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THE END OF ANOTHER YEAR.

The present number marks the close of the twenty-seventh volume of the SCIENTIFIC AMERICAN and also the expiration of many thousand subscriptions. Following our general rule based on the desire of not forcing our journal upon those who may not desire the continuance of its visits, we cease forwarding it to subscribers when the term, for which they have prepaid, ends.

The next issue will bear the imprint of a new year, a year, we trust, which at its close may find our country still further advanced in prosperity and greatness, and our industries and manufactures even more thriving; and which will in the end, to the inventor and to the artisan, the brain and hands of the nation, be productive of those substantial rewards which their labors so richly deserve.

With reference to the volume, the concluding words of which we now write, we believe that without egotism we may truly assert that it is the best we have ever published. And we may add the conviction that in no other journal can the same amount of valuable and practical information be found, so attractively presented. We point with a pardonable pride to the number and character of the original engravings embellishing every issue; to the fact that fifty-two numbers so copiously illustrated and so replete with interest can be afforded at three dollars a year, less indeed than half the subscription price of the majority of our English scientific contemporaries. Other periodicals, both American and foreign, have repeatedly expressed a natural surprise that so low a rate can be maintained. The explanation is obvious: mechanics, inventors, manufacturers, engineers, chemists, indeed all interested in the industrial progress of the world, make up our list of subscribers; with such a patronage, failure is impossible; aided by such numbers, cheapness of our product is a necessary consequence.

To those who for many years have been constant friends, the promise of increased excellence during the coming twelve months, the assurance that, as in the past, no effort will be spared to make the SCIENTIFIC AMERICAN the leading paper of its kind in the world, seems almost superfluous. To others, the proof that former and similar pledges have been amply fulfilled is best found in our circulation, which though steadily increasing, is now larger than that combined of all other journals occupying a similar field. We have printed for some time past 50,000 copies per week, and we have every hope that before the end of 1873 this already large number may be augmented to 75,000.

In conclusion, we ask our old subscribers, many of whom for a score of years have appreciated and encouraged our efforts, not only to renew, but still further assist us by obtaining new names. As the last volume was better than its predecessor, so shall the coming series be superior to that just concluded, and thus we trust that each year may find us the same silent though faithful teacher and, as we advance, a wiser and better guide to all who, whether in the realm of science, industry or art, labor for the benefit of their fellow men.

PROPOSED CHANGE IN THE PATENT LAW.

We have received a copy of the proposed amendments to the patent laws, lately reported to the House of Representatives by the Committee on Patents, which amendments are understood to have originated with the present Commissioner of Patents, General Leggett.

The bill provides for the detachment of the Patent Office from the Department of the Interior, and the forming of a new department to be known as the United States Patent Office, the various appointments thereto and general supervision to be in the hands of the Commissioner.

The rapid growth of the Patent Office and its widespread influence upon the progress of the country seem to render this change desirable, and we should be glad to see it effected.

The bill next provides for the appointment of nine "chiefs of division" and one chairman of the board of appeals, at a salary of \$3,500 each, who are to supervise and approve the work of the principal examiners, hear and decide all questions arising upon applications for patents and reissues, give judgments allowing and refusing the same, etc.

In other words, this is a provision to add a bureau of red tape to the business of obtaining patents, and to place unnecessary obstructions in the path of the inventor. One of the distinguishing features of the American Patent Law is the comparative absence of official circumlocution in the grant of patents. We say comparative, bearing in mind the superabundant interference of officials in such matters in other countries. We already suffer from it here, but not to so great an extent as it prevails abroad. It is sufficiently difficult now for the American inventor to get his patent promptly allowed.

It cannot improve the chances of the inventor to have the work of the principal examiners supervised by another set of examiners. We all know how such things work. If the examiner is of opinion that an invention is patentable, the chief of division will be just as likely to be of the contrary opinion. It is a matter of opinion on both sides, and unless the two parties were frequently to differ, the supervising chief would be apt to consider himself to be of little importance. The way to ensure official delays, circumlocution and red tapeism is to multiply officials and place one set to watch and criticize another set.

It seems to us that the new board of chiefs which this bill proposes is unnecessary. In former times, there was greater difficulty in making examinations at the Patent Office than now, for then there were no duplicates of the patents; but now the patents are printed, and the examiner is enabled readily to inform himself as to the state of the arts in his particular subdivision.

If the Commissioner needs more help in examining, let him have more examiners. But the plan of creating a body of nose men to smell out and poke over the doings of the principal examiners, we believe to be unnecessary and injurious to the efficient working of our patent system.

Another section of the bill relates to the qualifications of persons or agents who represent the inventor in making application for a patent. Such agent is to be required to produce, to the Commissioner of Patents, satisfactory evidence of his fitness to practice before the Patent Office. It seems to us that the law is well enough as it stands. It provides that persons who, by their acts, prove themselves to be unworthy shall be prohibited from practice.

If the inventor may apply in person for a patent, he certainly ought to be at liberty to appear by a representative of his own choice. The new proviso prohibits this, and requires the inventor to employ some person upon whom the official unction of the Commissioner has previously descended. Here the unnecessary red tape and official interference again makes its appearance. Give the Commissioner the power to say who shall and who shall not have the privilege of practicing before the Office, and you increase the difficulties and expenses of obtaining patents.

If any changes are to be made in the patent laws, let them be in the interest of simplicity, freedom, reduction of costs, and generous encouragement of inventors. The proposed changes we have criticized are likely to have an opposite effect. We shall refer to the subject again.

TIDAL WATER POWER; A NEW AND USEFUL SUGGESTION.

