

to its present low temperature, and received light and heat from sun and earth both.

The proof of this condition of Jupiter's satellites is furnished by the observation that, when a satellite passes over the light disk of the planet, it forms a perfectly black spot, while its shadow is not black but shows the luminosity of the vaporous surface on which it fell. Perhaps this vaporous envelope is of great extent, and the solid or fluid nucleus of the planet is much smaller than Jupiter appears to us.

The conclusion then arrived at, by astronomers of the present day, is that, when comparing the sun, Jupiter, and the earth, Jupiter is midway in temperature as well as in size; the sun is about one thousand times larger than Jupiter, and Jupiter about one thousand times larger than the earth. While the sun is most intensely white hot, Jupiter is moderately red hot, and the earth only radiates obscure invisible heat.

PROGRESS OF THE HOOSIC TUNNEL.

The great railway tunnel through the Hoosic Mountain, near North Adams, Massachusetts, is progressing very effectively, and it is probable that the bore will be completed in October, 1873. The boring has for the past year or more been carried on at four headings, one on each side of the mountain and two, in opposite directions, from the bottom of a vertical shaft which is sunk near the middle of the mountain. The 12th of December was an eventful day among the workmen. After some unusually heavy blastings, a junction of the two headings between the east end of the tunnel and the central shaft was then effected, greatly relieving the contractors by the immediate drainage of the water from the central shaft. The central shaft is 1,030 feet in depth, and, since the junction was made, it is found to operate like an immense chimney, producing a strong draft through the whole length of the eastern section of the tunnel, a distance of nearly two and a half miles. It has not yet been ascertained what, if any, difference exists between the lines of the two borings which have just been united; but it is believed that there can be only a trifling variation. The working of the pumping machinery, previously required to keep the shaft free, was a difficult and expensive operation. The water will now flow down grade into the Deerfield river and the pumps may be removed. A distance of about four thousand feet remains to be cut in order to complete the bore. The total length of the tunnel will be almost five miles. It is the second longest tunnel in the world, the Mont Cenis bore, through the Alps, being nearly eight miles in length. But the St. Gothard tunnel, through the Swiss Alps, which was commenced during the present year will beat both of the above, as it will be thirteen and a half miles in length.

THE FIRE AT THE FIFTH AVENUE HOTEL.

The Fire Marshal of New York, after an exhaustive examination of many witnesses, is of the opinion that the recent fire at the Fifth Avenue Hotel was caused by accident. The testimony clearly shows that the flames originated in one of the servant women's chambers, through which passed the laundry elevator, the opening therefor being a square aperture, cased with dry wood, extending from top to bottom of the building, about ninety feet. This elevator opening formed, in effect, an immense chimney for the rapid progress of the flames. The woman who occupied the chamber testified that she was in bed, sound asleep, and awoke to find herself surrounded by flames. Her clothing was destroyed, the bed clothing on fire, and she herself was badly burned. She escaped into the hallway, and gave an alarm; but the fire had already traveled to the attic, and an alarm been given. The Marshal thinks that the woman, in getting into bed, probably stepped upon a match, which ignited her clothing; the fire smoldered for a while, but at last increased, the flames entered the elevator, the draft carried dense smoke to the attic, which there suffocated the eleven unfortunate females, who lost their lives long before the flames could have reached their bodies.

The evidence goes to show that the Fifth Avenue Hotel was well provided with the apparatus for extinguishing fires, in the use of which the men connected with the hotel are frequently drilled. All the floors are provided with water mains, to which hose pipes are kept constantly attached, and there are also steam pumps always in readiness in the basement. In the present case it was not half a minute after the alarm was given before some of the hose had been stretched and water directed upon the flames. But the fire had evidently been burning for some little time before its discovery, and it was then too late quickly to check its spread.

RETIREMENT OF JUDGE NELSON.

After nearly half a century's honorable service on the bench, Judge Samuel Nelson has retired from the Supreme Court of the United States, thus closing a judicial career, in point of time, unparalleled in the history of jurisprudence.

Judge Nelson was appointed Judge of the Sixth Circuit, which included Otsego county in this State, in April, 1823, and held the position until February, 1831, when he was made Associate Justice of the Supreme Court of the State of New York. In 1837 he succeeded Judge Savage as Chief Justice, and in February, 1845, he was elevated to the bench of the Supreme Court of the United States, being appointed by President Tyler. His most notable decisions were in the celebrated Dred Scott and legal tender cases, though especial deference has always been paid to his opinions in questions of admiralty law and intricate patent suits. In deciding the latter class of litigation, Judge Nelson has probably had a greater experience than any judge that has ever lived, and

has won the highest honors for his strong common sense, broad views and ready grasp of the weightiest subjects.

