

IN THE FIELD OF ELECTRICITY

Results of Weather Bureau Experiments in Wireless Telegraphy.

TROLLEYS IN THE DOMAIN OF STEAM

Local Attacks on the Supremacy of the Locomotive—Britain's Telephone System—Fishing by Electric Light.

Prof. R. A. Fessenden, who has been in charge of the weather bureau experiments in wireless telegraphy since January, 1900, has been so successful that the bureau will soon be able to make use of a system fully equal to that of any department in any other country.

Prof. Fessenden says regarding his experiments: "In the first place it has been found possible in several ways to get over the old difficulty which troubled Hertz and later experimenters, i. e., that when the spark length was increased beyond a certain length the discharge became no longer oscillatory. An electrical device was invented, which on being applied directly to the sending wire measured directly the amount of energy radiated. A curve was then plotted, showing the relation between spark length and energy radiated, and it was found that the curve gave a sharp bend with a spark about one inch in length and no further increase of radiation could be obtained.

Other work done by the weather bureau has been along the line of producing a noninterfering system. The admirable and beautiful work of Mr. Marconi has resulted in a system by which within certain limits messages can be sent without interference. But one great objection has been found in the weather bureau experiments to this method, although it is described in some of the earlier patents of the weather bureau experimenters. That is, that while it is no doubt possible, under certain conditions, to send and receive individual messages, yet by connecting two brass semi-circles to a motor revolving at several thousand revolutions per minute, it is possible to make what may be called an electrical streamer, which will send down a scale of seven or eight octaves several thousand times a minute and which, as at some period of the scale it gives a note corresponding to any given synthesized receiver, it consequently allows the communication, when used in conjunction with the apparatus for strengthening the radiation, within a radius of 500 miles or so.

Consequently this method has been superseded by several other methods, which permit of selective signaling, no matter how strong the interfering radiations may be, or how close it may be, even approaching the interfering radiations within a few feet, producing absolutely no effect.

The parallel manner in which a considerable part of this work has been done may possibly be taken as evidence of the fact that the matter has now got down to a sound scientific base. Mr. Marconi and his eminent collaborator, Dr. Fleming, are certainly to be congratulated on the results they have so far achieved and no one can more heartily wish them the best of success than the writer. The future of wireless telegraphy in his hands is certainly assured and it cannot be many years before Mr. Marconi will see the point of and to put in practical form, in an universal use as our present methods of telegraphy.

Trolley and Steam Arranged. The successful preliminary trials made upon the long-distance trolley system of electric railways recently completed in the region of Lake Como, Italy, have attracted the attention of electric engineers and traction experts all over the world. It is believed by many that the successful operation of this system is the forerunner of a general application of electricity to existing railway lines, and hence a solution of no small number of traction problems in this country.

This system of heavy electric traction, which consists of sixty-seven miles of main line in the north of Italy, running from Lecco to Colico along Lake Como and from Colico to Sondrio and Chiavenna, is the first installation of electric traction. The Ganz system of polyphase traction. The company which installed this great plant was compelled to study the electrical equipment and operation of railways with a view to utilizing the water powers that abound so plentifully in Italy and with the hope of solving the problem of the economical operation of secondary railway lines in that country.

According to the Electrical Review the trials that are now being made are of two kinds, each of which answers particularly the conditions imposed by the regions in which the lines are operated. For the first complaints of considerable freight traffic and carrying numerous passengers the system of a central generating station, with distribution of energy by a fixed conducting system, has been adopted. For lines where the movement of freight is smaller, but the frequency of trains, a system of storage battery traction was installed.

All the electric power for the three branches of the line is produced directly as a three-phase current at 20,000 volts in the water power station at Morbegno, which is fed by a canal from Lake Como. The necessary power for the operation of the entire system is 2,500-horse power normal and 3,500 maximum at the power house, the installation being designed so as to be able to take care of the simultaneous transportation of 750 tons of trains at any point, a weight that may be distributed between five passenger trains or two passenger and two freight trains. Freight trains are drawn by an electric locomotive of 600-horse power, capable of handling a 250-ton train at a speed of twenty miles an hour on a 10 per cent grade.

