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NEW YORK, SATURDAY, OCTOBER 29, 1898.

OUR EXPORTS INFLUENCED BY OUR PATENT LAWS.

Twenty-five years ago the United States ranked fourth among the nations of the world in the value of her exports, but to day she stands second only to Great Britain, and there is little doubt that in a few years she will lead the world as a manufacturing and agricultural nation.

The inventive genius of the American is largely responsible for our tremendous stride forward, and the claim for second place among the nations is founded upon undisputed facts which formed the basis of the address delivered by Judge A. P. Greeley, Assistant Commissioner of Patents, at the recent dinner of the Patent Law Association in Chicago. This dinner followed the opening session of the Patent Investigating Commission now sitting in Chicago for the purpose of revising the patent and trade mark laws of the United States.

Foreign statisticians have been quick to grasp the significance of figures bearing on the export trade of the leading nations. Judge Greeley bears testimony to the accuracy of figures gathered abroad and tabulates them as follows:

	Amount of Exports.		Rank.	
	1872.	1896.	1872.	1896.
England.....	\$1,231,200,000	\$1,422,000,000	1	1
United States	430,583,000	1,050,692,000	4	2
Germany	559,700,000	994,156,000	3	3
France.....	726,066,000	656,393,000	2	4
Russia.....	270,586,000	513,908,000	5	5

These figures do not, however, tell all the story, as they are taken from the statement for the fiscal year ending June 30, 1897, but in the next fiscal year, which ended June 30, 1898, the exports of the United States increased to \$1,231,329,766—an increase over the preceding year greater than England's increase in twenty-five years. No more striking comparison of our wonderful advance in export trade is offered than this one, since Great Britain is the chief manufacturing nation in the world.

The increase in manufactures in the United States since 1860 forms the most remarkable feature of the growth in exports.

Judge Greeley states that the significant showing is undoubtedly due to the improvements in machinery made through patented inventions. Agricultural products have been outstripped in the race for foreign favor by the products of the inventor and mechanic. In 1860 agricultural products formed 81 per cent of the total exports of domestic products, while manufactured products amounted to less than 13 per cent. In 1898, however, out of the largest total exports ever known, they formed 24.06 per cent, amounting in value to \$291,208,358.

The direct bearing of patented inventions on the exports of manufactures is shown by taking certain classes of products and comparing the export values for 1898 with earlier years. For example, in 1873 there were no exports of bicycles, while in 1898 there were shipped abroad \$6,846,529 worth of bicycles and bicycle parts. Instruments and apparatus for scientific purposes, including telegraph, telephone, and other electrical machinery, were not included among the exports of the United States in 1873, but the records show that \$2,770,803 worth of this class of manufactures has been exported this year. Typewriters, photographic materials, and celluloid are other examples. Another large item in the exports of 1898 is that of fresh beef, which was not exported prior to 1877 in sufficient quantity to be worthy of separate mention. It has been increased this year to the value of \$22,966,556. Its export was only made possible by the invention of the refrigerating apparatus for cars and ships by which the meat can be transported without danger of spoiling. The most valuable comparisons that can be drawn from the exports of manufactured articles may be made by a glance at the annexed table:

	1873.	1898.
Agricultural implements	\$2,585,914	\$7,609,732
Iron and steel and manufactures of	13,649,027	70,367,527
Boots and shoes.....	421,518	1,816,538
Cottonseed oil.....	370,506	10,137,619
Paper and manufactures of	358,248	5,494,564
Total.....	\$17,686,243	\$96,426,960

There is no question that Judge Greeley is correct in assuming that we owe a large part of our success in the export trade to American inventions which have been fostered and protected by our patent laws.

IS THE THIRTEEN-INCH NAVAL GUN OBSOLETE?

A correspondent writes us that in reading over the annual report of the Chief of Ordnance of the Navy, a review of which is given in the adjoining column, he notes that while a new and powerful 12-inch gun is to be mounted on the three new ships of the "Maine" class, the old 13-inch weapon is to be placed on the vessels of the "Alabama" class. He asks whether it is too late to make such changes in the armament of the latter vessels as will make it up to date when they are commissioned. Our correspondent further asks whether he is wrong in thinking that the armament proposed for the "Alabama," "Wisconsin," and "Illinois" is even now behind the times, and whether it will not probably be still more so when these vessels are commissioned.

