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NEW YORK, SATURDAY, JULY 13, 1901.

The Editor is always glad to receive for examination illustrated articles on subjects of timely interest. If the photographs are *sharp*, the articles *short*, and the facts *authentic*, the contributions will receive special attention. Accepted articles will be paid for at regular space rates.

THERE IS ROOM AT THE TOP.

Not many months ago a man whose ambition it is to govern the affairs of this city—an ambition, unfortunately, in which he is only too successful—ventured to break the discreet silence that has contributed so largely to his political success, and give to the world his ideas on men and things in general. His words were not burdened with wisdom; indeed, they bordered so closely on the commonplace as to renew in our minds the wonder and humiliation of it all, that a political adventurer of such diminutive mentality should be so lording it over us, and growing fat upon the substance of the second greatest city in the world.

It was not surprising that the successful leader in a movement whose political methods have raised such a stench in the public nostrils should entirely misunderstand the lessons of the present remarkable developments in our industrial life; and he never made a more misleading statement than when he said that, owing to trusts and commercial combinations, the youth of the land no longer had a fair chance to earn a living. As a matter of fact one of the most striking features of our present industrial era is the remarkable prominence of the younger men; the splendid opportunities that are offered them, and the distinguished way in which they are carrying burdens of responsibilities, which in an earlier age were supposed to fall only upon much older shoulders.

The present is essentially—in America at least—the day of the young man. He is in demand. If he be mentally well-equipped, and have character and common sense to back his knowledge, he will find that there are opportunities open to him, often on the very threshold of his business career, such as the young man of an earlier day would dream of as the goal only of long years of waiting and working.

During a recent visit to that hive of industry which swarms around Pittsburg, and in the valleys of the Monongahela and Allegheny, we were impressed with the fact that in most of the great manufacturing establishments the highest positions of responsibility were filled by men who were yet several years on this side of the prime of life. That such young heads should so often be directing vast industrial concerns, is due in part to the amazing rapidity with which new industries have sprung up during the past decade, and in part to the fact that the keen competition of the age calls for the adaptiveness and energy which are the natural qualities of youth.

Time was when there was an overplus, especially in the technical trades and professions, of the supply of qualified young men; but to-day conditions are entirely reversed. Clear proof of this was shown at the recent annual commencement exercises of the Stevens Institute of Technology, Hoboken, when, out of forty graduates only a dozen were present to receive their diplomas. This unprecedented condition of things was explained by President Morton on the ground that the demand for graduates to fill business positions this year had been the most urgent in the history of the Institute, and that most of the absentees had been induced to leave the Institute a week or more before commencement, in order that they might begin their professional duties at once. President Morton further stated that the whole of the forty graduates could have secured positions at once if they had so desired. There is no gainsaying the significance of such facts as these; and as like conditions will produce like results, it is probable that, before many years have elapsed, these young graduates will have risen to positions which are both responsible and remunerative.

THE LEADING NAVIES OF THE WORLD COMPARED.

Comparisons of the relative strength of the leading navies of the world are in a measure unsatisfactory for the reason that any basis on which the comparison is instituted is necessarily more or less arbitrary. This is particularly true of comparisons based on tables showing the number of fighting ships of each class possessed by the navies compared. Great Britain, for instance, is credited with a total of thirty-eight first-class battleships as against a combined total of twenty-seven possessed by France and Russia, and the question is at once suggested: by what standard do we determine whether a battleship is of the first or some other class? Again, we may state that Great Britain possesses a total of fifty-nine battleships of all classes as against a total of fifty-nine battleships of all classes possessed by France and Russia; but here again we are confronted by the fact that some of the leading admirals and other experts of the British Navy are contending that many of the vessels which are ranked as third-class battleships in this estimate, are from twenty-five to thirty years old and are, therefore, too obsolete to rank in the active list of a navy of the year 1901; while, on the other hand, the oldest of the French third-class battleships have not seen more than twenty-six years of service, and, unlike the British vessels referred to, have been reconstructed and rearmed with modern weapons.