Mr. A. E. Gordon, the editor of the New Brunswick, N. J., *Times*, has made a suggestion in reference to the utilizing of the power of the tides, which appears to us not only novel but practical and important.

The use of tidal water power to drive mills is common along our coasts. The ordinary method is to shut off the mouth of a small inlet by means of a dam having sluice gates to admit the sea water which, by the rise of the tide, enters and fills the enclosure. By the fall of the tide the enclosed water derives sufficient head to drive a turbine or other wheel, and so give motion to the mill. But when the tide again rises of course the head is destroyed, so that the mill can only run alternately, during two separate periods of a few hours each out of the twenty-four. It is this alternating and irregularity in the hours of motion, together with the periods of entire inactivity, that prevent the employment of this species of motive power for general industrial purposes.

The improvement suggested by Mr. Gordon consists in providing two water basins, both of which are to be shut off by dams from the sea. One of the basins is to serve as a constant supply reservoir of water, and it is to have a close dam of such width and height that the tide water, when it has risen to within one foot of its normal height, will begin to pour over the dam and quickly fill the reservoir. The dam of the other basin is to be provided with swing valves

which permit exit of the water at low tide but prevent ingress of water from the sea. This basin, we will now suppose to be empty. The water wheel is to be placed between the two basins, and the fall of water from the reservoir into the discharge basin will afford continuous motive power so long as the supply of water lasts and until the rise of water in the discharge basin destroys the head. But as this latter basin is entirely emptied at every tide, the head will be always kept good, presupposing, of course, that the reservoir and the discharge basin are made of proper size. In respect to this last point, it is well known that basin capacity on our coasts is almost unlimited, and there are thousands of localities where extensive water powers may be thus provided and maintained at a comparatively small cost. We trust that Mr. Gordon will proceed to elaborate his plan and place it before the hydraulic engineers of the country for discussion.

THE PLANET JUPITER AS REVEALED BY THE MODERN SPECTROSCOPE, PHOTOMETER, AND TELESCOPE.

From a cosmical standpoint our sun is only one of the millions of stars which fill the infinity of space, and its annihilation would scarcely be perceived, while our moon is of no more consequence than a pebble on the seashore. From a terrestrial point of view, however, they are the most important heavenly bodies, and next to them comes the planet Jupiter, for reason of his immense size, which is more than twelve hundred times that of our earth and nearly equal to all the other planets taken together, for which reason Proctor calls Jupiter "the giant planet."

It is not only his size, but everything in relation to him which is astonishing. His axial rotation of 10 hours is so rapid that masses near his equatorial zone are carried round with a velocity of over 7 miles per second, a velocity sufficient to overcome all terrestrial gravitation, as a cannon ball fired upward from the earth with this velocity would never return. The consequence of this is that Jupiter's polar axis is 7,000 miles shorter than his equatorial diameter, which is 82,000 miles.

It is clear, then, that the ordinary notion, the result of the study of our astronomical text books, that the planets Mercury, Venus, the Earth, Mars, are of about equal importance with Jupiter, is erroneous; those four inner planets are very insignificant when compared with the colossal outer planets, Jupiter, Saturn, Uranus, and Neptune.

The next remarkable feature of Jupiter is his low density. The specific gravity of his mass is not much above that of water, while that of the earth exceeds water six times; and this fact has been a puzzle to astronomers, especially as falling meteoric masses from the planetary space have never shown any substances not present in our earth, and also as the spectroscope appears to reveal to us that the whole universe consists of the elements which are all known to us by terrestrial investigation.

What can then be the cause of Jupiter's low density, when he is most likely a collection of the same elements and chemical compounds found on our earth? And here, three different kinds of investigation, each requiring its special apparatus, have been at command of the astronomers, and have satisfactorily answered this question. The first is the telescope, the second, the photometer, the third, the spectroscope.

The telescope revealed the fact that Jupiter is surrounded by a series of vaporous belts laying parallel to his equator. Some of these belts are creamy white, others of a copper color, becoming bluish near the poles. These belts are subject to immense changes. In 1860, a rift in one of them behaved so as to prove the existence during six weeks of a violent hurricane, raging over a surface equal to that of the whole earth, and with a velocity of over 150 miles per hour. Such a storm on earth would destroy every building, tree, ship, etc., in fact would totally desolate the earth's surface. In 1870, it was discovered that the creamy white belt on the equatorial zone became orange, lost its sharp outline, and showed appearances which astronomers compared with post-holes, pipe bowls, oval moldings, etc.; while at the present day Lassell, President of the Royal Astronomical Society of England, and Father Secchi, possessing the finest telescope in Rome, agree that Jupiter is now presenting a most wonderful aspect, which only can be explained by the hypothesis that what we see of his surface is nothing but vapors of different substances, and that thus the planet possesses a much higher temperature than our earth.

The photometric observations of Zöllner in Germany, and of Bond in America, prove that Jupiter gives more light than could be reflected at his distance from the sun, if it was only solar light which we see. Zöllner found that he gives four times more light than would be the case if his surface was like that of our moon, and the conclusion to which we are driven is that the planet shines partially with its own light, is in fact red hot, and is surrounded by vapors.

The spectroscope has verified this view, and proved that the visible surface of the planet contains enormous quantities of aqueous vapor highly heated; in fact, it consists chiefly of superheated steam, of such very high temperature that it is self-luminous, and thus the planet itself is of a much higher temperature still.

The four satellites, in the meantime, are cold; they are so much smaller that they have cooled down far below the temperature of the planet, and may be inhabited, while the heat of the planet makes up for the great distance from the sun. Our earth and moon were probably once in the same condition, geology proving that the earth's crust was once in the fluid state, and our globe surrounded with red hot vapors. At that time the moon had probably not cooled down

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.