ments have already been made. Both in Germany and France such electric furnaces for steel making have been in profitable use the past year. In France at Le Praz, in Savoy, a plant for steel making utilizes the Heroult furnace, in which the electric arc is employed for heating, and at a cost of 6.5 c. per ton for electrical energy between six and ten tons of specialized steel are produced daily at a good profit. Over 5,000 tons of steel have been produced at this plant. Two other plants are in successful operation in France, one of which uses the arc for heating and the other the resistance method. In Italy the Stessam electric furnace is employed extensively, and in Germany similar attempts at steel making by the electric method are being carried on with more or less success.

In this country and Canada the electric steel furnace is in operation experimentally. At Massena a new process in which a patented electric furnace is employed has been tried, and the project promises much for the future. At Niagara Falls the Ruthenberg process is also in use, but not commercially. A number of other plants, using either the Heroult or Keller furnace, have been established, but so far most of them are making tests for future commercial exploitation.

In the manufacture of such alloys of iron as ferrochrome, ferro-silicon, and ferro-titanium by the electric furnace, a great commercial success has been attained. At Niagara Falls ferro-titanium is made in the electric furnace from scrap iron, aluminium, and cheap titaniferous iron ore. Even discarded slag is utilized. Likewise ferro-silicon is made from scrap iron and scrap steel. A good many of the old carbide works which failed have been rebuilt for manufacturing ferro-silicon. The resistance type of furnace is employed for this work, and the scrap iron or steel is melted at a high temperature with pure quartz. A 4,000-horse-power plant generally turns out about 20 tons of this alloy a day. Ferro-chrome is an alloy used in the manufacture of face-hardened steel, especially for armor plates and tools. One plant turns out upward of 1,800 tons per year for the Carnegie and Bethlehem steel companies. The electric furnace employed for this manufacture is not materially different from those used in allied industries. Ferromanganese is made in the electric furnace for the steel industry on a smaller scale, but it has become an important factor in modern production of high-grade steels.

The question of using the electric furnace in glass manufacture has received unusual attention the past year, and it is predicted that a complete revolution may be thus created in this industry thereby. If the electric furnace should prove as successful as promised in this field, it would probably mean the shifting of the center of manufacturing from Pittsburg to Niagara Falls or some similar place where electric current can be had cheaply and in abundance. It is not likely for some time to come that the electric furnace can displace the regenerative gas furnace for glass making except in a few favored regions. However, in Germany electric glass furnaces are being used, especially in the production of quartz glass vessels for chemical purposes. The quartz-glass manufacture has assumed a good deal of popularity in many new lines of work, for the glass is not easily fractured by sudden changes of temperature, and its melting point is very high. In regions where quartz exists in great quantities, and water power for electrical development is favorable, the manufacture of quartz-glass vessels and articles in the electrical furnace appears to have a very promising future. Experiments are now being conducted by a number of companies along this line, and only the future can determine what ultimate effect the electric current will have upon the glass trade.

In bullion refining electricity has made great strides. Electrolytic methods of refining gold and silver are employed in all parts of the world. At Perth Amboy and Philadelphia large quantities of the two precious metals are thus refined. In Germany the electric refining of gold and silver is carried on even more extensively, and the combined outputs of the Frankfort and Hamburg refineries are valued at a good deal over ten million dollars a year. The electrolytic method of bullion refining, however, is increasing rapidly in this country, and as one of the largest producers of precious metals in the world, it seems not unlikely that we shall stand first in this industry of refining within a few years.

Electro-metallurgical industries include the manufacture of many other products of only slightly less importance than those mentioned. Such new products as silicon-copper and siloxicon are the results of the application of the electric furnace to experimental fields. Nickel, lead, tin, and zinc have all come under the power of electricity, and they are either refined or extracted from the ore by electrical methods in increasing quantity. Not the least important of these methods is the recovery of scrap. Scrap tin and zinc are recovered to-day by electrolytic processes, which make every tin can, tin roof, or tin boiler of potential value. Electricity has made phenomenal strides in saving the waste. Metal of any kind can be reconverted by it into useful material for new manufacture. In other words, the scrap heap and waste pile is as legitimate a field of exploitation for electricity as the mines with their rich or low-grade ores.