However, since some basis of comparison is necessary, we will take, in the present case, the comparative tables of the leading navies of the world as published in Brassey's Naval Annual. In looking them over, one is struck with the fact that a conscientious effort has been made to separate the fighting ships into such classes as agree with their ever-increasing age and ever-decreasing efficiency; and although one may consider that such old vessels as the "Sultan" and "Superb," which still carry muzzle-loading rifles as their main armament, might well be dropped from the list of active battleships in the British Navy, there is compensation in the fact that such powerful battleships as the "Nile" and the "Trafalgar," of 12,000 tons displacement and 16½ knots speed, carrying four 13½ inch breech-loading rifles as their main armament, should have been transferred from the first to the second-class in these tables. We notice that in pursuance of the same policy our own battleship "Texas" appears in this year's annual as a battleship, not of the second, but of the third-class.

Of effective fighting ships built and building, then, Great Britain has fifty-nine, France, thirty-four; Russia, twenty-five; Italy, sixteen; Germany, twenty-three; the United States, eighteen, and Japan seven. On this basis of comparison the United States stands fifth in the list. Although Germany possesses five battleships more than this country, when the battleships are segregated into classes, we find that the position of the United States is greatly improved, while Great Britain shows a very great preponderance over the navies of France and Russia combined. Of battleships of the first-class, Great Britain comes first with thirty-eight, and is followed by the United States with seventeen, Germany with sixteen, Russia with fourteen, and France and Italy with thirteen and nine, while Japan comes last with six. This is certainly a gratifying showing for the United States Navy—particularly so when we bear in mind that our battleships, and especially the eight vessels of the "Maine" and "New Jersey" classes, are the most powerfully armed, and among the largest battleships in the world.

The most recent battleship designs vary considerably in displacement, the smallest being the seven vessels of the "Wittelsbach" class, of the German Navy, which are of 11,800 tons displacement and 19 knots speed, while the largest are the 15,000 ton vessels of the "London" and "Queen" type, of the British Navy, and of the "New Jersey" and "Rhode Island" type, in our own navy. The most original of all the new battleship designs is the "Regina Elena," of the Italian Navy, a 12,624-ton vessel which is to carry two 12-inch, twelve 8-inch, and twelve 3-inch guns, and is to have a sea speed of 22 knots an hour. With her belt of 9¾-inch steel and a stowage capacity of 2,000 tons of fuel, this vessel is certainly the ideal representative of that battleship-cruiser type, to which we are inclined to think all future naval construction is tending.

Under the head of cruisers Great Britain is credited with 149 and France with fifty-five; while the United States comes third with thirty-four and is followed by Germany with thirty-one, Russian twenty-five, Japan twenty-two, and Italy with twenty-one cruisers. Considering only the first-class cruisers, Great Britain is seen again to have a long lead, with a total of forty-three vessels, ranging in displacement from 7,350 tons and 20 knots speed to 14,000 tons and 23 knots speed, while the United States is bracketed with Russia in the third position, each having thirteen first-class cruisers, France coming second with nineteen of this class. Cruisers of the first-class, particularly those which have lately been authorized, are all armored vessels, and, in fact, the unarmored cruiser seems to have passed almost entirely out of favor. Great Britain has now under construction fourteen armored vessels of 9,800 to 14,100 tons displacement, all of 23 knots sea speed, while our armored cruisers of the "California" type are about the same size as the 14,100 ton cruisers, but have one knot less speed. Against this, however, is to be offset the fact that the armament of our cruisers is somewhat heavier.