The preliminary trials of this system have surpassed expectations. The operation of the turbine machinery and the various automatic electric appliances, devised especially for this system, appears to be perfect. There is little doubt that its success paves the way for the gradual unification of the vast networks of inter-urban lines in this country. In many parts of the country it will bring about conditions where the only remedy left for the steam railroads will be to electrify their own tracks and to connect them into vast trolley lines.

British Telephone System. The National Telephone company, which controls the business in the United Kingdom, is the subject of an interesting article

in the Electrical World and Engineer. The company has just moved into its new home on the banks of the Thames, into a building which is 250x250 feet, seven stories high and takes the place of five separate buildings where the work of administration was carried on. In speaking of the telephone system of London, of which the new building is the head office, the article says: "London is divided into six departments and has forty-seven exchanges and the whole country is split up into sixty-one districts, each of which is independent of the other and reports directly to the general manager at Telephone House. In December last there were 988 exchanges throughout the country, which take care of 200,000 stations or subscribers, with the enormous number of 62,857,854 messages per year. The business of the National Telephone company is steadily growing in spite of the opposition which is about to be met in the shape of municipal telephones and government postoffice telephones, and arrangements have recently been made for the establishment of another large exchange in London, which will be operated on the central battery system, the apparatus for which will be furnished by the Western Electric company of London. The apparatus at present in use by the National Telephone company varies somewhat, part being American make, part English and part of continental manufacture. The National Telephone company has been in the habit of buying wherever the best market could be obtained, a practice of which it will be loath to cure the average Englishman of intelligence. At the annual dinner of the company in London on May 17, when over 200 members of the staff were present, Mr. John A. Roebing's Sons company, for instance, will construct the nearly and send pendents. The towers and land spans were built by a company that is now merged in the United Steel corporation, but was originally the New Jersey Steel company and the Pennsylvania Steel company will build the approaches and the truss of the main span.

It is necessary that the towers shall be high enough to allow for the sag in the cables and keep the lower surface of the bridge at the proper elevation above the water. In this which bridge the towers are of stone. Those of the new ones are of steel, and a part from their foundations (which extend nearly 150 feet below high-water mark), weigh 40,000 tons each.

The immense anchorages. The anchorages are enormous masses of masonry in which are imbedded colossal chains. In each of the new East River bridges there are two towers, and each tower has two chains, one for each cable. Each set of chains is composed of thirty-eight separate strands 120 feet long, and following a curved path backward and downward in the masonry. The links of these chains are flat bars nine inches wide, one-half inch and of various lengths. Now when it is remembered that the anchorage in which these chains are secured weighs about 120,000 tons, while the middle span of the bridge will, when completed, be only one-tenth as much, one gets a vivid idea of the security of the structure.

Work on the towers and anchorages was conducted simultaneously, because the two are independent of each other. But it was necessary to begin both nearly or quite together. Before beginning the cables, however, the masonry has been left open on top of the anchorages in order to expose the upper ends of the chains temporarily. One important prerequisite to the construction of the towers and anchorages is the erection of a light footbridge reaching from one anchorage up to the nearest tower, and so down to the second anchorage. Another preliminary step is putting on top of the towers a kind of saddle for each cable to rest in. This saddle is made of steel and allows the cable to slide a little to and fro under the varying strains to which it is eventually subjected.

The footbridge serves the purpose of a mason's scaffold. It is a temporary structure of steel, which is erected in the permanent edifice. The first step in building the footbridges for these are two, parallel and sixty feet apart—to stretch small cables from anchorage to anchorage over the towers. The length of these cables is 4 1/2 inches. The space between the first and second cables is 1 1/2 feet, that between the second and third 60, and that between the third and fourth 11 1/2. The first and second hold up one footbridge and the third and fourth another. The length of the cross timbers of each bridge is upward of twelve feet, but the whole area is not planked over. In the interest of economy "walks" only four feet in width are constructed along each edge. The total length of these two sets of footbridges is 3,000 feet. While the horizontal distance from tower to tower is 1,600 feet, the sag of the cables makes the middle span of each footbridge 1,850 feet long. The length of each land span, from tower down to anchorage, is 1,000 feet.