George E. Walsh.

SOME COSTLY EGGS.

By Arthur H. J. Keane.

By reason of the extinction of certain classes of birds, there are many eggs which are so scarce and costly, that they can be termed rarities without fear of exaggeration. The rarest of all the eggs of a still existent family of birds is that laid by the condor. At the present moment there is not in existence one single dozen perfect specimens, and the few there are can be seen solely in some of the wealthiest and richest collections. The condor, which is found in Southern California and the Andes, is now hopelessly doomed to die out. It is also practically impossible to collect any fresh specimens of its eggs, as these rare and extremely shy birds nest thousands of feet above the plains, in the most rugged and inaccessible fastnesses of the San Bernardino and San Jacinto Mountains. Hence finding and plundering (two very different things, by the bye) a condor's nest is regarded as a most wonderful and sensational event; in fact, a prize of $500 would not tempt any sane man to start out on the hunt for a fresh condor egg.

Still more costly are the eggs of the great auk, or garefowl, a flightless marine bird, with large head, heavy body, and compact plumage, the last two living specimens of which were discovered and killed in Iceland in the year 1844. One of these eggs is now to be seen, carefully preserved under a glass case, in the National Museum at Washington; the original owner sold it in London for £22 ($110) in the year 1851, whereas its present value is estimated at more than £2,000 ($10,000). In 1853 two other auks' eggs were sold in London for £85 ($425) apiece, while in 1869 a nobleman (Lord Caervagh) paid £74 ($370) for a damaged specimen. A Scotchman of the name of Powell was fortunate to buy two of these eggs in Edinburgh in 1879 for a mere song, viz., 32 shillings; a few weeks afterward he sold them for £240 ($1,200) each. In 1887 an auk's egg, which was sold for £40 ($200) in 1867, realized $800 in America. At the present time there are only from 70 to 80 specimens known to be still in existence; 12 of these are in the British Museum (London). This bird died out because of its inability to fly, and of the difficulty of its movements upon dry land. It used to nest in thousands on Funk Island (a rocky islet opposite the coast of Newfoundland) which at one time was used as a kind of provisioning station by whalers, who used to kill these fat and palatable birds in hundreds. The birds were knocked on the head with clubs, plucked (the feathers used to fetch a good price) and salted for future consumption.

Funk Island also used to afford shelter every year, at breeding time, to countless numbers of other natatory birds, among them being the white booby (*Sula bassana*). These birds have also met with the same fate as the auk. In the year 1860 their nests were still to be seen in thousands, but at the time of writing it would probably be a matter of impossibility to find one solitary specimen. Ruthless slaughter, and the scaring away of the birds—due to the erection of a signal station on the island, which used to fire off a shot every minute in foggy weather—soon led to a thinning of their ranks, and the price of their eggs already began to rise in the seventies. Now they are great rarities, and would fetch large sums, but unfortunately there are no specimens in the market. Some specimens are on view at the Smithsonian Institution and at the American Museum of Natural History in New York; they range in value from $500 to $750 apiece.

Large sums are also paid for the eggs of the aepyornis or moa, a gigantic wingless bird of from 12 to 14 feet in height, which as long ago as two hundred years was already dying out in Madagascar. In appearance the bird much resembled the ostrich, and its egg was one foot in length. The first specimen was brought to Europe (Paris) by a French merchant in 1851, and caused quite a sensation from the amount of interest it attracted; its cubic capacity is about equal to that of one hundred goose eggs. In 1897 one of these eggs was found swimming about on the southwest coast of the island of Madagascar, in Augustine Bay. It now lies in the British Museum, and is undoubtedly one of the most extraordinary and valuable relics of its kind.