Under the head of coast-defense ships, we find that Germany heads the list with nineteen vessels, followed by Great Britain with seventeen, Russia, sixteen; France, fourteen; the United States, ten; Italy, three, and Japan, one vessel. Here again mere enumeration of units fails to give the United States its adequate position, since in some of the foreign countries the coast-defense vessels are a nondescript lot of old battleships and cruisers of somewhat doubtful utility, whereas our ten vessels include the new 4,000-ton monitors of the "Arkansas" class, which will be armed with a pair of the most powerful 12-inch guns in the world, and also the "Monterey," which may be called a thoroughly modern vessel. The United States do not figure in the comparison of the strength of the world's navies in what is known as torpedo gunboat class, our smaller vessels being of too large a displacement to be included under this head. Great Britain has thirty-four gunboats built and building; France, twenty-one; Italy, seventeen; Russia, nine; Germany, four, and Japan, two.

Summing up, it must be confessed that the comparison is a pleasing one judged from the standpoint of the United States; especially when we remember that it was not so very many years ago that our navy, in the modern sense of the term, did not exist. As matters now stand the United States and Germany appear to be of equal strength, considered numerically; but when we consider the offensive and defensive power of the battleships which we now have under construction, it must be admitted that, in spite of the large building programme which Germany now has in hand, the fighting strength of our navy to-day is, perhaps, on paper, a little stronger than that of Germany.

REPORT OF ROYAL BRITISH OBSERVATORY FOR 1900.

The report for 1900 of the Royal British Observatory at Greenwich has been issued. This observatory was founded in 1675 during the reign of Charles II., owing to the increase in the British maritime trade rendering the determination of longitude at sea absolutely necessary. The hill which the buildings now occupy was formerly the site of a castle owned by Humphrey, Duke of Gloucester, and the alterations were carried out by Sir Christopher Wren. When the Duke died the property reverted to the Crown, and the castle was then successively utilized as a royal residence, a prison, and a place of defense.

The director of the Observatory is officially known as the Astronomer Royal. He receives his appointment from the Prime Minister, although the Observatory is under the control of the Lords of the Admiralty. The present Astronomer Royal is Mr. Christie, who succeeded Sir George Airy twenty years ago.

During recent years the buildings have been considerably extended, and several new instruments have been added. The most important is the telescope designed by the Astronomer Royal and erected by Sir Howard Grubb. It is a most powerful telescope, as the tube is 28 feet in length, the objective 28 inches in diameter. Although a large instrument, it is so delicately adjusted that it can be moved by the hand to any part of the heavens. Another important instrument is the photographic telescope presented by Sir Henry Thompson, and which is accommodated in a specially constructed building. In addition to the general daily and nightly observations of the heavens, exhaustive records are kept relating to the changes of the temperature, velocity of the wind, humidity of the atmosphere, the earth's magnetism, etc. All the chronometers used in the Royal Navy are examined and tested at the Observatory. Hourly and daily signals are sent to the various post offices throughout the United Kingdom, giving Greenwich time, while on the eastern turret an apparatus is placed by means of which captains of vessels passing up and down the Thames can ascertain the actual time.

Apprehension is being entertained that now that electricity is being so widely utilized throughout London for street transit purposes the magnetic instruments of the Observatory will be disturbed and incorrect records obtained. The London County Council have adopted a perfectly satisfactory insulated return, so that the magnetic registers will not be deranged, and it is hoped that the other companies will adopt similar measures. The French Magnetic Observatory at St. Maur is encountering similar difficulties, owing to the near approach of electric tramways to the Observatory, but M. Moureaux has discovered that copper dampers reduce the intensity of the vibrations by about one-tenth. According to the annual report, the planet Eros has been photographed with the Thompson refractor for the determination of the solar par-

allax. The new star in Perseus, first seen at Greenwich on February 25, has been photographed every night since when weather permitted. The Astronomer Royal, by means of the expedition which went to Ovar, Portugal, to observe the total eclipse of the sun on May 28, 1900, has obtained five large-scale photographs of the corona; four pairs small-scale photographs showing the extension of the corona; and two photographs of the corona spectrum. The first contact could not be seen at Greenwich owing to the presence of clouds, but during the clear intervals eleven observations were made with the new altazimuth.

