which I hope mineralogists will forgive me. A very fine slab of the meteorite, weighing about seven pounds, which has escaped the solvent, is on the table before you.

Here, then, we have absolute proof of the truth of the meteoric theory. Under atmospheric influences the iron would rapidly oxidise and rust away, colouring the adjacent soil with red oxide of iron. The meteoric diamonds would be unaffected, and would be left on the surface of the soil to be found by explorers when oxidation had removed the last proof of their celestial origin. That there are still lumps of iron left at Arizona is merely due to the extreme dryness of the climate and the comparatively short time that the iron has been on our planet. We are here witnesses to the course of an event which may have happened in geologic times anywhere on the earth's surface.

Although in Arizona diamonds have fallen from above, confounding all our usual notions, this descent of precious stones seems what is called a freak of nature rather than a normal occurrence. To the modern student of science there is no great difference between the composition of our earth and that of extra-terrestrial masses. The mineral peridot is a constant extra-terrestrial visitor, present in most meteorites. And yet no one doubts that peridot is also a true constituent of rocks formed on this earth. The spectroscope reveals that the elementary composition of the stars and the earth are pretty much the same; so does the examination of meteorites. Indeed, not only are the self-same elements present in meteorites, but they are combined in the same way to form the same minerals as in the crust of the earth.

This identity between terrestrial and extra-terrestrial rocks recalls the masses of nickeliferous iron of Ovifak. Accompanied with graphite, they form part of the colossal eruptions which have covered a portion of Greenland. They are so like meteorites that at first they were considered to be meteorites till their terrestrial origin was proved. They contain as much as 1·1 per cent. of free carbon.

It is certain from observations I made at Kimberley, corroborated by the experience gained in the laboratory, that iron at a high temperature and under great pressure will act as the long-sought solvent for carbon, and will allow it to crystallise out in the form of diamond—conditions existent at great depths below the surface of the earth. But it is also certain, from the evidence afforded by the Arizona and other meteorites, that similar conditions have likewise existed among bodies in space, and that a meteorite, freighted with its rich contents, on more than one occasion has fallen as a star from the sky. In short, in a physical sense, heaven is but another name for earth, or earth for heaven.

THE INSTITUTION OF MECHANICAL ENGINEERS.

THE Institution of Mechanical Engineers was founded in 1847, and the present year is therefore its jubilee. As it came into existence as a Birmingham Society, and for the first thirty years of its career had its offices in that city, the removal to London being made in 1877, it was appropriate the jubilee meeting should be held there.

The meeting commenced on Tuesday of last week, July 27, and was brought to a close on the following Friday. There were two sittings for the reading and discussion of papers held on the Tuesday and Wednesday mornings, the President, Mr. Mr. E. Windsor Richards, occupying the chair. There were five papers on the agenda, but time was only found for the reading of the following three:—

"Some points in cycle construction," by F. J. Osmond, of Birmingham.

"The City of Birmingham Corporation Waterworks," by Henry Davey, of London.

"High-speed self-lubricating engines," by Mr. Alfred Morcom, of Birmingham.

The President also read an address, in which he gave particulars of the founding and early history of the Institution, together with short biographical notices of its past-presidents, from George Stephenson, who was the first, down to the present day.

Mr. Osmond, in his paper, discussed a few of the points to be observed in designing a successful bicycle. The principal causes of inefficiency, he said, were want of rigidity and undue friction. Of these two he considered the former the most important, and it is in this particular that cycles differ far more than in friction. The cause of loss is twofold. Firstly, the work done in springing the frame out of shape at each stroke of the foot is not spent in driving at the end of the down-stroke, but only in lifting the foot at the beginning of the up-stroke. Secondly, the springing of the frame causes a general condition of instability, due partly to the alteration of the balance through lateral movement of the pedals, and partly to the wheels being forced out of line, thereby causing the machine to swerve from side to side instead of running a true course. Purchasers of bicycles would do well to remember these facts. The rage for lightness is so great, that the makers, who have to follow the fashion, often cut material down to a point where there is only just enough metal to support the rider's weight under the varying conditions of running, the factor of safety being perilously small. As to rigidity, that is often abandoned altogether, or at any rate is only considered so far as it does not add to weight. Considering that the average purchaser only tests the machine by spinning the wheels and pedals to see if they run easily, one cannot wonder at this abandonment of a vital principle by the maker; but perhaps after the warning of Mr. Osmond, himself a noted manufacturer of cycles, sounder principles may prevail. In well-constructed machines friction is mainly due to the chain, and it is said that no more than 1 per cent. of the total power exerted by the rider has been lost. Even allowing a much higher factor than this, and doubtless it is too small, it will be seen to what perfection ball bearings have enabled the cycle maker to produce his machines. Mr. Osmond thinks that a mechanical efficiency of 95 per cent. would be nearer the truth, and this would be somewhat lower than the best record with which we are acquainted for the steam engine. The factor of safety for the bicycle frame is about $1\frac{1}{2}$, and if this is to be taken as including the ordinary conditions of riding, Mr. Osmond considers it true; but he states that a well-built frame will carry at least ten times its natural load without injury. The difference is due to the fact that the front part of the frame is exposed to shocks which must cause bending stresses near the head. If the two front tubes are arranged so that their axes intersect vertically above the axle of the front wheel, the stresses are only pure tension and compression so long as the force acting through the front axle is purely vertical. Such conditions are naturally not present when the wheel meets an obstacle, and bending stresses are therefore introduced. Other details of construction were discussed in the paper, and were illustrated by numerous wall diagrams. The discussion on this paper was confined to the suggestion by one speaker, Mr. Sharp, of Birmingham, that the weakening effect of brazing together the members of frames might be overcome by making a mechanical joint in which a hollow plug of suitable formation should be inserted in the ends of two tubes to be connected, the plug being corrugated on the outside, the idea being that the tube ends of the tubes containing the plug should be pressed into the corrugations. The joint would seem difficult to make, and one would fear that even if tightly made in the first instance it would be likely to work loose in time; but we are assured by the inventor that the device has given most promising results in actual practice. If these promises can be confirmed, the invention is of considerable value, as the brazing of steel undoubtedly causes deterioration of the metal.

