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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.

THE ART COMMISSION AND PUBLIC STRUCTURES.

The creation of the Art Commission was one of the most fortunate provisions of the new charter of the city of New York. In the scope of its judicial powers and the make-up of its personnel the Commission is admirably adjusted to its important duties. The work of the Commission is purely honorary, and it needs but a glance at the list of members to realize that its decisions will be rendered solely with an eye to the highest interests of the city. Under the charter, the Commission has jurisdiction over the acquisition, reconstruction, or removal of works of art, and over all designs of municipal buildings, bridges, and other city structures that may be referred to the Commission by the Mayor or Board of Aldermen. This jurisdiction has been actively exercised since the year 1898, and during the past six years over 200 subjects have been submitted for approval.

On January 1, 1902, the powers of the Commission were greatly enlarged by a provision requiring that all municipal structures exceeding in cost one million dollars must be approved by the Commission. Whereas previous to 1902 the Commission merely had jurisdiction over such buildings as might be submitted, now all public buildings that cost over one million dollars pass directly within the scope of the Commission, and do not have to be referred to it by the Mayor or the Board of Aldermen.

Now, that this second provision confers no mere empty authority has recently been established by the courts. The charter provides that expenditure of the city's funds without the approval of the Art Commission is illegal in such cases as come within its jurisdiction. Thus, for instance, if the designs for a public structure costing several millions of dollars should be disapproved by the Commission, and the contractors nevertheless proceed to carry them out, or if the contractor should fail to submit them to the Art Commission, payment of any money to the contractor under such circumstances would be illegal. The decision of the courts above referred to as bearing on this subject was on an application for an injunction against proceeding with the erection of Blackwell's Island bridge, except on the original plans, and involved the legality of a proposed expenditure of about seven million dollars. In its opinion the court said: "The Art Commission called in by the Mayor, and invested with the veto power by law, has rejected the original design. That disapproval disposed of it. The bridge could not, therefore, be constructed in accordance therewith."

By far the most important case that has come before the Art Commission is that of the new Manhattan Bridge, which involves an expenditure of about twenty million dollars; and recently a great deal of confusing and profitless discussion has taken place, in this connection, as to the actual scope of the authority of the Commission. It has been claimed that this body, not being composed of expert engineers, is necessarily unable to pass upon any but the æsthetic features of this bridge or any other engineering structure that may be submitted to it. It will be seen, from what we have said above, that, on the contrary, its powers are absolute as to the acceptance or rejection of a proposed structure. Its jurisdiction is not specifically limited to the artistic and architectural features only; it covers the structure as a whole.

Now it must frequently happen that the subjects submitted, especially if they are of an engineering character, will contain elements upon which the Commission must be advised by expert opinion before it can render an intelligent decision. This fact was recognized when Mayor Low appointed a commission of five eminent bridge engineers to pass upon the then current plans for the Manhattan Bridge, so as to provide the Commission with an independent estimate of the engineering features of the structure, upon which they might base their action. Obviously, this was the proper course for the Mayor to take, and upon the presentation of the report, favorable action was speedily taken by the Art Commission.

The new Bridge Commissioner, however, wishes to reject the design accepted by the Art Commission, and asks that body to indorse his own plans, which are for a structure of an entirely different character. In making a choice between the two designs the Commission, as matters now stand, finds itself confronted by a difficult dilemma; for the new plans are backed by the opinion of the Bridge Commissioner only. They have received no consideration by any independent board of experts, such as indorsed the Art Commission's accepted plan, and that body is, therefore, entirely without any expert advice as to the engineering merits of these plans.

Under the circumstances, in order to enable the Commission to make an intelligent comparison of the relative merits of the two designs, the obviously wise course would be for the Mayor to follow the example of his predecessor in office, and appoint an engineering commission. Surely, the Bridge Department has everything to gain and nothing to lose by such a searching investigation of their strain sheets and working plans as this Commission would make. If their report should establish the fact that, from an engineering and constructive point of view, the new designs will provide a bridge stiffer, stronger, cheaper, and quicker of erection than one built on the accepted plans, there is not the slightest doubt that the Art Commission would render an immediate decision in its favor, and the present intolerable delay of this greatly-needed public work would be ended.

THE AGRICULTURAL IMPORTANCE OF BACTERIA.

Nitrogen is to the soil in which our plants grow much what the oxygen of the air is to us; for without it the death of vegetation must ultimately ensue. For that reason we add the necessary quantity of nitrogen to the tilled soil in the form of fertilizers. It happens, however, that the supply of fertilizers, which in turn is dependent upon the supply of nitrates in the world, is limited. Like the coal fields of Pennsylvania, the nitrate beds from which nitrogen compounds are obtained must ultimately be exhausted. And because the free nitrogen of the air in its elemental state cannot be assimilated by vegetation, it is no wonder that the agricultural chemist has taken it upon himself to devise some means for restoring to the earth the nitrogen which it must give up to the growing plant, and without which the plant could not grow.

Just how the nitrogen of the air could be converted into nitrates suitable for fertilization is a problem that has been attacked time and time again with scant success. Crookes proposed a plan not without merit, a plan by which the nitrogen of the air was converted into nitric acid through the agency of the electric spark. In the current issue of the Supplement another solution of the vexing problem is outlined, which comes from an entirely different quarter of the scientific world. For centuries farmers have known that different crops should be grown in the same field with each succeeding year. Some crops following clover and other plants were found to flourish admirably. Careful analyses by agricultural chemists have shown that the benefits derived by this rotation are due directly to the increased stores of nitrogen placed at the disposal of the benefited plants. It would necessarily have followed that plants of the clover type were able to render available nitrogen which would otherwise be unassimilated. Further investigation showed that this nitrogen was fixed in a manner entirely unsuspected, and that we need have no fear of the exhaustion of the nitrate beds which supply us with the chief ingredients of our fertilizers.