The Judge has, with slight exception always enjoyed robust health, and has never been absent from duty at the State or United States Courts but one term, that of last year. At the closing session of the High Commission in the spring of 1871, he incurred a severe illness which confined him to his house for several months. From this he has since recovered and now, impelled by his weight of years and need of repose, retires from the position which he has so long and so ably filled.

While expressing our regret at the necessity which causes, to the inventors of the United States, the loss of so honorable, wise and faithful an arbiter, we but join in the general public opinion in thus placing upon record our earnest appreciation of the "purity, dignity and impartiality which have commanded the confidence, esteem and admiration of an entire nation, and the acknowledgement of jurists in other lands."

THE CENTENNIAL OF 1876.

The organization of the United States commission appointed under a recent act of Congress is now perfected, and two meetings have been held at Philadelphia. Funds are now needed to carry out this great and patriotic work; and, in order that our readers may understand the salient points of the undertaking, we extract the following from information furnished by Mr. J. V. L. Pruyn of Albany, the United States Commissioner from New York.

It is proposed to celebrate the one hundredth anniversary of American Independence by holding a Grand International Exhibition of the arts, manufactures and products of the entire world, in the city of Philadelphia in the year 1876. The United States Centennial Commission is made a body corporate authorized to issue stock to the amount of ten millions of dollars, in shares of ten dollars each, for the purpose of defraying the necessary expenses. Subscriptions will be received at all incorporated banks, State and National, and by numerous private bankers; the books will be opened for one hundred days, beginning in New York from November 21st. The stock is apportioned *pro rata* among the States and territories, according to their respective populations. In New York, the quota is \$1,136,660.

We sincerely trust that this call for money for so laudable a purpose will meet with a most generous response. The exposition for which we have three years to prepare will be the grandest the world has ever seen; and we indulge in no egotism when we predict that it will throw far into the shade the World's Fairs of London and Paris, and even the much vaunted Vienna show.

It will exemplify the unprecedented progress of our nation during its brief existence of one hundred years; and, while attracting to our shores the products of other countries, will exhibit to the world at large not only what we have accomplished, but the vast resources of our territory remaining yet to be developed. Such an exhibition will be of incalculable benefit to the whole land, and we are confident that no efforts will be spared or assistance denied which will tend to make it a worthy commemoration of the greatest event in the history of the United States.

AMERICAN INVENTIONS IN EUROPE.

In referring to the dangers of infringement of his patent rights incurred by the American inventor contributing to the Vienna Exposition, we have frequently alluded to the fact that Austria is by no means the only country in Europe which, under cover of a so-called protective act, countenances the piracy of the property of strangers. The same is true to a greater or less extent in all the continental nations, though from the evidence of Mr. Henry Bessemer, the English manufacturer, recently published in our columns, and from the facts given below, it may be fairly conceded that the new German Empire rivals its southern neighbor in systematic injustice. The Paris *American Register* prints a letter from a correspondent in Berlin, in which we find it authoritatively stated that the Prussian field artillery, which figured so largely in the recent war, is the invention of a prominent American, who applied for a patent in Prussia some years since and was rejected. The inventor at the same time offered his invention to the Government and solicited a proof, but the Government condemned it without a trial. Later, under the noted Prussian manufacturer's name, Krupp, it became an invention and was adopted. The new small arm (described in our last issue) was invented by an American, and a patent applied for, but as usual the application was rejected. Trials were made with it before the Prussian Government, in 1868 which attracted little or no attention, but recently it also has been adopted under the name of a Prussian subject.

In further corroboration of the assertions above made as regards German injustice, we have lately received a communication from an American inventor, detailing his experiences in both Austrian and Prussian patent law. He favors us with the following copies of official letters received by him, and adds that they may prove of especial interest from the fact that the identical invention has since been adopted by the German Government and a patent thereon granted to a native of the country. We give the documents *verbatim* so that they may explain themselves:

[TRANSLATION OF REFUSAL.]

BERLIN, May 21, 1868.

