The formula of the base itself must consequently be

$$C_{12}H_9I_2OH.$$

The reaction for its formation from iodosobenzene may be most simply stated thus :—

$$2C_6H_5 . IO = I\begin{cases} C_6H_5 \\ C_6H_4I \\ OH \end{cases} + O.$$

It may also be expressed so as to account for the action of the sulphuric acid as follows, starting with the sulphate of iodosobenzene :—

$$C\ H_5I : \overline{|SO_4 +} \begin{array}{c|l} \overline{H} & OH \\ \\ \underline{H} & C_6H\ \ . IO \end{array} = I\begin{cases} C_6H_5 \\ C_6H_4I \\ OH \end{cases} + H_2SO_4 + O.$$

The chloride, $C_{12}H_9I_2Cl$, is a white curdy precipitate much resembling silver chloride. It crystallises from warm acetic acid, but the crystals are most readily obtained by mixing the aqueous solution of the free base with cold acetyl chloride, and boiling the resulting precipitate in the liquid for a short time; the clear solution deposits white rosettes of needles on cooling. The crystals melt at 200°–201°, decomposing into chlorbenzenes like the iodide.

The bromide, $C_{12}H_9I_2Br$, is a pale yellow precipitate similar to silver bromide; it melts at 167°–168° with similar decomposition. The melting point of the iodide is 144°.

The nitrate was obtained from the sulphuric acid solution by the addition of nitric acid, in the form of a white semi-solid precipitate, which changes into a mass of crystals upon agitation with ether. It dissolves in hot water.

The sulphate is readily soluble in water, as is evident from the mode of preparation; it dries to a solid, which has not yet been crystallised.

Concerning the second member of the series, $I\begin{cases} C_6H_5 \\ C_6H_5 \\ OH \end{cases}$, it is stated that it has been obtained from its iodide by the action of moist silver oxide, and that it is likewise a strongly alkaline substance readily soluble in water. The iodide, a polymer of iodobenzene, passes completely into the latter substance upon dry distillation.

$$I\begin{cases} C_6H_5 \\ C_6H_5 \\ I \end{cases} = 2C_6H_5I.$$

Further details of these interesting compounds, which must of necessity considerably modify our conception of the nature of iodine, are promised for the next number of the *Berichte*.

A. E. TUTTON.

PRINCE HENRY THE NAVIGATOR.

THE Royal Geographical Society held a special meeting on March 5, to celebrate the five-hundredth anniversary of the birth of Prince Henry the Navigator, the real initiator of modern maritime exploration. H.R.H. the Duke of York and the Portuguese Minister were present amongst the large audience, and appropriate addresses, illustrated by reproductions of early charts and historical portraits, were given by Mr. Clements R. Markham, F.R.S., President of the Society, Sir George Taubman-Goldie, Captain Wharton, F.R.S., Hydrographer, Mr. Beazley, Mr. H. Yule Oldham, Lecturer on Geography at Cambridge, and the Portuguese Minister. The anniversary was celebrated on a large scale with considerable pomp at Oporto, the ceremonies occupying three days.

If the formal celebration of the lives of the initiators of great movements in history and in science is a privilege of which their successors do well to avail themselves, the ceremonies observed at Oporto and in London, on March 4 and 5, were grateful acts. Prince Henry, distinguished from all his namesakes by his inseparable surname "the Navigator," was born on March 4, 1394, the son of King John I. of Portugal, and of Philippa, daughter of the Duke of Lancaster. From his early years he showed himself exceptionally studious, and when taking part in the siege of Ceuta, in 1415, he undoubtedly learned much of the interior trade of Africa, which supplemented the knowledge derived from the Arab geographers. But it is probable that the main incentive in his life-long effort to promote navigation and maritime discovery was the prospect of achieving the sea-route to India, and of making his country the first mercantile power in Europe. At the age of twenty-four he had definitely made up his mind on the subject of his life-work, and chose as his residence Sagres, at the extreme south-western corner of the Iberian peninsula facing the unknown ocean. The Prince made himself a master of the mathematics and astronomy of the day, and strove to induce mariners to follow his example and make use of the astrolabe in navigation. Observations at sea with an instrument so crude were necessarily very unsatisfactory, and, like their predecessors, the sailors of that day kept prudently within sight of land. Aided by the funds of the Order of Christ, Prince Henry fitted out expedition after expedition to trace out the African coast to the southward past Cape Nun. Inducements to trade were held out to adventurous merchant seamen of all nations, but these were insufficient as long as the explorers ventured no further than Cape Bojador. In 1434 Gil Eannes rounded that Cape, but the barren coast of the Sahara still met his eyes. In 1443 Antonio Gonsalvez crossed the Tropic of Cancer, reached and passed Cape Blanco, and brought home gold and slaves. From this time advance was more rapid, the inducements of commerce brought more volunteers to the work, and in three years the fertile coasts beyond Cape Verde were reached, and before the death of the Prince, in 1460, his efforts were rewarded by the rolling back of the cloud of absolute ignorance from over 1500 miles of hitherto unknown coast. The enterprise thus inaugurated went on with increasing success until Diaz rounded the Cape of Good Hope in 1486, and Vasco da Gama fulfilled the life's ambition of Prince Henry by reaching India in 1497, and raising Portugal to the height of its short-lived fame.