Mr. Davey's paper gave an historical and general account of the Birmingham water works, together with cost of pumping, &c. This contribution led to practically no discussion.

Mr. Alfred Morcom's paper was far the most important of the three, and indeed was an excellent example of what a contribution to the proceedings of this Institution should be. The author is managing director of the firm of G. E. Belbis and Company, who have for some time past devoted their resources largely to the construction of what are generally known as high-speed engines, for which of late there has been a large demand owing to the spread of electric generation for lighting and power purposes. The engines of this firm differ from those largely manufactured for like purposes in the fact that the cylinders are double-acting, steam being taken on both sides of the piston. For very high speeds of rotation it has been often said to be necessary, in order to give smooth running, that there should be no reversal of stress on the working parts; steam, therefore, has generally been admitted only above the piston, so that the stresses on the connecting-rods were always those of compression. With such an arrangement naturally a given cylinder only does half the work that can be obtained from a double-acting cylinder of the same capacity, and this leads to additional weight and space being required for the single-acting engine. For this reason it was the common practice, and still is to a large extent, to run the necessarily quickly rotating dynamo belt-gearing from a large engine making moderate revolutions, and occupying much space; but for a considerable time past the high-speed, single-acting engine, coupled direct, has been a formidable rival. The high-speed double-acting engine has also been growing in favour of late, and, as has been stated, undoubtedly has advantages. The dynamo-electric machine has certainly done one good thing—it has raised the standard of stationary engine design and manufacture enormously, just as the torpedo boat did for marine engineering. The chief features dealt with by Mr. Morcom in his paper were lubrication and vibration, the two great difficulties to be met in quick-turning engines. To effectually lubricate bearings a force-pump is employed, which continuously injects oil at pressure into the space between the shaft or journal and the bearing. The reciprocation of pressure of the shaft on the bearing assists the circulation of the lubricant for the following reason: when strain is above the piston, and the connecting rod is in compression, the journal will be pressing on the bottom brass—we put out of consideration any tendency of the shaft to bend—and, as a journal can never be an absolutely tight fit in its bearing, there will be a space between the top bearing and the shaft. Into this space oil is at once forced by the pressure-pump, and when the stress is reversed the film of oil remains during the whole of the up-stroke, because there is not time to squeeze it out from between the rubbing surfaces before the pressure is again released. The same thing, of course, applies to the bottom brass, and in this way there is always a liquid film of oil between the journal or shaft and the brass or bearing, and the two, therefore, never come in contact. Observed data support the latter view, as the wear on journals has been found to be inappreciable after considerable running; but perhaps the best testimony is that Prof. Kennedy, in an exhaustive test of one of these engines, found the mechanical efficiency of the machine to be 96·3 per cent. It will be seen that in this matter of distributing the oil on the bearing surfaces the double-acting engine has an advantage over the single-acting engine, where the pressure is always in one direction, and is never released while the engine is running, although it may be relaxed. In regard to vibration so much has been done lately, especially by the builders of torpedo craft, that not much is left to add. It may be said that Mr. Morcom is fully alive to the need for providing against the disturbance "due to couples produced by the changing momentum in the several lines of moving parts," and that occasioned by the obliquity of movement of the connecting-rod. He refers to Mr. Yarrow's admirable experiments, and considers the effect of crank angle and multiple cylinders. We have not, however, space to go into these problems, and must refer our readers to the original paper.