The eggs of the aptornis, a recently extinct wingless bird, probably a member of the Rallidæ family, also fetch very high prices, fine colored specimens fetching as much as $750 to $1,000 apiece. The apteryx or New Zealand kiwi is a bird which, though still living, is becoming scarcer from day to day, and its final extinction is only a question of years. These kiwi breed very slowly, only one or two very large eggs being laid during the season, and as yet there is no record of the successful rearing of young in captivity. Speculators might do much worse than to buy up as many eggs of this bird as they can get hold of, for, although now carefully protected, it is to be feared that the specimens now existing are the last of their kind.

Collectors also pay good prices for the eggs of the golden eagle, the East Indian swallow, the Californian parrot or "popinjay," etc., and for those of all similar birds which make their nests in such inaccessible spots that their obtaining is a matter of difficulty and danger to life.

The ordinary barndoor fowl or "breakfast table" egg has also a fancy value—sometimes, to wit, when like wine it has "improved" with age. We rudely term such eggs "rotten." In China, however, such an egg is a delicacy of the first water, and the well-to-do pay high prices for a real good old egg of the "blue-blooded" type that has had "ample time to mature."

SCIENCE NOTES.

Curious experiments are being carried out by Capt. Simpson of the steamship "Moravian" to test the course and speed of ocean currents. For the past fifteen years, during the passage of this liner between Plymouth, South Africa, and Australia the captain has every day thrown overboard a tightly corked beer bottle containing a scroll bearing the latitude, longitude, and date when cast adrift, together with a request to the finder to forward the bottle to him at the London offices of the steamship line. The captain, who is a member of the British Meteorological Society, keeps a careful record of his daily operations. The number of bottles returned to him, however, is very small, the average being less than one per year.

The second law of thermo-dynamics may be formulated in different ways. It limits the possibility of natural processes to the occurrence of those in which a difference of intensity is diminished. If there is a difference of pressure in two parts of a gas, a movement will occur producing equality; if there is a difference of temperature, heat will be transported so as to produce equality once more. It is curious that such simple necessities, which we all feel as such, can be converted into far-reaching sharply formulated equations, as was done by Carnot and Clausius. These principles were first applied in chemistry by Horstmann. Then, by successive application to chemical problems by Massieu, Gibbs, Helmholtz and others, was won a system of relations touching the problem of affinity.

The bacteria and other microscopic forms of plant and animal life, all of which are conveniently included under the term microbes, have so lately begun to be understood and appreciated that we must still emphasize their extreme importance. The discoveries of the botanists and zoologists and revelations of the microscopists in this domain are comparable, in their importance to public health science, with nothing less than the revelations of the telescope to astronomy. Astronomy had indeed existed long before the invention of the telescope, and public health science had its beginnings nearly a century before any considerable progress had been made in micro-biology. But it is not too much to say that the developments in micro-biology since Pasteur began his work have not only revolutionized our ideas of the nature of the infectious diseases, but have also placed in our hands the key of their complete control.

Arrangements have been completed by a British corporation for the development of the extensive Australian shale fields, which are among the largest yet discovered in the world, and the manufacture of lubricating and illuminating oils, etc. The fields are located about one hundred miles from Sydney, the capital of New South Wales, in the fertile and well-watered valleys of Wolgan and Capertee. It is estimated that the fields contain many million tons of the richest shale. Every assistance possible is being rendered by the government to promote the success of the enterprise. A railroad about twenty-seven miles in length of the existing government gage is being laid, connecting the fields with the government trunk system. Electrical ore-cutting machinery is now in operation, boring a tunnel three miles in length through the heart of a mountain, which throughout its length is rich with shale deposits. By means of this tunnel the shale will be brought into direct communication with the extensive retorts and refineries that are in course of erection, the government railroad, and the port of Sydney. The Australian government in their latest financial report describe the industry as one of the largest that has ever been established in Australia, and which will ultimately eclipse all the others in size and value. Arrangements have been concluded for the exportation annually of hundreds of thousands of tons of shale to Europe and other parts of the world in connection with the manufacture of gas. According to the leading authorities on coal gas who have examined the shale, it gives the greatest quantity of gas and the highest illuminating power yet obtained.