A Delicate Undertaking. To enable workmen to pass from one footbridge to the other, they have been constructed. There are nine of these between the towers and one between each tower and the adjacent anchorage. An additional advantage of connecting the two footbridges is that this double structure is thus stiffened and better resists the effect of a wind blowing up or down stream. Further rigidity is given to the aerial scaffolding by running a large number of girders or stays downward from it to "atom cables" stretched across the river from tower to tower. Eventually the footbridge, storm cables and girders will be entirely removed.

The footbridges hang just three feet below the level of the future main cables all the way across. Thus the latter will be about opposite the waists of the workmen engaged in making them. Rightly to adjust the small temporary cables which sustain the footbridges was probably one of the most delicate and difficult tasks in the whole undertaking. It was necessary to foresee changes which would result

from stretching and other causes. As originally hung these small cables were ten feet higher than the positions they now occupy over the middle of the river. But the latter are correct and the engineer's calculations have been beautifully verified.

Further preparation for constructing the cables will be made within the next few weeks. The cables will consist of the erection of wire rope tramways from one anchorage to the other. The apparatus will closely resemble that used by the tunnel contractors for transporting rock and dirt from a hole in the ground to a wagon at some distance. First there is a stout wire cable stretched horizontally between the towers as a sort of railway, on which rides a traveler, a device so hung on rollers that a slight pull will drive it in either direction. The load is attached to the traveler. Finally there is a cord, by means of which the traveler is moved.

On the bridge there will be four tramways, or rather, two double ones. Each will be so arranged that a traveler will go across by one route and come back by the other. The cord that does the pulling will also be endless and will follow the same path, of course. To operate the tramways a sixty-horse power steam engine will be called into service on the New York side of the river.

Stringing the Permanent Cables. When cable making begins there will be set up on each anchorage suitable frames in which drums holding the material for the cables will be suspended, so that they can rotate. The wire is wound on a drum as a thread is on a spool, and it unwinds when the drum turns. The drum is more like a broad wheel than a spool. Its diameter is six feet, while it is only eighteen inches thick. There will be four tons of wire on a drum, and as it weighs a pound for every ten feet, there will be upward of 80,000 feet in each coil.

On beginning work the end of a wire from a drum will be passed over a pulley on the traveler, and then brought down to the anchorage chains and fastened. As soon as the endless rope starts, the traveler is in the shape of a loop or hump, the halves of which lead respectively to the anchorage and the drum. If all goes well, the traveler will have gone clear across the river in about ten minutes, and in doing so will have stretched two wires, not simply one. There the movement is interrupted an instant, while the loop is detached from the traveler by one gang of men, and a light from another drum is caught over the pulley by a second gang of men.

REARING A MASSIVE BRIDGE

Intricate Work on the Steel Structure Between New York and Brooklyn.

WEAVING THE GREAT WIRE CABLES

Statement of the Uses of the Various Parts and the Way in Which They Are Put Together—An Illustrative Story.

Not far from 200,000 persons cross the old Brooklyn bridge daily and survey thereof from the new one now in process of construction. But only a few of them fully understand the relation of the different parts of it to each other or the methods employed in this highly interesting work.

The most important things in a suspension bridge, relates the New York Tribune, are the towers, the cables, the cables, the anchorages in which the ends of the cables are fastened, the cables themselves, the suspenders by which the bridge proper is hung from the cables and the truss work. The engineer who designs the bridge puts all of these with special reference to the work expected of the bridge, and thinks out almost every detail. Then the building is entrusted to one or more contractors. The John A. Roebing's Sons company, for instance, will construct the nearly and send pendents. The towers and land spans were built by a company that is now merged in the United Steel corporation, but was originally the New Jersey Steel company and the Pennsylvania Steel company will build the approaches and the truss of the main span.

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The first pair of wires to belong to one cable, and the other pair to a different one. Now, when the traveler gets back to the starting point it will be once more employed to pull wire from the first drum. Such connections will be made with the cables, which have already been placed on the bridge that it will not be necessary to cut the wire at all. The operation of pulling from each drum continuously will be kept up until the whole 80,000 feet have been used up.

