posited 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 actions;" 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.