the sum of between 13,000*l.* and 14,000*l.* has been expended in research. There is no doubt that this policy has greatly enhanced the reputation of the Institution and has been of the utmost value to the engineering world. The time has arrived when the relation of the Institution to the National Physical Laboratory and the Government Department of Scientific and Industrial Research must be carefully considered. In view of present-day demands on the Institution and its members in all parts of the world, the council must consider to what extent, if any, it will be able to contribute in future to researches which may well be left in the hands of the above-mentioned bodies. The Institution is closely associated with both bodies through several members of council, and these will continue, as in the past, to give freely their services and experience. There is also a feeling that the Institution should not encroach upon the ground which newer and special Institutions are better qualified to undertake.

Prof. Hele-Shaw has long been known for his interest in inventions, and his remarks on inventions and inventors are of value. All progress, at any rate in mechanical science, must be in the nature of invention. Every step taken in which new ground is trodden, every new device or new mechanism, or new machine of changed form, in which the movements of parts differ, or even if the object attained is different, can result only from the exercise of the inventive faculty. If a man cannot do more than alter the dimensions of the machinery which he is constructing, he cannot be called an engineer at all. Even where it is necessary to duplicate indefinitely any existing machine or machine part, invention is required, and has in recent years been exercised in a wonderful way for production purposes.

The present stress of competition necessitates the more intense application of the inventive faculty, and an average of 30,000 patents is taken out each year by inventors searching for new devices and new results. It is easy to see what a hopeless task is being attempted by the ignorant and uneducated inventor. In one case he is probably attempting to discover something well known; in the other he lacks the education which would prevent him from attempting the hopeless task of trying to produce the impossible. Any one who studies the *Patent Journal* week by week must see that even to-day the attempts of a large number of inventors would be ludicrous if they were not in most cases pathetic. The truth, however, must be told—engineers in practice in the course of their work constantly spend large sums of money on inventions which, if they are more plausible, are not less impossible than those above mentioned.

Prof. Hele-Shaw has long thought that, beyond general engineering training, the time has come for an actual chair of invention. He hopes to see such a chair founded somewhere, and that a professor of invention may give lectures (one or more a year) to engineering students of different schools throughout the country. This would enable the principles on which success depends to be placed before rising engineers, as well as the methods of obtaining information on what had been already achieved in any subject, the cause of failure in previous attempts, and how to approach new problems so as to avoid falling into endless repetitions of previous workers.

The Life History of the Eel.

THE complete story of the breeding of the European eel has now been told by Dr. Johs. Schmidt in a memoir published by the Royal Society (Phil. Trans. B, vol. 211, pp. 179-208, plates 17, 18, April 4, 1922). The publication will become a classic of science, not only because of its literary charm and the results that it sets forth, but as a record of the resolution of a man of science determined to carry his investigation to a satisfactory conclusion.

In May 1904 Dr. Schmidt, while working on fishery research on board the Danish Fishery vessel *Thor* west of the Faroes, found a Leptocephalus larva of 7½ cm. in length. "With little idea, at that time, of the extraordinary difficulties" of the investigation, he began his research. From then till 1910 he made what use he could of the *Thor*, but the vessel was too small. He obtained collections made by the *Michael Sars* and others stored in Danish museums, but the material was very inadequate. Then he persuaded various Danish shipping companies to help, and the skippers were supplied with nets and instructions. One ship-of-war also assisted. In 1913 a Copenhagen company allowed him the use of the *Margrethe*, and for five months all went well. Then the *Margrethe* was wrecked on a West Indian island, "but the collections fortunately were saved"! In 1914 and 1915 the United States Fishery vessel *Bache* and two Danish traders obtained plankton samples, and then the war stopped all further collecting till 1920. Finally, a Copenhagen company gave Dr. Schmidt the use of the *Dana*, and with the experience gained, abundant collections were made in 1920 and 1921. It was then, "with mingled feelings," that he found that the rich material included two species of eels, the American and European. These could only be separated by laborious countings of the myotomes and pigment spots, and all this had to be done aboard ship immediately after the fishing operation.

The outcome of all these difficulties is the almost complete story of the European eel. For a period of five to twenty years, according to sex, climate, and quantity of food, the eel remains in fresh water. It is yellow-green in colour and without metallic lustre. Then the desire for food fails; the migratory instinct awakens; the silvery "bridal dress" is assumed, and the eels descend to the sea. This is the last that is seen of them, and the period of their migration is unknown. Sometime during the spring or summer, however, they spawn, in deep water, in the West Atlantic between about 22° and 30° N. lat. and 50° and 65° W. long. (roughly in the middle of the Sargasso Sea). The smallest larvæ caught are about 7 to 15 mm. in length, and they are found at about 200 to 300 metres from the surface. From then onwards their area of distribution widens. They rise to near the surface of the sea and begin to migrate to the north-east. In the first summer they are about 25 mm. long, and are found west of 50° W. long. In the second summer they are 50 to 55 mm. long, and they then inhabit the central Atlantic. In the third summer they are about 75 mm. long, and can now be found on the European coastal banks. They are still leaf-shaped, transparent Leptocephali, but in the autumn they undergo metamorphosis and enter the rivers as the cylindrical, smoky-brown elvers, about three years in age. The further history is well known: they may ascend rivers to a height of 3000 feet above sea-level (in Switzerland). Growth proceeds, and some five to twenty years later the seaward migration occurs. The story is unique in natural history, not only for its own interest, but also because of the patience and resolution with which it has been elucidated. J. J.