The *Leguminosiæ* family of plants, among other distinctions, have well-defined nodules at their roots, highly charged with nitrogen and constituting the habitat of certain bacteria indispensable in nitrogen assimilation. Elaborate experiments proved that the destruction of these bacteria was equivalent to the destruction of the plant life itself. Bacterial life, then, and nothing else, contains the secret of nitrogen production. It having been settled with reasonable certainty that the fixation of nitrogen in the case of *Leguminosiæ* is directly traceable to bacteria, the next investigation to be carried out had for its determination the life process of these bacteria—the conditions under which they thrive, the amount of light, heat, and moisture that they require, the manner in which the plant appropriated the nitrogen brought to it from the air, and finally, the possibility of artificially stimulating plant life by inoculating soil with the bacteria. These investigations have been carried out with striking success. At no very distant day the farmer will either inoculate his field with a culture of bacteria adapted to the crop he wishes to grow, or incorporate with his soil earth of a field where the crop has already been successful. The uncertainty of a good crop will then have vanished, and a farmer will be assured of the best obtainable crops from the seed which he has planted. Guesswork will have given place to absolute certainty.

POSSIBILITIES OF PEAT AS FUEL.

The discovery of extensive deposits of valuable peat in many parts of this country, and the invention of improved machinery for cutting, extracting, and compressing it into commercial size bricks, must eventually have a most important bearing upon the question of economical power production. Unquestionably we are rapidly approaching a time when steam and electrical uses will be less dependent upon anthracite coal than in the past. With a continuation of our industrial expansion, anthracite coal must soon be regarded more in the light of a luxury than a necessity. Fuel economy must begin with the fuel itself, and not limit itself to the invention of machinery for extracting a larger percentage of thermal units from the material burnt.

The immense amount of material in one form and another scattered around in the shape of waste must be utilized in order to keep down the present high bills for operating power stations. The heavy deposits of peat naturally must call for attention. Raw peat has not been considered an economical or satisfactory fuel in this country. It has been questioned whether it could ever be extracted and put on the market in such a condition as to attract power producers in a way that would make it a commercial success. With over 85 per cent water, and scarcely 13 per cent of combustible material, with about 2 per cent of inorganic matter, raw peat has not apparently offered very great inducements to manufacturers.

The problem of extracting this 13 per cent of combustible material from the peat at a cost which would enable the owners to sell it at a commercial profit, and at the same time make it cheaper for producing steam than either coal or liquid fuel, has not been an easy one to solve. Peat cutting and compressing machinery has reached a remarkable state of development in the past decade in Germany and other continental countries. This machinery has reduced the cost of working the fuel into commercial forms, and has at the same time improved its burning qualities.

One of the most important of recent methods of handling peat in Germany is to reduce the combustible material through grinding and maceration, and then mix it with other inflammable material to insure superior heat-producing qualities. The different materials mixed with the peat pulp are usually dry sawdust, anthracite culm and bituminous coal dust. These are added to the wet peat when in a dry state, and they are run through the grinding machinery with it. The result is that the two are mixed thoroughly, and the dried product is very inflammable and steady in its burning. The added ingredients give to the peat a more compact density, which adds to its value in many ways. It is less liable to break and pulverize in handling, and it does not disintegrate in the furnace so readily.

As high as 30 per cent of bituminous coal dust, 40 per cent of anthracite culm, and 15 per cent of dry sawdust are added to the peat pulp. When thus mixed the bricks are pressed into shape by hydraulic machinery, which makes them suitable for almost any kind of use. The amount of worthless coal dust that accumulates at the coal yards as well as at the mouths of the mines cannot be utilized to any greater advantage than by helping to form a new fuel of this character.

The conversion of peat into coke is a comparatively new process that may be considered as the most scientific method of utilizing this fuel. Chemical engineers of all countries have sought to accomplish this end. As a new industrial process it has already become established in parts of the leading peat-producing countries, especially in Germany and Russia. The peat is converted into coke by carbonization in retort ovens. To make it more profitable and successful, the effort has been successfully made to recover the gas, tar, and other by-products of distillation. These by-products represent a gain of no small figure, and they add to the profits of the undertaking in a way that promises to make the process extremely valuable.

The peat is carbonized in closed ovens, which are heated by burning under them the gases generated by the coking process. In other words the process is self-sustaining after the fire of wood or coal is first started to produce the coking. A very small amount of fuel is thus used at the start, and thereafter there is no expense whatever in burning fuel. The gases are carried from above to the burning chamber where they are consumed to continue the process.

To make the process even more complete and profitable, the escaping heat of the retort ovens is utilized for heating the drying ovens. This escaping heat is carried through a dry-air chamber to an upper receptacle where the raw peat is placed for drying. The raw peat must be dried to a crisp point where carbonization follows quickly when introduced into the coking oven. Ordinary wet peat, when put into the carbonizing ovens, wastes heat to such an extent that the process in the past has been rendered unprofitable. More than this, the drying of the peat for carbonization in ovens prepared for it has been found unsatisfactory owing