Prince Henry emphatically lived for his work, pursuing it without intermission in spite of the vast weight of prejudice and indifference against which he had to fight, and the result of that work is his best monument. He, if any one man, was the first to stir into strength the movement toward maritime exploration, which not only revealed the true form and extent of the most ancient continent, but in direct succession led to the discovery by Cabral of the new world, a discovery in no way brought about by the earlier voyages of Columbus, although these in a sense were the outcome of the same original impulse. It is through Ca da Mosto, a Venetian sailor engaged in African discovery for the Prince, that the best account of him as a man, and of his methods as a patron of exploration, are handed down. In his words—"He was the noblest Prince of his age, a man whose smallest virtue would suffice to immortalise him."

SCIENCE IN THE MAGAZINES.

SCIENCE makes a good show in the March magazines. Sir Robert Ball, F.R.S., contributes to the *Fortnightly* an article on "The Significance of Carbon in the Universe." The object of the article is to call attention to an investigation carried out by Dr. G. Johnstone Stoney, F.R.S., nearly thirty years ago, but the significance of which has not been widely recognised. From the tenor of the article we presume that the author refers to Dr. Stoney's paper "On the Physical Constitution of the Sun and Stars," read before the Royal Society in 1867. The paper is well known to workers in astronomical physics, though Sir Robert laments that some eminent physicists whom he questioned were unaware of its existence. Dr. Stoney gave evidence to show that the photospheric clouds on the sun were composed of carbon. In his words—"We have strong reasons for suspecting that the luminous clouds consist, like nearly all the sources of artificial light, of minutely divided carbon; and that the clouds themselves lie at a very short distance above the situation in which the heat is so fierce that carbon, in spite of its want of volatility, and of the enormous pressure to which it is there subjected, boils." (*Roy. Soc. Proc.* vol. xvi. p. 29, 1867-8.) Sir Robert Ball has taken the result contained in this conclusion, and expanded it into a lucid article containing much that is interesting. Dr. J. W. Gregory describes his adventurous journey to Mount Kenya. It is impossible not to admire the indomitable spirit he displayed throughout the whole expedition. He went to Africa to obtain information upon certain points, and though he found himself stranded at Mombasa before anything had been done, he got together a party of forty Zanzibaris, marched into the interior, accomplished his task, and returned to the coast in safety. Dr. Gregory's objects in visiting Kenya were: (1) To collect the flora and fauna of the different zones; (2) to see if an Alpine flora occurred similar to that of corresponding altitudes in Kilima Njaro; (3) to examine the geological structure of the mountain with a view to the determination of its position in the African mountain system; (4) to see if there were any true glaciers upon it; (5) especially to determine whether these had at any time a greater extension than at present. All these points were satisfactorily settled, and the information obtained during the exploitation of the region traversed is of prime scientific importance. An interesting question as to the origin of the Rift Valley is raised, of which the following is a description: "From Lebanon, almost to the Cape, there runs a long, deep, and comparatively narrow valley occupied by the sea, by salt steppes that represent former lakes, and by a series of over twenty lakes, of which only one has an outlet to the sea. This is a condition of things absolutely unlike anything else on the surface of the earth. . . . . But if the Rift Valley is unique as far as the earth is concerned, there are structures elsewhere which may be compared with it. It has long been known that there are on the moon, in addition to the well-known ring systems—generally spoken of as volcanoes—a series of long, straight clefts or furrows, known as 'rills.' The great East African depression would present to an inhabitant in the moon much the same aspect as the lunar rills do to us. Not the least interesting of the problems raised by this Rift Valley, is the possibility that it may explain the nature of these lunar clefts which have so long been a puzzle to astronomers."