The little balconies which project from the footbridges at numerous points will be men known as "regulators." They grasp and adjust each pair of wires as they are stretched. There will be from twenty-five to thirty men in each of the bridge houses, in order to prevent tangling by the wind, and to insure the wires lying close beside one another, strings will be tied temporarily around them at short intervals, and as each fresh one is added the old will be removed and the new ones substituted. In order to encircle the whole number, there will be a Scotch fellow on the right strain upon it, and take its proper share in the future work of the bridge, the men see that it lies exactly parallel with the other, they have placed signals. Signals are given to the engineer to increase or relax the strain when this adjustment is made.

One Year to Make Cables. The wires are of steel and coated with oil. When 208 have been strung they are combined into a strand by tying them together at intervals of about ten feet with two or three turns of finer wire. There will be 7,936 strands in each cable. When the whole thirty-seven strands are finished they will be placed in a covering of thin sheet steel. The cables of the old bridge were wrapped with wire. But that procedure will not be adopted in the present case. Before the addition of the cables the cables will be eighteen and three-fourths inches in diameter. It will take about a year to finish this part of the work.

The trusswork or frame on which the floor is laid is a lattice of steel. It is so designed as to remain rigid when heavy cables are hung over it, and to resist the strongest winds that strike it on the sides. The same amount of steel gives far greater strength, vertically and sidewise, if put in the form of open frame than in one solid plate or beam. The land span trusses of the new bridge are already finished. What remains is going up the necessary structure to sustain them with temporary wooden frames built over the street. There will be no suspenders to connect them with the main cables. When the main span over the river is being built work will be pushed from both low and the necessary support will be afforded chiefly by the suspenders, which will be rigged simultaneously.

One important difference between the old bridge and the new will lie in the provisions made for the expansion of the trusswork of the main span. That of the old structure is cut in two in the middle and in zero weather there is a gap nearly eighteen inches wide, covered by metal plates. Each half expands seven or eight inches in summer. In consequence the lower ends of the suspenders, which are here from twenty to thirty inches long, are displaced in very hot or very cold weather. In the new bridge the gaps or slip joints will be at

the towers, not in the middle. At these points the suspenders will be nearly 300 feet long and the same displacement of their lower ends will hardly throw them out of plumb or strain their connections with the truss. A new mode of attaching the suspenders to the cables will be employed. The wire rope constituting the suspenders will be doubled and the main cable will pass through the loop thus formed. The loop will rest in a sort of saddle placed on the cable and not touch the latter directly. The two lower ends of the suspender will be fastened to the trusswork in much the same way as on the old bridge.

Approaches to the Bridge. When a bridge crosses a river with high, steep banks, as at Niagara, the ends are usually down at the level of the earth. But when the shores are low, and yet it is necessary to raise the structure to such a height as to allow ships to pass under freely, then the ends are far above ground. In such cases it becomes necessary to build sloping extensions or approaches. Those of the old Brooklyn bridge are of masonry. The approaches of the new structure will be of steel. That in Brooklyn will be short, owing to the rapid rise of the land from the shore. Already this approach has been begun. It looks like a portion of an elevated railroad or the New York Central's viaduct up above the tunnels. To handle the huge steel beams that compose it an immense traveler, or traveling crane, is used. This rests on the completed portion of the approach, and is easily moved about as occasion requires. Doubtless when the river span is built this same crane will be found useful there.

Wilhelm Hildenbrand, engineer of the John A. Roebing's Sons company, the firm which has the contract for making the cables, is in charge of that branch of the work. Mr. Hildenbrand is one of the best known bridge builders in the country. He assisted the Roebings in the erection of the old Brooklyn bridge and of several other suspension bridges. The reconstruction of the Cincinnati-Covington bridge and the construction of the Wheeling and Mapimi (Mexican) bridges were his work exclusively. Three years ago Mr. Hildenbrand offered to rebuild the Brooklyn bridge for \$2,500,000 or \$4,000,000 and double the capacity, and already a design of his for connecting the lower ends of the suspenders with the trusses has been adopted by Mr. Probasco. By substituting a roller and messenger pulley for the old rollers, Mr. Hildenbrand hopes to diminish the possibility of accident from expansion. The new device will be introduced for a distance of only 150 feet each way from the center of the bridge under all four cables.