A long and interesting discussion followed the reading of the paper.

There were several excursions to neighbouring towns, where works were visited, speeches made, and luncheons eaten after the manner of meetings of this kind. One of the trips which attracted a great deal of interest was that to Coventry, where the much-discussed "motor-mills" where "horseless carriages" are made in such profusion, according to certain glowing accounts, were to be inspected. This establishment is said to be "the largest and best organised for the purpose in the country." To judge by what was seen in regard to work in progress, there need not be much fear that the country will be flooded by horseless carriages for some time to come yet.

A TROUBLESOME AQUATIC PLANT.

FOR several years past an aquatic plant known as the water hyacinth has been developing to such an enormous extent in the St. Johns River, Florida, as to cause serious apprehension in that region regarding its possible obstruction to navigation. About two years ago the War Department was asked to investigate the matter, and did so. In answer to urgent requests for exact information on the subject, the Department of Agriculture, on January 25, directed one of its agents, Mr. Herbert J. Webber, an assistant in the Division of Vegetable Physiology and Pathology, to visit the region and prepare a report covering the following points: (1) Historical notes regarding the plant, including its habitat, manner of growth, propagation, and anatomical and physiological characters; (2) an account of its introduction and spread in Florida; (3) the present distribution of the plant in the State, and its effect on navigation and commerce; and (4) possibilities of exterminating it. Mr. Webber's report has now been issued from the Government Printing Office, Washington, and is very exhaustive. The plant is mostly limited in its growth to sluggish fresh-water streams, lakes, &c., and the character of the water appears to have much to do with its growth. It can endure only a small percentage of salt, and is killed when it floats down into the sea-water. It is normally propagated by seeds and by stolons. Its introduction into the St. Johns River took place about 1890, when a number of plants were thrown into it. They grew there luxuriantly, producing beautiful masses of flowers which rendered the river attractive. At this time no one suspected that the plant would become a nuisance, and it was introduced at various points to beautify the river. In a short time it interfered very materially with navigation, making it, in fact, both difficult and dangerous. Its effect has been most disastrous to those engaged in the lumber trade and in the fishing industry. It is feared that eradication is impracticable, but suggestions are made as to possible methods for keeping the evil in check. Of these the one most in favour with the author is the use of a light-draught stern-wheel steamer, having a double bow or outrigger, which, being forced into a mass of plants, would cause them to gather towards the middle of the boat, where an inclined carrier would pick them up and deposit them in front of rollers driven by machinery, which would force the water from them, thus greatly reducing their bulk. The crushed material could be delivered to barges alongside, to be deposited where no injury could again result, or a cremator could be arranged on a barge alongside of the boat, and so save additional handling.

THEORY AND PRACTICE.[1]

I PROPOSE to speak to-day of the relative importance of theory and of practice in the arts; and especially, of course, in the art of medicine. It is said that Englishmen are falling behind other nations, and especially behind the German nation, in their perception of the value of theory in the practical arts. Now this is somewhat strange and inconceivable to us. Englishmen proudly feel in this year of the Greater Jubilee that their achievements in the conduct of life are not only great but incomparable. Not only has England become great as an empire, as the Roman Empire; it is great also in the achievements of the intellect: the land of Roger Bacon, of Francis Bacon, of Newton and Adams, of Berkeley, Locke and Hume, of Boyle, Priestley, Cavendish and Dalton, of Young and Faraday, of Harvey, Owen, and Darwin, need not be ashamed even before the brilliant nation of Descartes and Laplace, of Lavoisier and Cuvier, of Paré, Bichat, and Bernard. Nor will I forget to speak of our place in letters, wherein we acknowledge none as our masters; for it is of the gifts of imagination no less than of the gift of analysis that scientific theory is born. Can it be true, then, that with these endowments we are to fall behind in the practice of the arts because, as a nation, we have no due sense of the bearing of theory upon practice?

It cannot be doubted, I fear, that, in some departments of knowledge we are falling behind relatively if not absolutely; that we have failed to keep before ourselves a due sense of the value of theory, and have forgotten that, although in generalisation we should never lose our hold upon detail, nor lose our tact in converse with the manifold aspects of life, nor our memory of the devices whereby we must meet the incursions of contingencies often themselves incalculable, we shall nevertheless fall behind in the fight with reluctant nature if we do not incessantly revise our formulas in the light of progressive research on more and more general lines. We have perhaps forgotten that the work of Watt and Stephenson would have made little progress but for the great modern advances in thermodynamics in which, among others, are

[1] Abstract of an address delivered at the combined meeting of the Cambridge and Huntingdon, the East Anglian, and the South Midland Branches of the British Medical Association at Cambridge, by Prof. T. Clifford Allbutt, F.R.S. Abridged from the *British Medical Journal.*