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THE REDUCTION OF PATENT FEES.

The patent system of this country was established "to promote the progress of useful arts," as set forth in the title of the creative act of April 10, 1790. This wise purpose has been most grandly accomplished, and we have become a nation of inventors. It was probably no part of the original design that this system should be a source of revenue to the general government, yet so greatly has the business of the Patent Office been extended that we are officially informed in the last report of the Commissioner of Patents that there was on January 1, 1891, the sum of \$3,872,745.24 in the treasury of the United States which had been received from the Patent Office in excess of its running expenses, and that the excess for the single year of 1890 was \$241,074.92. This surplus has been taken from the pockets of inventors for fees. Every inventor pays a first fee of \$15 when he makes an application for a patent, and a final fee of \$20 before his patent can issue. Now, while this large surplus may be proof of the prosperity of the Patent Office, it is also proof that inventors are paying more in fees than is necessary for the support of the system as at present managed, and more than is necessary to accomplish the design of its institution. Of course, the cheaper patents can be obtained, the greater the number that will be applied for, and the more will the inventive business of the country be stimulated, and the greater will be "the progress of useful arts." That the present tariff of fees is too high seems to be proved by the report already mentioned, in which it is stated that the number of patents withheld for non-payment of final fees during the year 1890 was 3,559. In other words, 3,559 inventors who had paid their first fees of \$15 each, or \$53,385 in the aggregate, after their applications had been granted failed to pay their final fees, and forfeited their patents and the money already paid. How many were too poor to pay cannot be told, probably a large proportion. The number of patents issued in 1890 for inventions, exclusive of designs and reissues, was 25,284. If a reduction of \$10 in each of these final fees had been made, the total reduction would have been \$252,840, or a little more than the surplus for that year, and it is probable that if such a reduction had been made, enough more of the final fees that were forfeited would have been paid to have more than made up the deficiency. From this *resumé*, believed to be a correct statement of the facts, it seems evident that a reduction of \$10 might safely be made in the fees in each case of obtaining a patent, that it would be a boon to the inventor, and would "promote the progress of useful arts."

BUILD UP THE NAVY.

In 1886 the House Naval Committee were of the opinion and recommended that the government should at least create a navy that would be of respectable size and that it should demonstrate its capacity to increase rapidly to any required extent.

In what manner can such proposed rapid increase be provided if substantial encouragement be not given to our manufacturers to enable them to maintain the most improved modern plant for such work? What incentive will these manufacturers have to keep in hand the mechanism for this magic expansion unless appropriations are continuous and liberal? It would be impossible to exercise too great impartiality in the recognition of those who risk their wealth and reputation in the vast undertakings thus far so inadequately provided for.

The silver men are so eager for the success of legislation that will guarantee a market for their mines, and the farmers are so clamorous for the political control which they believe will secure for them an outlet for their produce, that they cannot pause long enough to realize that a liberal naval policy will, by the aid of its insurance and mechanical education, assure an increase of the output of the mines of the one and the more rapid and secure transit of their grain for the other. These and other important advantages would be attained by a policy of generous appropriations for increasing the strength of our navy.

Since 1861, when a wooden ship could be built and armed with iron smooth-bore guns in three months, thirty years have passed, during which time the most prominent European powers have adopted and developed the models, suggestions, and conceptions that were the direct fruit of our civil war, and which have produced radical alterations and transformations in vessels of war.

As many years are now required as months formerly to build and arm a modern battle ship. What folly, therefore, to talk of creating a navy in an emergency.

If we are to have a navy at all, let us have one that can whip the enemy if we must fight, and one that will be a school of the highest form of mechanical education if we shall be blessed with peace.

The country's naval strength cannot be reached and maintained by impetuous and spasmodic effort; it can only result from a well determined programme of such magnitude and duration as will induce our manufacturers to make the requisite provision for such a supply as will secure and reward their best efforts.