If the Navy Department were asked the question, it would probably answer that it is both too late and too early to substitute the new 12-inch gun for the old 13-inch weapon; too late, because the 13-inch guns for the "Alabama" class are already completed, and too early because the ships will be completed long before the new 12-inch gun could be built and tested, and the requisite number of weapons of the new type constructed.

The question, however, may reasonably be asked whether it would not be possible to find other employment for these 13-inch guns, and whether the great increase in the power of the main battery of these three first-class battleships, due to substituting the 12-inch for the 13-inch gun, would not be sufficient to warrant a delay of a few months in the date of their going into commission. If it should be determined that the change ought to be made, there would be no difficulty in disposing of the twelve 13-inch guns which would be displaced. They might be utilized for coast defense, either by mounting them on half a dozen sea-going coast defense vessels of the type of the "Jennuapes" in the French navy, ships of 6,600 tons and 16 3/4 knots speed, or they might be transferred to the army and be mounted in our coast fortifications. The 13-inch gun has about 2,000 foot-tons more energy than the 12-inch 40-caliber army gun, and as its breech mechanism is of the latest Fletcher type, its speed of fire would be considerably greater.

Is the 13-inch gun obsolete? For use in the second class of battleships, in coast-defense vessels, or on shore fortifications, it is not; but for mounting on first-class battleships, which will go into commission for the first time not before the twentieth century has opened, we think it is a decidedly obsolete weapon. In using the term obsolete in this discussion, we do so in a limited sense, as applied to the arming of first-class, up-to-date battleships. To determine its standing we cannot do better than compare the 13-inch with the new 12-inch weapon to be mounted on the "Maine" class. The correct way to determine the relative efficiency of two guns is to divide the energy of the projectile by the weight of the gun and compare the results. The 13-inch gun weighs 60.5 tons, and its muzzle energy is 33,627 foot-tons. The new 12-inch gun is to weigh, according to Captain O'Neill's report, 53 tons, and we believe its proposed energy is to be 48,000 foot-tons, with a velocity of 3,000 foot-seconds. Although no official statement of the energy has appeared, it is likely that the above figure is correct, as the new English 12 inch gun, which is 2.75 tons lighter, has an energy of 44,500 foot-tons, and with a heavier gun our experts will undoubtedly produce a more powerful weapon.

Assuming that 48,000 foot-tons is correct, and dividing this by the weight of the gun, and doing the same thing in the case of the 13-inch gun, we get 906 foot-tons of energy for each ton weight of the 12-inch gun, and only 556 foot-tons per ton of gun in the case of the 13-inch gun—an increase in efficiency of 63 per cent in the new over the old weapon. In view of these facts we must assure our correspondent that "the armament proposed for the 'Alabama,' 'Wisconsin,' and 'Illinois' is even now behind the times," and that it "will be still more so when those vessels are completed."

There are probably no structural difficulties of an insuperable character to prevent the substitution of the new 12-inch for the 13-inch gun. Turrets that have been designed for guns of a certain weight will certainly carry others of less size and weight. The new weapon, though of less caliber, will probably, being designed for smokeless powder, be of greater length; but the increase will be chiefly in the chase of the gun and outboard of the turret. There would be no difficulty in the arrangements of ammunition hoists, handling gear, and magazines, where the reduced size of the shell and charges would, indeed, favor the change.

Moreover, apart from the positively enormous increase in the power of the battery, there would be a great gain in the amount of ammunition that could be carried. Thirty tons would be saved in the weight of the four guns in each ship and about 600 pounds in the weight of each round, one round for the 13-inch gun

weighing 1,650 pounds, whereas a round for the new 12-inch gun would weigh only about 1,050 pounds. Consequently, if the substitution were made, not only would the power of the main battery of the "Alabama" class be raised 63 per cent, but the reduction in the weights of guns, mounts, and ammunition would allow fully 50 per cent more ammunition to be carried. This increased ammunition supply alone might well prove the determining factor in a prolonged naval engagement.

