel; this puts the screw in revolution, and the screw of course the wheels; the action of the wheels, added to that of the wind, impels the craft with increasing velocity; and so the work goes on, the screw giving power to the wheels and the wheels to the screw—until, carrying the invention to its logical conclusion, the vessel must either take fire from excessive friction, as she dashes onward in her maddened career, or bring up against some unlucky continent with a shock sufficient to discharge cargo and passengers at any point in the interior without the delay attending the ordinary mode of discharging freight. His application was properly rejected. "Perpetual motions" have never yet succeeded.

As regards inventions of a mischievous tendency, a notable case came before the officer under the administration of the Hon. Joseph Holt. The applicant sought a patent for a "policeman's club," so constructed that upon releasing a spring, a triple row of keen-edged lancets would leap from the hidden recesses and mangle the hand of an adversary. Applicant's professed object was to provide policemen with ample means of protection and yet obviate the necessity of arming them with deadly weapons—so objectionable because so often used with fatal effect in the heat and danger of personal encounter. The Commissioner refused the patent on the ground that while the safety of the conservatory of the public peace in their conflicts with lawless men was a laudable object, and might be secured by the new implement, yet, if transformed to a weapon of defense in the hands of desperadoes, as it inevitably would be, it would be an evil.

Among the many thousand applications received yearly, it is to be expected that many singular inventions will be found. Besides the cases already named, reference might be made to a patent granted years ago for a mode of removing worms from the human system without medicine. A small cylinder filled with a tempting bait, and having a string attached to it, is swallowed by the sufferer. The worm, if he kindly consents to carry on his part of the programme, thrusts his head into the trap, and disturbs a spring which is armed with a set of teeth, and which, on being released, darts forward to seize the intruder by the throat, when worm and trap are withdrawn together. The description suggests a strict course of preliminary dieting for the patient, and actually recommends in obstinate cases, in order to insure complete success, that he be kept without nourishment for five and six, or even seven days.

A few statistics as to the current business of the Patent Office may not be uninteresting. The whole number of patents issued up to date is 100,486, while about 50,000 cases have been rejected. In 1869 the applications numbered 19,271, and the patents issued 13,986. Of these 15,442 were to citizens of the United States, and 544 to citizens of 27 different foreign countries. To put these patents into print there is constantly employed at the Government Printing-Office a force of 17 compositors. The patents to American citizens were distributed in part as follows: To New England about 20 per cent, Massachusetts having as her share 10 per cent and Connecticut 5½ per cent; to the Middle States, 36 per cent, New York alone receiving 23 per cent; to Ohio and Illinois 7 per cent each; to California 2 per cent; and to the 11 States that engaged in the Rebellion, but 4½ per cent. Before the war these States had never received a larger proportion of the patents granted than 7½ per cent. The figures show that New-England receives the largest proportion of patents according to her population.

The expenses of the Patent Office up to the present time have been $5,583,337·35, to which, if be added the cost of the building itself, and the money expended upon the annual reports, the entire sum will reach perhaps $12,000,000. But what is this compared to the benefit derived by the public from a single invention of real importance. There are, perhaps, 400,000 sewing-machines in use in the country. Ten cents a day would seem an absurdly low estimate of the value of each of these to its owner; and yet even this daily profit would make the aggregate annual sum to the community from this source alone $15,000,000. It is computed that the saving of grain by the use of thrashing machines in place of the flail which they have supplanted is 10,000,000 bushels annually.

The distinctive feature of the American system as compared with the European is the official inquiry instituted into the character of the invention as regards its alleged novelty and utility. In Europe patents are usually granted upon simple registration. Two or three countries only provide for a preliminary examination; but this is conducted upon such illiberal principles as to amount almost to prohibition. In Prussia, for instance, in 1867, only 103 patents were issued, while in the United States the number reached 13,000. The patent of registration carries with it no presumption of validity.

The recent outcry in England against patents is based largely upon the amount and excessive cost of litigation in this class of causes. The great majority of American patents are beyond doubt good and valid, and by consequence patent property possesses a commercial value in this country that attaches to it nowhere else. And this too, has contributed largely to induce the liberal policy displayed by our courts in dealing with patent questions; since, in marked contrast to the English practice, they have generally aimed, in accordance with the maxim of interpretation, *ut res magis valeat quam pereat*, to sustain the patent, if not plainly in violation of principle.