What is needed is a legislative encouragement that will secure for the nation the ripest fruit of our ablest mechanical minds, ready and willing to acquire and impart the education that such a policy must entail. Congress encourages medical development, agricultural development, makes special legislation for mining and opens the treasury for thousands of measures of greater or less importance; why not give equal stimulus to the new industries that have become so necessary and prominent a factor in the development of our new navy?

Whether these expenditures are needed from the standpoint of insurance, for "no man objects to paying money to have his house insured against fire, though he never expects it to be burned, nor should he object to the slight tax necessary to insure his house, his business, his country, against the transgressions or the possible transgressions of an enemy," or whether from the standpoint of avoiding temptation, for "there is no greater temptation to malevolents than an undefended people, a country with unprotected shores is an invitation to all the thieves and robbers of the world," or whether from the standpoint of education in the mechanical arts, to which we wish to give particular prominence, the work of protecting our nation, its people and its wealth, should go on vigorously and the requisite lines of naval and shore defense provided without delay. This done, and we shall be a nation anxious for peace, ready for war.

THE PATENT CENTENNIAL CELEBRATION.

The significance of the exercises connected with this celebration touches almost every department of human activity, and it is difficult to exaggerate the importance of their real meaning. Coming so gradually as we have to a realization of the vast results which have been but a natural outgrowth of the establishment of our patent system, one does not immediately perceive how great has been the actual progress, a conviction of which is most forcibly borne in upon the mind when it is remembered that it is only a hundred years ago that President George Washington signed the original law putting the patent system on a permanent basis. The present anniversary of this day is, therefore, fittingly marked in the programme of exercises for the week by an excursion to Mt. Vernon and an address on "Washington as an Inventor and Promoter of Improvements," while the programme for the evening of the same day includes a meeting presided over by the inventor who has given his name to the telephone. And the subjects of the papers of this evening—could they but be looked upon in the light which was vouchsafed our legislators of a hundred years ago—what would they not suggest of the marvelous and incredible? One of these papers of itself covers a wide scope, and touches upon many separate branches of inventive activity. It is entitled "The Relation of Invention to the Communication of Intelligence, and the Diffusion of Knowledge by Newspaper and Book." This rather Baconian title, however, wide as its scope, by no means trenches on the subjects of other speakers, as the literary feast provided by the programme has many other equally interesting and comprehensive papers. The most important of these we shall endeavor to lay before our readers, in whole or in part, at an early day.

Waves Caused by Explosions.

Methyl nitrate, CH_3NO_3 , may give by explosion CO , $+\text{CO} + \text{N}_2 + 3\text{H}_2\text{O}$, or $2\text{CO}_2 + \text{N}_2 + \text{H}_2 + 2\text{H}_2\text{O}$. In both cases the volume of the gas generated is the same, viz., 1,028 liters for 1 kilogramme, the heat of decomposition being 1,451 calories. These numbers are very nearly the same as those furnished by nitro-glycerine and gun cotton. The pressure developed when 1 kilogramme of methyl nitrate is exploded in a vessel of 1 liter capacity is no less than 11,000 kilogrammes per square centimeter. The author has attempted to measure the velocity of propagation of the waves, but the vessels employed were always broken by the shock. A calculation shows that the resistance offered by the vessels only increases with the thickness up to a certain limiting pressure. The pressure developed above this limit has infinite force. Hence nothing can resist it.—*M. Berthelot, Academy of Sciences, Paris.*

Sustaining Capacity of the Great Republic.

According to a recent census bulletin, the ratio of land and water surface is 98.16 and 1.84 per cent respectively. This bulletin also gives the area of the States and Territories by counties, and the classification of the latter by sizes. The average number of persons to each square mile of the land surface of the Union is 21.08.

As illustrative of the sustaining capacity of the United States, the bulletin says that if Texas, the largest State in the Union, was as thickly populated as the State of Rhode Island, it would have 83,523,628 inhabitants, while if the United States had a density of population equal to that of Rhode Island, the population of the Union, instead of being 62,622,250, would reach the enormous sum of 945,766,300, or nearly two-thirds of the present population of the world.