A BUTLER SPOON STORY. John Budd's Defense of His Old Commander's Memory. John Budd of Wiscasset, the oldest and quaintest toll gatherer in Maine, now has a more singular tale to relate than the story of his life; and just one little chapter in his life is strange enough for most people, relates the New York Tribune.

Budd was one of twin brothers. His parents died when he was an infant and the two little shavers were taken in hand by charitable people. No one family desired both of the twins and so the boys were separated. John Budd was adopted by a French-Canadian family and was taken into their home and reared. His brother, Thomas, was taken into a Scotch family in the provinces and there arrived at manhood. After they had become men the brothers traced each other out and met, but they required an interpreter before they could converse. John had lived among French-Canadians all his life and had not then learned to speak English; the brother had a broad Scotch accent that might bother even a Yankee ear.

For years John Budd had been the toll gatherer at the end of the Wiscasset bridge, the longest in the state of Maine. It is built on treaties and is something over a mile long. Whenever Chief Justice Peters, now retired, held court at Wiscasset each April and October he never allowed a day to pass without calling on John Budd at the toll office. The chat of the old man amused the justice very much, for, as the most noted wit and raconteur in Maine, he knew picturesqueness of character more than any other tribute. He knew intimately every quaint old chap in the state.

A few days ago Budd was sitting in the sun at the door of his little booth smoking his pipe. Two young men, evidently city boys on a pedestrian tour, came along across the bridge and stopped to pay their toll. They tossed their knapsacks on their shoulders and sat down on a bench at the side of the booth for a moment's rest. Budd naturally asked them whence they had come and whether they were going.

"Oh, home in New Orleans," said the older of the young men. "We are up here in Maine for the summer."

"I stopped in New Orleans at one time," said Budd.

"When was that?"

"When I was with General Butler," said the older one, with much bitterness of tone.

"Well, you can't be very proud of that!"

"And why not, you young snip?" demanded the younger, who just as much asperity.

"Because Butler was an insulter of women, a tyrant and an old thief; that's what he was, and the boys of New Orleans who never saw him hate him just as much as the men and the women who suffered from his orders. And, besides, he stole all the spoons out of my grandfather's hotel."

"He did, eh?" snapped Budd. "What was the name of your grandfather's hotel?"

"The St. Charles."

"Oh, just a moment, young man." Budd went upstairs into his living room and brought down a heavy canvas bag. He opened it and took out a handful of spoons. On the handle of each was engraved "St. Charles."

HERE ARE A FEW OF THE Timely Articles

By Eminent Writers that have appeared in The Twentieth Century Farmer

during the first six months of 1901.

"What the Government Has Done for the Farmer," SEOR ETARY OF AGRICULTURE JAMES WILSON.

"The Advance Made in the Study of Insects," Prof. LAWRENCE BRUNER, State Entomologist of Nebraska.

"Some Leading Features of Kansas Agriculture," F. D. COBURN, Secretary of the Kansas State Board of Agriculture.

"Why Live Stock Men Oppose the Grout Bill," J. W. SPRINGER, President of the National Live Stock Association.

"Arguments in Favor of the Grout Bill," J. B. RUSHTON, Ex-President of the Nebraska Dairymen's Association.

"New Department of Agriculture in Iowa," G. H. VAN HOUTEN, Secretary of the Iowa State Board of Agriculture.

"Review of the Last Century in Dairying," Prof. D. H. OTIS of the Kansas Experiment Station.

"Redeeming the Semi-Arid Plains," C. S. HARRISON, President of the Nebraska Park and Forest Association.

"Pertinent Facts About Seed Corn," N. J. HARRIS, Secretary of the Iowa Seed Corn Breeders' Association.

"Question of Feeds for the Dairy Farmer," E. A. BURNETT, Animal Husbandman of the Nebraska Experiment Station.

"Proper Care and Treatment of the Soil," R. W. THATCHER, Assistant Chemist of the Nebraska Experiment Station.