In view of these facts, it may well be asked whether the 13-inch gun is not obsolete as the armament of a first-class battleship whose first commission will bear date in the early months of the year 1900? We think it is, and we sincerely hope that when the three noble ships in question are sent out to uphold the dignity of our flag upon the high seas, they will carry the very best weapons that American skill can produce, and not, as is now proposed, a gun that was designed more than a decade ago, and before the present remarkable era of gun construction had well commenced.

WORK OF THE NAVAL BUREAU OF ORDNANCE.

The reports of the various chiefs of bureaus of the navy possess a special interest, coming, as they do, at the close of a foreign war. We all remember the general sense of unpreparedness with which the country commenced hostilities—the conviction, based upon no one knew just what grounds, that we were quite unready to face the responsibilities of war with a European power. There is no doubt that in some respects, notably in the matter of coast defense and the equipment of our army, we were not as well furnished for war with even such a minor power as Spain as could have been wished; but it is satisfactory to know that in one branch of the service—the navy—our ships were ready to take the sea on the day that war was declared.

In his annual report to the Secretary of the Navy, the Chief of the Naval Bureau of Ordnance says on this question, as far as it concerned his department, that the resources of the country to supply war material were scarcely touched, and unquestionably there is no limit to the amount that can be procured of all kinds, in case of need, provided time is not too important a factor. It is a pleasant surprise to learn that, contrary to the general impression, the amount of ordnance and ammunition purchased abroad was quite inconsiderable. We are informed that owing to the exigencies of the war, a number of minor caliber guns and some ammunition for them and a few torpedoes were purchased abroad, but that neither powder nor projectiles for heavy guns, nor in fact any war material, except as above quoted, was procured by the navy out of the United States.

The work done during the year included the placing of new batteries and the proper supplies of ammunition on 107 vessels that were acquired by the navy and transformed into auxiliary warships, and the arming of 12 torpedo boats and 2 gunboats. This brought up the total number of vessels furnished with guns and ammunition to 121, and of these the auxiliary vessels called for 576 guns, all of which had to be delivered within the space of a few weeks. It is interesting to learn that there are 564 breech-loading rifles of over 4-inch caliber in the main batteries of the regular naval vessels and 1,023 weapons of less than 4-inch caliber in the secondary batteries. These added to the guns mounted on the auxiliary ships give a total of 2,163 guns of all calibers in our navy at the close of the war.

It is gratifying to learn that the performance of guns, mounts, and their appurtenances under the active operations of the war "has been in general thoroughly satisfactory." The only defects occurred in the minor details of some of the mounts for guns of small caliber, and the general tenor of the reports received from the various vessels is that the guns, mounts, turrets, and ammunition worked well.

The lessons of the war from the view-point of the Bureau of Ordnance are of special interest. Capt. O'Neill, the Chief of Ordnance, is of the opinion that, while heavy guns in turrets must be regarded as one of the chief characteristics of modern battleships, the lessons of the day indicate that the greatest execution (except against the heaviest armor) may be expected from a number of quick-firing guns of small caliber, mounted separately in armored casemates or in a redoubt. While it is true that turrets afford the best protection for a gun, they provide no protection for the hull of the ship. They are cramped, close, hot in warm climates, provide only a contracted outlook for the gunner, and they are heavy and slow-moving. Nevertheless, they are a necessity.

But although we must retain the heavy armor-piercing gun, the Bureau is of the opinion that its caliber and weight may be reduced with advantage, and recommends that the 60.5-ton, 13-inch gun be replaced by a 12-inch gun, with a saving of 7 1/2 tons of weight. While it is true that this does not seem to be a great reduction in itself, the reduction in size and weight of the turrets, barbets, and ammunition will be very large. It is certainly encouraging to know that the Ordnance Bureau is at last moving in this important matter, and

that our new battleships of the "Maine" type—the "Maine," "Ohio," and "Missouri"—will carry 12-inch guns as their main batteries which will equal the best of the foreign guns in velocity energy, and penetrating power. At the same time, as we have stated elsewhere, it is greatly to be regretted that the 13-inch gun is to be retained on our new ships of the "Alabama" class. The new 12-inch gun is also to be mounted on the four new monitors, contracts for which have recently been let.