THE BERLINER TRANSMITTER PATENT HELD TO BE INVALID.

On Monday, June 24, 1901, Judge Brown, representing the United States Circuit Court for the District of Massachusetts, handed down the full text of the opinion of that court in the two so-called Berliner telephone patent cases.

These cases were practically decided in February last, and an additional mention of a rescript of the court's opinion was made in the columns of the SCIENTIFIC AMERICAN of March 9, 1901. The complete opinion of the court, however, was not made public at that time.

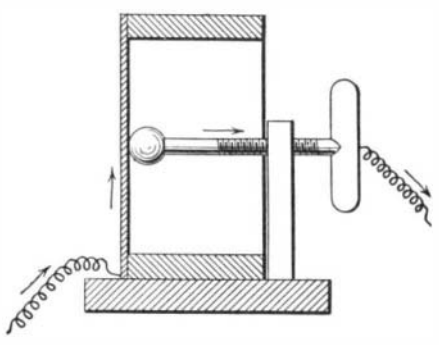
The two respective suits were brought by the American Bell Telephone Company in the form of bills in equity seeking to enjoin the National Telephone Manufacturing Company et al. and the Century Telephone Company et al. from infringing patent No. 463,569. As heretofore stated in these columns, the application for this patent was made by Emile Berliner on June 4, 1877, and was assigned to the Bell corporation the year following, but through the manipulations of the assignee's attorneys, the patent was not issued from the Patent Office until November 17, 1891. The logical effect of this delay was a tendency to prolong the monopoly of the Bell corporation, provided, of course, the patent was valid and could be given a broad interpretation in the courts.

In the suits in question the Bell corporation alleged the infringement of claims 1 and 2 of this patent, which are as follows:

"1. The method of producing in a circuit electrical undulations similar in form to sound-waves by causing the sound-waves to vary the pressure between electrodes in constant contact so as to strengthen and weaken the contact and thereby increase and diminish the resistance of the circuit, substantially as described.

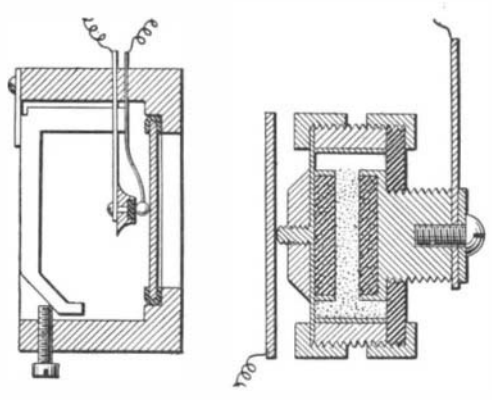
"2. An electric speaking-telephone transmitter operated by sound-waves and consisting of a plate sensitive to said sound-waves, electrodes in constant contact with each other and forming part of a circuit which includes a battery or other source of electric energy and adapted to increase and decrease the resistance of the electric circuit by the variation in pressure between them caused by the vibrational movement of said sensitive plate."

The structure shown in the patent and upon which these claims were based is represented in Fig. 1. The



current follows the path indicated by the arrows, passing from the metallic diaphragm to the metallic sphere in contact with the same. The screw serves to adjust the contact between the diaphragm and the sphere.

The transmitters used by the defendant corporations, and which were alleged by the complainant corporation



to infringe the structure above shown and defined in claims 1 and 2, are represented in Figs. 2 and 3. The structure shown in Fig. 2 is one form of the familiar Blake transmitter. A little sphere of platinum is located between the diaphragm and a button of hard carbon, which is mounted upon a spring, and is adjustable toward and from the diaphragm.

In the transmitter shown in Fig. 3 a loose carbon powder lies between two solid carbon plates, one of which is actuated by the diaphragm, so that movements of the latter cause the loose carbon particles to be alternately pressed together and released. The carbon plates are encased and mounted upon a leaf-spring.