"History of the Nebraska State Board of Agriculture," Ex-Gov. ROBERT W. FURNAS, Present Secretary and First President of the Board.

"Irrigation and Farming," GEORGE H. MAXWELL, Executive Chairman of the National Irrigation Association.

"Making Winter Wheat Hardy," T. L. LYON, Assistant Director of Nebraska Experiment Station.

Articles on Soil Culture and Conserving the Moisture in the Semi-Arid West, H. W. CABELL

Special Articles each week, JAMES ATKINSON, of the Iowa Experiment Station at Ames.

Letters of Travel—FRANK G. CARPENTER.

Other writers contributing to The Twentieth Century Farmer, are:

Chancellor E. BENJAMIN ANDREWS, of the University of Nebraska.

Prof. CHARLES E. BESSEY, State Botanist of the University of Nebraska.

R. M. ALLEN, President Standard Cattle Company.

C. R. THOMAS, Secretary American Hereford Breeders' Association.

B. O. COWAN, Assistant Secretary American Shorthorn Breeders' Association.

Dr. A. M. COTTRELL, Kansas Experiment Station.

Prof. H. T. PETERS, Nebraska Experiment Station.

Hon. J. STERLING MORTON, Former Secretary of Agriculture—Father of Arbor Day.

Prof. A. L. HAECKER, Nebraska Experiment Station.

E. F. STEPHENS, President Nebraska Horticultural Society for five years.

E. WHITCOMB, Friend, Nebraska, Supt. Bee Exhibit at Nebraska State Fair.

O. H. BARNHILL, Shenandoah, Iowa, Secretary Southwestern Iowa Horticultural Society.

Women's Department conducted by Mrs. NELLIE HAWKS, of Friend, Neb.

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Twentieth Century Farmer OMAHA.

Personalities of the Press

By Harriet Prescott Spofford

There is an unpleasant amount of complaint in private circles and sometimes in print, concerning the personalities to be found in the modern newspaper. But if the practice of printing personalities is an evil there is an easy way to correct it, and that is to show no interest in them. The press furnishes only what people want and when they cease to want personalities the press will cease to give them.

The present writer, lodging once in the same house with a woman who reported with great particularity and accuracy the social gossip of Washington for several important journals in different parts of the country, saw a letter this reporter received from a wife of an eminent justice, telling her that she was going to such a function and would wear such a dress, with an elaborate description, and enclosing a \$10 dollar bill. The reporter, who measured the honor and dignity of the press by a high standard, sent back the money. But the justice's lady was at the said function and was heard to say: "Oh, there comes that reporter! Let us get away before she can see what we have on."

Another letter ran: "Dear —: Miss So-and-so is to visit us next week. Do give her as pretty toilettes as you can, so that she may send the papers home and let them see there what a belle she is." Miss So-and-so was relegated to some one else to dress up, for this reporter never told anything but the truth as she saw it.

Nor were all these gifts from the foreigners by any means. A set of most delicately carved pink coral was presented to this society reporter by an American lady, ask-

ing her to accept them, as they had lost their value for her. She had another person, wife of a prominent member of congress, sent her a fine gown, lined with silk, almost unheard of at that period, and a year or so later enclosed to her two \$50 bills, saying she had had no time to attend to her Christmas or her charities that year, and would our reporter kindly pay her own Christmas gift with one of the bills and use the other in charities.

It was the wife of one of the presidents, who, on the celebration of a private and personal anniversary, gave her, without being requested, a place to review the proceedings and make notes. And it was the wife of another who displayed to her the trousseau of a White House bride. So much were her personalities in demand that when this reporter sent a note to the first lady in the land, asking what she was to wear on a certain occasion, the note received satisfactory reply.

That this same reporter was given honor at various times at leading hotels for the sake of having her letters dated from those hotels, and that she had been paid special rates on certain railroads, and that another one was given the best accommodations on steamship lines while paying for poorer, only emphasizes the fact that the wares they had were in demand. And all this success, if such it should be called, simply shows that people like them, and that when people come to recognize their vulgarity and offensiveness the press, as has been said before, will cease to deal in them.