Regarding armor plate, the report says that the Bureau is considering the advisability of reducing the thickness of the belt, diagonal, turret, and barbette armor, which on our battleships has heretofore been very heavy, more so than now in its opinion appears necessary or desirable, and it considers that 12 inches is the maximum thickness that will hereafter be required. Reference is made to the recent improvements in the manufacture of armor plate and the late tests of Krupp plates, an illustrated description of which appears in the SCIENTIFIC AMERICAN of August 27, 1898.

On the question of smokeless powder, the report says that after many difficulties the manufacture of a purely smokeless powder, made by the Bureau's formula from soluble nitro cellulose, which is uniform in character and possesses good keeping qualities, has become an accomplished fact. Henceforth it will be the standard powder of the navy, and a few vessels have already been furnished with a complete supply. All vessels hereafter fitted out will be supplied exclusively with smokeless powder, except that a few charges of brown powder will be carried by each ship for target practice. A parcel of land on the Indian Head reservation has been chosen for the erection of the government powder factory which was authorized by Congress at its last session.

TAXATION OF PATENT RIGHTS.

Once more the courts have had to intervene, and interdict the taxing of patent rights by local authorities. The opinion of Judge Parker, of the New York Court of Appeals, from which we quote below, is of special interest to inventors in that it shows an appreciative understanding of the purpose which the framers of the Constitution had in view in authorizing the granting of patents, i. e., to offer an inducement for inventors to freely communicate their secrets in processes, machines, and manufactures.

The case arose upon certiorari proceedings brought by the Edison Illuminating Company, of Brooklyn, to review the action of the Board of Assessors of the city of Brooklyn in assessing for the purpose of local and State taxation the various patents or patent rights owned by the company and upon which the company in making its return to the assessors had placed a valuation of \$945,000. The proceedings were instituted in the New York Supreme Court, and the Special Term sustained the contention of the company that its patent rights were not taxable, and vacated the assessment. The Appellate Division, on appeal, affirmed the order of the Special Term (19 App. Div. 599) and an appeal was then taken to the Court of Appeals, which on October 4 handed down a decision affirming the order of the Appellate Division.

Chief Justice Parker, whose opinion is reported in 156 N. Y. 417 (advance sheets October 15), cites the cases, *Webber v. Virginia*, 103 U. S. 344; *Ex parte Robinson*, 2 Biss. 213, and *Patterson v. Kentucky*, 97 U. S. 501, and thus states with approval the argument in support of the doctrine that patent rights are not taxable:

"The Constitution of the United States (Art. I, sec. 8, subdiv. 8) conferred upon Congress the power to promote the progress of science and useful arts, by securing for limited times, to authors and inventors, the exclusive right to their respective writings and discoveries.

"In pursuance of this power, Congress enacted that patents should be issued to inventors, which should secure to them for a limited term the exclusive right to make, use, and vend the invention or discovery through the United States and the Territories thereof." (U. S. Rev. Stat. S. 4884.) Patent rights are, therefore, granted under the Federal Constitution and necessarily for the promotion of federal purposes. (*Grant v. Raymond*, 6 Peters 218, 241; *Ames v. Howard*, 1 Sumner 482; *Blanchard v. Sprague*, 3 Sumner 535). The federal purpose is primarily to stimulate genius, talent, and enterprise by holding out that encouragement which patents give, but ultimately to secure to the whole community the great advantages that flow from the free communication of secrets, processes, and machinery.