In the Netherlands abolition has actually been voted by large majorities in both Chambers of the Legislature. Switzerland never had a law on the subject. And in December, 1868, Count Bismarck, in a message to the Federal Parliament of the North German Confederation, took the ground that conferring exclusive rights in industrial inventions is warranted neither by a natural claim on the part of an inventor which should be protected by the State, nor is it sanctioned by general economic principles.

It is the inevitable tendency of all improvements in the arts to cheapen production. Heathcoat's machines reduced our prices of bobbin net lace from five guineas a yard to six pence. The Bigelow looms for weaving ingrain carpets, both reduced the cost of the manufactured article 20 per cent, and improved the quality of the goods. The cotton gin reduced our price of raw cotton, stimulating the production so that it increased in three years from 138,000 pounds to 5,000,000 pounds. The Bessemer process of making steel has so cheapened that most useful article, that from a very limited use before it has now become largely available for engineering purposes. Without the prospect of protection and the accompanying hope of gain, it is hardly probable that Bessemer would have been encouraged to carry on the long series of costly experiment necessary to the perfecting of his process. Without the same inducement the Lowell Company would hardly have ventured an investment of several hundred thousand dollars in developing the capacity and economy of the Bigelow loom, Cartwright would not have been justified in devoting a princely fortune to the creation of the power loom, nor is it reasonable to suppose that Goodyear would have given his life to the vulcanization of rubber. A great invention is usually a thing of slow development. It is the creation of years of toil and perplexing thought and heroic effort and costly experiment. Without the prospect of reward capital will not go to the aid of the inventor in his uncertain efforts, and it is equally absurd to suppose that men will invent to any great extent from the pure love of inventing, or actuated by the hope of honor and prestige merely. They cannot afford to expend time and energies and means upon that which will, when attained, be at once appropriated by the world at large.

In view of the diminution of labor, the abridgment of time, the annihilation of space—which have marked man's assertion (through the agency of machinery) of his dominion over nature who can withhold assent from the verdict that "the introduction of great inventions is one of the most distinguished of human action;" for, says Bacon, "the benefits derived therefrom may extend to mankind in general, but civil benefit to particular spots alone; the latter, moreover, lasts but for a time; the former forever!" Neither king, nor emperor, nor sage, nor warrior ever won a prouder tribute than the inscription in Westminister Abbey upon the monument of James Watt: "He enlarged the resources of his country, increased the power of man, and rose to an eminent place among the most illustrious followers of science and the real benefactors of the world."

MISSOURI LEAD.—The annual yield of lead in Missouri is estimated to be less than 2,000,000 pounds, though that State may be taken as one of the best lead producing regions in the world. Lead has been discovered in 48 counties and over 500 localities. The St. Louis *Journal of Commerce* reports the receipts of Missouri lead at that city, in 1869, at 172,538 pigs. Receipts of foreign lead 7,856 pigs, and of Illinois lead 26,775 pigs consumed in city, and 15,801 pigs re-shipped. Lead is in Missouri mostly found in sulphuret. Out of 120 specimens of ore referred to by the *Journal* 113 were sulphuret, 6 sulphuret and carbonate, and 1 sulphate. From 60 to 85 per cent of the ore is pure lead. The gangue is generally sulphate of baryta; the ore is often found in magnesian limestone, or red clay interspersed with brown hematite, pyrites, and ocher.

IMPROVEMENTS IN GUNPOWDER AND ITS MANUFACTURE.—One of the buildings of the Luzerne Powder Company, at Wilkesbarre, Pa., recently took fire and was burned to the ground. Although some 400 pounds of powder were in the premises, no explosion took place, and all the workmen escaped without injury. Loss $2000. This Company is working under the patents of Paul A. Oliver, who has made valuable improvements in the quality of powder and in the machinery for its manufacture, whereby safety to workmen is secured, a stronger explosive is produced, and the prime cost lessened. This powder does not develop explosive properties until tamped or confined where it is to act, and then its power is enormous. But when exposed in a loose condition or in kegs it burns slowly without explosion.

CEMENT FOR LEATHER.—A cement for leather is made by mixing 10 parts of sulphide of carbon with 1 of oil of turpentine, and then adding enough gutta-percha to make a tough thickly-flowing liquid. One essential pre-requisite to a thorough union of the parts consist in freedom of the surfaces to be joined from grease. This may be accomplished by laying a cloth upon them and applying a hot iron for a time. The cement is then applied to both pieces, the surfaces brought in contact, and pressure applied until the joint is dry.