The Barnum Institute of Science and History.

Those whose association of ideas with the name of P. T. Barnum are only of the street parade, canvas tent and hippodrome can hardly realize the fact that in Bridgeport, Conn., where his home has been for many years, people think of him mainly as a most kind-hearted gentleman and public-spirited benefactor. His gifts to the city are numerous and munificent, and he has recently crowned them all by purchasing an ample lot centrally located and beginning the erection of an elegant and spacious edifice which is his gift to the Scientific and Historical Societies of Bridgeport. More than a year ago he had informed those societies that he had remembered them in his will to the amount of \$200,000; but his sensible conclusion has been to become, as far as possible, his own administrator, and hence the immediate erection of the building now briefly described. In style it will be purely Romanesque, with abundant ornamentation. At the angle of the streets there will be a grand dome, flanked by balconies. An historic frieze, with figures half life-size, will extend between the cornice of the dome and the top of the circular windows of the third story. Its five panels will set forth the various stages of the municipal career from colonial times down to the present day, and the medallions in the interspaces will be embellished by likenesses of eminent men. The material for the frieze will be terra cotta, and the intention is to make it a fine work of art. The upper parts of the dome and towers will be covered with copper, while the remainder will be tiled. At the apex of the dome there will be a gilded eagle. Back of the main dome will stand an observatory for astronomical purposes. The ground floor will be given up to stores, the rental from which will go to maintain the expenses of the building. The entrance to the Scientific and Historical rooms will be a gateway through the square tower on the right. The division between these rooms will be merely an open screen of arches and columns, so that free access can be had to any part of the floor, with the exception of a small hall intended for the use of the city medical society, and another room for business meetings. Under the observatory will be a fire-proof vault, in which may be stored specially precious relics and scientific specimens. The staircases and division walls are also to be fire-proof. In the third story will be a long hall lighted by sky lights, adapted for a picture gallery. A large room in the east wing will be devoted to exhibits of the two societies, while the auditorium for lectures will occupy the dome, but with sliding doors making the entire floor available when there may be occasion for so much space. The building material will be red sandstone, and the edifice will be a perfect model of its kind.

Site of the Chicago World's Fair.

President Lyman J. Gage, of the Chicago Board of Directors of the Columbian Fair, recently made an interesting report upon the progress made during the past year, from which we extract the following particulars as to the grounds, buildings, and transportation facilities:

The South Park system consists of two great parks connected by the Midway Plaisance, a strip of land a mile long and 600 feet wide, and united by boulevards with the heart of the city and with the West Side and North Side parks. Both Washington and Jackson Parks, and the Midway Plaisance, as well, have been placed at the disposal of the Columbian Exposition. The South Side system of cable cars connects with the two parks, and the Illinois Central Railroad passes near the western boundary of Jackson Park, and, with other roads, will be directly connected with the Fair during its continuance.

By reason of the greater picturesqueness of the lake shore site and the superior accessibility of Jackson Park, both by water and land, and for the additional reason that being now for the most part unimproved it is more readily adaptable to the purpose, Jackson Park has been chosen as the principal site of the Fair. The eighty acres at the north, which are now laid out and under cultivation, form but a small fraction of the entire area of this park, which extends a mile further south, broadening constantly along the curving shore of the lake. In this unimproved portion, much of which is thickly wooded with native trees, the ground is being prepared for a system of lagoons and canals from 100 to 300 feet wide, which with the broad, grassy terraces leading down to them will pass the principal buildings, inclose a wooded island 1,800 feet long, and form a circuit of three miles navigable by pleasure boats.

These canals, which will be crossed by many bridges, will connect with the lake at two points—one at the southern limit of the present improved portion, and the other more than half a mile further south, at the great main court of the exposition. At this point, extending eastward into the lake 1,200 feet, will be piers which will afford a landing place for the lake steamers and inclose a harbor for the picturesque little pleasure boats of all epochs and nations which will carry pas-

sengers along the canal, stopping at numerous landing places.