"The next step is, that patent rights being created under the federal Constitution and laws for a federal purpose, the States are without the right to interfere with them. The right to tax a federal agency constitutes a right to interfere with, to obstruct, and even to destroy the agency itself, for, conceding the right of the State to tax at all, then it may tax to the point of destruction. This doctrine is elaborately discussed by Chief Justice Marshall in the U. S. Bank case (*McCulloch v. Maryland*, 4 Wheaton 316), wherein the court

decides that Congress has power to incorporate the bank as a federal agency, and that having done so, the State cannot tax the bank upon its circulation. The latter proposition is regarded as a necessary conclusion from the former. The federal government having the right to create the agency, it necessarily has the right to protect it, not only from destruction, but from interference from any other government, whether such interference be in the guise of taxation or otherwise, as the power to tax involves the power to destroy, and the power to destroy may render useless the power to create. In the course of his opinion, Chief Justice Marshall said:

"If the States may tax one instrument employed by the government in the execution of its powers, they may tax any and every other instrument. They may tax the mail; they may tax the mint; they may tax patent rights; they may tax the papers of the custom house; they may tax judicial process; they may tax all the means employed by the government to an excess which would defeat all the ends of government."

Justice Parker's opinion was concurred in by all the judges of the court, and the State of New York has now formally and firmly concurred in the decisions of the United States courts that patent rights may not be taxed by the State or municipal authorities.

THE HEAVENS IN NOVEMBER.

BY GARRETT P. SERVINS.

The advance guard of the great November meteor swarm is due this month, and on the nights of the 13th, 14th and 15th astronomers in all parts of the earth will be awake and on the lookout. They will be both surprised and disappointed if a meteoric spectacle, which may be a brilliant one, is not beheld by some of the watchers. The main swarm of the meteors is not due until November, 1899, but their advancing columns, broken into parallels and separated by considerable gaps, occupy so much space on the celestial highways they traverse that millions of the mysterious little bodies must already have reached the neighborhood of the earth's orbit, and it can hardly happen that many of these will not become entangled by the terrestrial attraction, and dart their fiery spears through the upper air.

The reader may like to be reminded that this, the greatest known "meteor shower," has a period of 33¼ years; that the history of these meteors has been traced back to the year A. D. 126, when the planet Uranus is believed to have captured the wanderers and turned them into a permanent orbit around the sun; that a comet (Tempel's) is known to be traveling in the same orbit with them, and that the world was astonished at the magnificence of the displays which they made in 1833 and 1866. At their return in 1866 changes had taken place in the array of the meteors, indicating a considerable scattering, and in November, 1867, enormous bodies of them were still rushing across the earth's orbit, and another splendid display occurred.

The point in the heavens from which the meteors appear to radiate is situated within the curved blade of the imaginary "sickle" which marks the constellation Leo. This is not well risen until midnight, but late in the evening meteors radiating from it may be seen shooting upward from the northeastern horizon. Observers are advised to begin watching for them about 11 P. M. on November 11, keeping up the watch for five nights altogether and continuing it until the morning twilight begins. Fortunately, there will be no trouble from the moon, which is "new" on the 13th.

The November meteors are very swift in movement, since the earth meets them "head on," and they frequently exhibit bright colors and leave brilliant trains.

The Harvard College Observatory offers to send maps and forms of record to all who will take part in systematic observation of the meteors.

If the expected display on the 13th or 14th does not equal expectation, another chance will be presented on the night of the 27th, when the celebrated Andromeda meteors are due. These are believed to be part of the debris of the vanished comet of Biela, and they furnished dazzling spectacles in 1872 and 1885. Their period is thirteen years. During the shower of 1885 an iron meteor, supposed to belong to the Andromeda swarm, and subsequently famous under the name of "a piece of Biela's comet," fell at Mazapil in northern Mexico. Unlike the November 13th meteors, which are known as the Leonids, the Andromeda meteors are slow, because they overtake instead of meeting the earth. Their color is frequently reddish. The full moon will interfere with the observation of these meteors, whose radiant point is overhead between 9 and 10 o'clock in the evening.

THE PLANETS.

Mercury is an evening star, but does not attain its greatest eastern elongation until early in December. It moves from Libra into Sagittarius.

Venus ends its career as an evening star with the last day of the month. It is in the constellation Scorpio.

Mars, in the constellation Cancer, rises about 9 P. M. in the middle of the month.

Jupiter has become a morning star in Virgo, but is too near the sun for satisfactory observation.