The demand for patent, contained in the papers hereunto annexed, of the 21st of March, for improvements said to be novel in breech-loading firearms, with sliding and turning bolt, relates, according to the opinion of the Technical

Commission charged to examine the patents, to the shape of the grooves and channels which serve to operate and secure the locking. As such they are not patentable, inasmuch as patents cannot be granted for modifications in forms already known. The assemblage of a spring, furnished with a hook on the locking piece in order to remove the cartridge shell from the gun, is a combination well known, and has been the object for many demands of patents. In consequence, the patent cannot be granted.

THE MINISTRY OF ETC., ETC.
[COPY.]

BERLIN, September 16, 1871.

To your application of August 30, we reply, returning documents, that the patent applied for Mr. Benjamin Berkeley Hotchkiss, of New York, "improvements in projectiles," cannot be granted, because nobody can be prevented attaching to the point of a projectile a whistle, etc., to produce a loud sound.

Ministry of Commerce, Trade and Public Works,
IV. Department.
(Signatures illegible.)

These litera translations, we think, will supply adequate proof of the Prussian mode of conducting patent business. The plan is simply either to urge inventors to make experiments, and after all possible information is elicited to inform the would-be patentee that his device is no improvement or not enough of a one to justify the further proceeding of the trials, or else, to assert that the invention is a mere modification, and as such not subject to the grant of a patent. Of course it is practically impossible to discover where a modification stops and where an improvement begins.

Dismissing here the Prussian law, we have yet a few words to add regarding the Austrian regulations, in the shape of the following extracts taken from the letter of a practicing attorney in Vienna, sent to his American client and by the latter gentleman transmitted to us. The communication states that if the American Government would take cognizance "of the way in which patent affairs are treated in Austria, it might feel it a duty either to make the Austrian Government aware that it must either ensure protection for patents or the American Government would be obliged to warn its citizens from being entrapped by a mere show of protection at the exposition." Further "there is no doubt but that the ministry will not alter its proceedings, having given no order as yet." "Your papers have again wandered to the Polytechnic School, and if they do not call experts to inquire into the affair in your presence, so as to give you an opportunity to explain the matter, it is evident the suit will never be finished, except if they think it admissible to decide against you." The date of this document is October 26, 1872, proving that, as late as two months ago, nothing had been done to alter the existing laws.

There is little necessity of our entering further into the details of this subject. No treaty between the Austrian Government and our own has as yet been concluded, nor in the slow circumlocution of diplomatic negotiations is there much probability of anything of the kind being done in due season to prepare goods for exhibition. Moreover, there is no use in patching up a bargain with Austria and leaving Prussia untrammelled; there is just as much danger to be apprehended from one country as from the other. Altogether, we can hardly see how any new American device can be forwarded to Vienna unless the owner chooses to risk the dangers we have pointed out. If then it is expedient to send novel inventions, our display must necessarily be confined to already well known products, and in reference to these there must be a decided objection to Congress wasting public funds, by appropriating money sadly needed for many purposes of direct national benefit, solely to secure an advertisement for established and wealthy manufacturers.

SCIENCE RECORD FOR 1873.

The forthcoming volume of the above, for the new year, will be ready sometime in January, and promises to be a most interesting and valuable work.

The unexpected success which attended the issue of the volume for 1872 has encouraged the publishers to undertake its enlargement and improvement. The RECORD for 1873 will contain almost twice as much matter as the preceding volume. The new RECORD will have six hundred octavo pages, will be illustrated with a large number of engravings, and will contain accounts of all the leading facts of interest that have transpired during the preceding year in the various branches of science, embracing Chemistry, Metallurgy, Mechanics, Engineering, Railways, Navigation, Electricity, Light, Heat, Sound, Technology, Botany, Horticulture, Agriculture, Rural Household Economy, Materia Medica, Therapeutics, Hygiene, Natural History, Zoology, Meteorology, Terrestrial Physics, Geography, Geology, Mineralogy, Astronomy, Biography, Necrology, etc. In short, the general scientific progress of the world during the preceding year will be faithfully represented in SCIENCE RECORD for 1873. It will be a volume packed full of useful information, exceedingly convenient for reference, and should have a place in every library. Price \$2. Published by Munn & Co., office of the SCIENTIFIC AMERICAN, New York.

NEW GALVANOMETER.—M. Bourbouze of Paris is the inventor of a new galvanometer. It consists of a magnetized steel balance beam, delicately poised and capable of being adjusted by means of sliding weights. This beam, which is enclosed in a coil of wire, is provided with a long pointer at its center, and the end of the pointer passes along a graduated arc. This galvanometer is so delicate that it shows a considerable deflection when the hand is brought near a thermopile connected with it.