This harbor will be bounded on the east, far out in the lake, by the long-columned facade of the Casino, in whose free spaces crowds of men and women, protected by its ceiling of gay awnings, can look east to the lake and west to the long vista between the main edifices as far as the gilded dome of the Administration Building. The first notable object in this vista will be the colossal statue of Liberty, rising out of the lagoon at the point where it enters the land, protected by moles which will carry sculptured columns emblematic of the thirteen original States of our Union. Beyond this, beyond the first of many bridges, will lie a broad basin from which grassy terraces and broad walks will lead on the north to the south elevation of the enormous Main Building, and on the south to the structure dedicated to agriculture.

The main building, extending northwestward a third of a mile, will be devoted to manufactures and liberal arts, and will receive from all nations the rich products of modern workmanship. Recalling, architecturally, the period of the classic revival, it has the vivacity, the emphatic joyousness of that awakening epoch. The long, low lines of its sloping roof, supported by rows of arches, will be relieved by a central dome over the great main entrance, and emblematic statuary and floating banners will add to the festive character. The north elevation of the classic edifice devoted to agriculture will show a long arcade behind Corinthian columns supporting a series of triple arches and three low, graceful domes. Liberally adorned with sculpture and enriched with color, this building, by its simplicity, refinement, and grace, will be idyllically expressive of pastoral serenity and peace. At its noble entrance a statue of Ceres will offer hospitality to the fruits of the earth. Beyond it, at the south, sixty-three acres of land will be reserved for the live stock exhibit.

The lofty octagonal dome of the Administration Building forms the central point of the architectural scheme. Rising from the columned stories of its square base 250 feet in the air, it will stand in the center of a spacious, open plaza, adorned with statuary and fountains, with flower beds and terraces, sloping at the east down to the main lagoon. North of the plaza will be two buildings devoted to mining and electricity, the latter bristling with points and pinnacles, as if to entrap from the air the intangible element whose achievements it will display. South of the plaza will be Machinery Hall, with its power house at the southeast corner. A subway at the west wall will pass under the terminal railway loop of the Illinois Central road to the circular Machinery Annex within. North of this railway loop and along the western limit of the park will be the Transportation Building. Still further north, lying west of the north branch of the lagoon at the point where it incloses the wooded island, will extend the long shining surfaces and the gracefully curving roof of the crystal palace of Horticulture. Following the lagoon northward one will pass the Women's Building, and, eastward, will reach the island devoted to the novel and interesting fisheries exhibit, shown in an effective low-roofed Romanesque structure flanked by two vast circular aquaria in which the spectator can look upward through clear waters and study the creatures of the ocean and river. This building will be directly west of the northern opening of the system of lagoons into Lake Michigan, and in a straight line with the Government Building and the Main Building, which extend along the lake shore to the southeast.

North of the lagoon which bounds this fisheries island lies the present improved portion of Jackson Park, which will be reserved for the buildings of the States and of foreign governments. The Illinois building will occupy a commanding position here, its classic dome being visible over the long lagoon from the central plaza. Along the Midway Plaisance will be placed a number of special exhibits, like the historical series of human dwellings, reproductions of famous streets, etc., and it is probable that some of these may overflow into Washington Park. At the junction of the Midway Plaisance with Jackson Park is the site chosen for the Proctor tower, which, rising 1,100 feet into the air, will command a majestic view of the beautiful grounds and buildings, brilliant with light and color, and the great city lying between boundless levels of land and sea.

Thus the various portions of the exhibition will be equally accessible by water and by land. The traveler may come by carriage, by cable, or by rail, and be carried from one section to another on the elevated roads which will connect and perhaps penetrate the buildings, or follow the broad footways which will surround them. Or he may arrive by steamer from the lake and board one of the gay boats which will glide from building to building along the lagoons. But by whatever path he comes he will behold a scene of commanding beauty—noble edifices grouped with consummate art in grounds admirably disposed. The genius of the late consulting architect and his eminent coadjutors will here proclaim to the world the supremacy of American architecture and the artistic resources of the new world Columbus discovered four centuries ago.