Saturn remains on the borders of Scorpio and Ophiuchus, slowly moving eastward. It is still an evening star, but, like Jupiter, too near the sun to be well seen.

Uranus passes from the evening into the morning sky on the 25th, and is hidden in the solar rays.

Neptune, in Taurus, rises early in the evening, but being invisible to the naked eye, possesses little interest for the amateur star gazer.

Several planetary conjunctions occur in November. On the 11th, at 10 P. M., Mercury and Uranus meet; on the 18th, at 1 P. M., Mercury and Saturn; on the 20th, at 3 A. M., Mercury and Venus; on the 24th, at 3 A. M., Venus and Saturn.

THE MOON.

New moon occurs on the 13th about 7 P. M.; first quarter on the 20th at noon; full moon on the 27th at midnight; last quarter on the 6th at 9 A. M. The moon is nearest the earth on the 16th, and farthest from it on the 4th.

The lunar conjunctions with the planets occur as follows: Neptune on the 3d, Mars on the 5th, Jupiter on the 12th, Uranus on the 14th, Mercury on the 14th, Saturn on the 15th, Venus on the 15th, Neptune again on the 29th.

MISCELLANEOUS.

There will be minima of the variable star Algol on the 14th at 8:23 P. M., and the 11th at 11:35 P. M.

The wonderful variable Mira Ceti, having reached its maximum in October, should be seen fading during November.

The winter constellations are advancing into view, but will be better seen and described in November.

THE HISTORY OF THE MASSAGE TREATMENT.

It is often impossible to determine the origin of our methods of treatment, particularly as most of them date back to the dark ages, when accuracy in detail was not a characteristic feature in medical records. Sweden is usually credited with being the place of origin of the scientific system of massage and physical exercises. This, says The British Medical Journal, is no doubt correct as far as modern Europe is concerned, but the real originators of massage and physical exercises appear to have been the Chinese. An interesting article appeared recently in the *Deutsche medicinische Wochenschrift*, in which reference was made to a book lately published by P'an Wei, Governor of Hupeh. The author, a great authority on massage, was consulted by the late Empress of China. The Chinese legends contain many references to various systems of physical exercises, and these are associated in a curious manner with metaphysical thought. Life, according to the Chinese traditions, is entirely dependent on "air currents," which are designated as the primary aura of the organism. So long as the body is permeated by the "air current" it is proof against disease. The object of physical exercise is to circulate the "air current." The Chinese system is divided into three periods, each period occupying one hundred days. The first period should commence at the time of the new moon. The patient must rise at 4 A. M. and walk outside his house, and take seven deep inspirations; immediately after this two youths, who have been specially trained, commence a gentle friction all over the body, starting over the cardiac area. At the time of full moon a further set of inspiratory exercises must be taken. Later on in the second period the various parts of the body are rubbed with wooden planks until the muscles are hardened. It is not until the hardening of the muscles takes place that the real physical exercises commence. Between the fifth and sixth months is the period of greatest activity; the European dumb-bell is replaced by large sacks filled with stones. In the third period the back muscles are chiefly exercised. Great benefit is said to have resulted from this system.

ARMY TENT STOVES.

Bids were recently opened in St. Louis for two thousand conical tent stoves. They are very curious in appearance. The stove has the form of a frustum of a cone and is constructed of number fourteen United States standard gage common annealed plate iron and is in one piece, except the collar and door. The aperture for the door is 6 inches wide and the covering is sufficiently large to lap over. There is a vent in the bottom of the stove, directly under the door. The height of the stove to the top of the collar is 28 inches. Its outside circumference at the bottom is 58 inches, and at the top 13 inches; the distance from the bottom of the door aperture to the base of the stove is 14 inches. The total weight is 19 pounds. The cost to the government for those on hand is \$1.23 each.

The observatory established on Mont Blanc at an altitude of 4,400 m., by M. Vallot, is being moved to a position where the drifting snow will not interfere so seriously. The woodwork for the new building, which is larger and better arranged than its predecessor, is being carried up the mountain by some forty men, work having been begun on July 16.