The defendant corporations contended among other things that the patent was void, and for the following reasons, to wit:

First, the patent as finally issued represented a different structure from that which Berliner described in the application as originally filed.

Second, that Edison and not Berliner was the inventor of the subject matter finally patented.

Third, that the structure which Berliner originally described in his application was old at the time the application was filed; and

Fourth, that a former patent issued to Berliner had disclosed his structure, and therefore the Patent Office had no power to issue another patent to him upon the same structure.

The merits of the case were argued at great length pro and con by distinguished counsel. The famous transmitter invented in Germany by Reis, several transmitters of Mr. Edison, and Bell's so-called liquid transmitter were brought into discussion, the question being whether these devices anticipated Berliner's structure and patent. Much expert testimony was taken.

One important question presented by the suits was whether a metallic sphere adjustable against the vibratory diaphragm and claimed broadly could anticipate the well-known carbon transmitter. The peculiar properties of carbon for this purpose were apparently unknown to Berliner or anybody else at the time the application was originally filed. In other words, it was a question whether a metallic contact in a transmitter, broadly claimed, could anticipate a carbon contact of variable resistance, the variable-resistance property of the carbon being unknown at the time of the application.

Referring to the anticipatory effect of Bell's liquid transmitter, the patent for which had formerly belonged to the complainant corporation but had expired, so that the public had a right to use the invention, the court significantly remarked:

"The attempt to dispose of that apparatus by characterizing it as a mere laboratory experiment, after . . . it was presented to the Supreme Court as a speaking telephone (126 U. S., 247 to 322) is not successful. This instrument is quite as important after the expiration of Bell's patent as it was before."

Upon the subject of the difference in scope between the patent in suit and the original application therefor as filed in the Patent Office by Berliner, the court said:

"I am of the opinion that the language of these claims is clear and that no resort to the specifications is necessary to explain its meaning. They are not claims made in the infancy of an art by an unskilled inventor. They were put in the present form more than two years after Edison's carbon telephone had been placed on the market."

Discussing the changes alleged to have been made in the structure and action of the apparatus after the original application had been filed and before the patent was issued, the court observed:

"The patent calls for constant contact of electrodes and an unbroken current; the application, for an interrupted contact and a broken current. The Supreme Court has decided that these methods are radically distinct. (126 U. S., 544 to 545)."

The learned judge summed up the opinion of the court in the following language:

"I am, therefore, of the opinion that even if the complainant were able to prove that Berliner had in fact made an invention; that his application upon its face disclosed this invention; that he was lawfully entitled to make the amendments; and that his previous patent of 1880 did not exhaust the power of the Commissioner to grant the patent in suit, and that he was not anticipated by Edison; that, even after all this, well-established rules of law would require us to hold that claim 1 of this patent is void, and that claim 2 is either void or so limited that it does not include the defendants' transmitters.

"It has been impossible, in this opinion, to consider all the points of the very able arguments that have been presented, or all the important contentions that have arisen. The brief of the defendants has met the case of the complainant thoroughly and completely, and with very exceptional ability and commendable fairness has demonstrated, in my opinion, that the complainant's case rests upon a patent that should not have been granted, and which is void for error apparent upon the face of the records of the Patent Office; that as a matter of fact Berliner on June 4, 1877, the date of his application, had not made the discovery that speech could be transmitted with the apparatus of the patent in suit, and was at that time, and long after, like other unsuccessful experimenters, attempting to use a broken current. In addition to the fundamental defects in the complainant's title to the patent, it appears that the best argument that skilled experts and learned and ingenious counsel can base upon this patent is logically untenable and legally unsound.

"The bills will be dismissed."

PARIS-BERLIN AUTOMOBILE RACE.