New Signaling Inventions Called for.

On February 20 last a collision took place in the underground railway tunnel of the Harlem Railway Company at 85th Street, New York City, by which six persons were killed and several injured. The casualty was due to a rearward collision; an express passenger train going thirty miles an hour ran into the rear cars of another train moving in the same direction at six miles per hour. The cars of the slower moving train were telescoped and wedged together into a shapeless mass, a stove was upset and fire instantly added to the horror of the scene. The slow train was nearly empty, as it was on its way to the cleaning yard. Nearly all those who were upon it were hurt or burned to death. The tragedy was due to lack of audible signals. The railway is admirably equipped with the electrical block system of signals, with brilliant signal lights, but these, owing to the steam and smoke which fill the tunnel, could not be seen. Hence the sad result. It seems this most dangerous condition of things has been allowed to exist for years, with liability to accident at any moment. The fire was due to the car stove. Great public indignation was occasioned when this fact was made known. The officers and directors of the New York, New Haven and Hartford Railway Company were arrested, have been indicted, and will be tried. The New York State law forbids the use of stoves in cars on any railway of more than fifty miles length. As the cars of both the trains that collided are owned by the New York & New Haven Railway Company, which does not run for fifty miles within the State, it is thought the directors cannot be legally punished. But an attempt to do so will be made. The New Haven Company has not yet fully adopted steam heating.

The Grand Jury of New York state that some new system of audible signals is absolutely required. Here is a chance for inventive genius. It is hoped practical inventions in this line will soon be forthcoming. This is the way the jury presents the matter:

"The Grand Jury has been made satisfied that the present system of signaling in the Grand Central tunnel of the Harlem Railroad is inadequate. A part of this inadequacy is due to conditions of fog and smoke, which serve to obscure the signal lights. Some efficient system of audible signaling ought therefore to be added—some connection with the danger signal, which, in contact with the locomotive, should sound an alarm within the locomotive cab, as an unmistakable notification to the engineer that the danger signal is set against him. We further recommend that the State Railroad Commissioners be immediately empowered and directed by the Legislature to recommend and require such further improvements and means to public safety throughout this entire tunnel system as can be skillfully devised."

Judge Fitzgerald told the Grand Jury in discharging them that their action in the tunnel collision case had met with public approval, and is recognized on all sides to have been dictated by a high sense of the duties and responsibilities attached to their body. "Copies of the presentment," he said, "will be forwarded to the railroad commissioners, to both branches of the legislature, and to the Governor of the State, with a view of accomplishing any further legislation that may be necessary in order to compel those who are intrusted with large public franchises to adopt the best and most improved methods to secure public safety."

Artificial Rubies.

The experiments of MM. Fremy and Verneuil on the artificial production of rubies have been in progress for some years, but it appears from their recent communication to the *Comptes Rendus* that they have now successfully overcome the difficulties which attend their manufacture, and are obtaining much larger crystals. The artificial rubies have already been employed as pivots in watches, and are said not to be inferior to the natural stones in hardness. The process consists in heating alumina and a trace of potassium bichromate with barium fluoride or a mixture of fluorides of the alkaline earths to a high temperature for several days. Recent progress has been due to the discovery that the addition of a small quantity of potassium carbonate to the mixture, so as to render the fused mass alkaline, facilitates the formation of the crystals. It is believed that the crystals are produced directly from the interaction of the volatile compounds produced, and by employing crucibles of several liters capacity in gas furnaces as much as 3 kilos., or 6½ pounds, of rubies are obtained in a single operation.

THE Lick telescope is the most powerful glass in the world. It is reported the observers at Mount Hamilton have lately kept a sharp eye turned upon the shadow of one of the moons of the planet Jupiter. This shadow seemed double, indicating that the tiny moon which cast it is also double. Since the first hint of the discovery many observations have been made through the Lick glass, all tending to confirm the original impression, to wit: That this particular satellite of the greatest of the planets is double—a dot of a moon revolving around the main moon.