Racing automobiles were never put to a more severe test than in the Paris-Berlin race. The machines started on June 28 from Champigny, a suburb of Paris, and finished their trip June 29, at Berlin. M. Fourrier, with a Mors carriage, covered the 750 miles in record time. A crowd of 2,000 persons witnessed the start. One firm of automobile builders had a staff of seventy-seven mechanics on the ground to inspect their machines before leaving. The route was by Aix-la-Chapelle and Hanover. M. Fournier was the first to arrive at the former place. He stated that the crowds which lined the road during the last 40 miles were so great that he constantly feared there would be a fatal accident. M. Fournier's actual racing time for the 282½ miles was 6 hours and 58 minutes, road-rules compelling him to slow down in many towns and villages. The next day's trip was from Aix-la-Chapelle to Hanover, a distance of 275 miles. M. Fournier was again the first to arrive at the end of the second stage of the race. His time was 9 hours 7 minutes and 39 seconds. Many of the drivers of the automobiles were so exhausted and nerve-shaken at the end of their second day's trip that they could hardly speak. The bad condition of the roads and the hot sun which affected the tires, prevented any very phenomenal speed. There were a number of accidents on both days' runs. The third stage from Hanover to Berlin, 297 miles, was made in 11 hours, 46 minutes and 10 seconds. M. Giradot, on a Panhard machine, finished second in 12 hours, 15 minutes and 40 seconds; M. Brasier was third. The reception of the riders by the Germans at Berlin was an ovation.

SCIENCE NOTES.

Dr. Vaughan Cornish, F. G. S., gave an interesting lecture at the London Geographical Society concerning waves, illustrated with photographs which he had secured during his investigations. Regarding ocean waves and the enormous heights they are generally supposed to attain, Dr. Cornish stated that the average height of waves in mid-ocean was 18 feet, though waves 30 feet in height were by no means uncommon. During a recent storm in the North Atlantic, however, the lecturer had measured some of the waves and found that they attained the extraordinary height of 40 feet.

Sir Norman Lockyer, the eminent English astronomer, resigns his position as Professor of Astronomical Physics at the Royal College of Science, South Kensington, London, at the end of the present year. He has been connected with the Department of Science and Art for twenty-six years. Between the years 1870 and 1900 he was the chief of seven eclipse expeditions, and his volume "Recent and Coming Eclipses," based upon his investigations during those thirty years, is a valuable addition to scientific literature. Sir Norman Lockyer, however, proposes to retain his position as Director of Solar Physics at the South Kensington Observatory.

The farmers in South Lincolnshire (England) have been suffering from a plague of insects called the mustard bug, which devours the white mustard crops. Several farmers have had acres of valuable crops destroyed by this pest, and have been unable to discover an efficacious remedy. They have now resolved upon a curious expedient. Flocks of chickens are turned into the white mustard fields, and since the bug is somewhat of a delicacy to the fowl, it is anticipated that the pest will be overcome and that the crops so far untouched will be saved.

The first sealed thermometer was made some time prior to 1654 by Ferdinand II., Grand Duke of Tuscany; he filled the bulb and part of the tube with alcohol, and then sealed the tube by melting the glass tip, says The Engineer. There appears to be considerable doubt as to who first employed mercury as the thermometric liquid; the Academia del Cimento used such an instrument in 1657, and they were known in Paris in 1659. Fahrenheit, however, appears to have been the first to construct, in 1714, mercury thermometers having trustworthy scales. The use of the boiling point of water as the upper fixed point was suggested by Carlo Renaldini in 1694.

DEATH OF PROF. JOHN FISKE.

Professor John Fiske, of Cambridge, the historian and philosopher, died from the effects of the heat on July 4th. He was born in Hartford, Conn., March 30, 1842. As a boy he was extremely precocious; he began the study of Latin when only six years old, and at seven he was reading Cæsar. In 1860 he entered the Sophomore class of Harvard and finally became a lawyer. He did not practise law to any extent, but commenced to write for magazines and reviews. In the scientific world he was regarded as a specially able expounder of the philosophy of Herbert Spencer and the theory of evolution. His scientific writings were considerable.