Under the title "Scientific Problems of the Future," Lieut.-Colonel Elsdale considers, in the *Contemporary*, four leading problems, some, if not all, of which seem practically certain of solution in the next generation, if not in our own. The conquest of the air is the first of these problems, and the conclusion is arrived at that if the rate of progress of the last thirteen or fourteen years is kept up for a similar period in the future, aerial navigation will be an accomplished fact. The second of the problems is the diminution of the large percentage of the total resistance to a vessel's motion through the water due to surface or skin friction. "This friction," says the author, "is the leading and essential cause of the great waste of power in the propulsion of all vessels of man's design, whether partly or wholly submerged, when compared with the natural propulsion of fish or marine animals, such as whales, under corresponding circumstances and conditions. Hence the question of the possible reduction of this friction is one of vast and supreme importance to the marine engineer." Two other questions to which answers may be expected in the future are—"How can we best, by some simple and practical process, reduce coal to a condition in which it will, when brought into conjunction with the inexhaustible reservoir of oxygen in the atmosphere, give us the necessary elements for the production of an electric battery?" and "how to reduce the vegetable foods which at present are only adapted to animals like the cow, the sheep, or the horse, to a condition suited to the human digestion and to the human palate?" "Shakespeare's Natural History—a new light on Titus Andronicus," is the subject of an article by Mr. Phil Robinson. Shakespeare's authorship of this play has been disputed by many eminent critics. Mr. Robinson shows, however, that the natural history references in the play are almost identical with those of all the other plays attributed to Shakespeare. It has been objected that though the panther is referred to three times in "Titus Andronicus," it is not mentioned in any other of Shakespeare's plays. The reply to this brings out the following bit of information:—"If anyone will glance over the bard's flora, he will find that Shakespeare uses a great number of common plants only once—for instance, the holly, poppy, clover, brambles, lavender, and harebell, &c., and most remarkable of all, perhaps (and in a hunter, such as Shakespeare undeniably was), *fern*. . . . . Among other trees he only mentions the ash once (and then as the shaft of a Volscian spear!), the birch once, as furnishing 'threatening twigs,' the lime-tree once. Among others, he never mentions at all the walnut-tree, the larch, the fir, the chesnut, the alder, the poplar, or the beech."

A well-illustrated and simple account of earthquakes and the methods of measuring them is contributed by Dr. E. S. Holden to the *Century*. The Lick Observatory is furnished with a complete set of Prof. Ewing's seismometers, and Dr. Holden describes them, while their arrangement and use are shown by means of several woodcuts. After stating the Rossi-Forel scale of earthquake intensity, a means is indicated of making the scale even more useful than it is. From earthquake records, it has been found possible to assign a mechanical value to each of the ten numbers of the scale. Taking an acceleration of one millimetre per second as a unit, Dr. Holden has calculated that I. on the Rossi-Forel scale corresponds to $\frac{1}{490}$ of the acceleration due to gravity, or 20 units; II. corresponds to $\frac{1}{245}$ of gravity, or 40 units; III. corresponds to 60 units; IV. to 80 units: V. to 110 units; VI. to 150 units; VII. to 300 units; VIII. to 500 units; and IX. to 1200 units. All the shocks felt in San Francisco in the years from 1800 to 1888 have been evaluated in this way. There were 417 shocks in all, and the sum total of their accelerations was 33,360 units of intensity. "The average intensity of the 417 shocks of these 80 years results as IV., and this is $\frac{1}{123}$ part of gravity. The total intensity for the whole period is 3·4 times the acceleration of gravity; that is, if all the earthquake force which has been expended in San Francisco during these 80 years were concentrated so as to act at a single instant, it would be capable of producing an acceleration almost $3\frac{1}{2}$ times that of gravity."

Harper's Magazine contains an excellent article entitled "The Welcomes of the Flowers," in which Mr. W. Hamilton Gibson traces the development of knowledge as to flower-fertilisation from the time of Nehemias Grew to Darwin, and exemplifies the method of cross-fertilisation by a number of well-chosen examples. The article is embellished with twenty-two remarkably fine illustrations. The Bessemer process of steel-making, and the plant used in the steel works of the United States, forms the second of a series of articles on "Great American Industries," edited by Mr. R. R. Bowker. Dr. T. M. Prudden writes on "Tuberculosis and its Prevention."

Mr. Frank Beddard, F.R.S., contributes to *Blackwood* a popular description of the characters and habits of some remarkable earth-worms, under the title "The Newest about Earth-worms." *Chambers's Journal* contains several chatty articles. In one of these, entitled "A Vegetable with a Pedigree," mention of the asparagus is traced back to about 425 B.C. Other articles deal with Italian granite, great cork forests, and Brazilian snakes. A facetious review of the "History of Four-footed Beasts and Serpents," by the Rev. Edward Topsel, an Elizabethan zoologist, appears in *Cornhill*. That distinguished author wrote of birds, beasts, and fishes which have never come within the ken of latter-day naturalists. Dr. T. Lauder Brunton, F.R.S., is the author of a short paper on "The Progress of Pharmacy" in the *Humanitarian*, and Sir Douglas Galton dwells on the necessity of observing "abnormal children" in elementary schools, in order to establish a sound basis for the proper conduct and development of our educational system. *Good Words* contains an illustrated article on "Celestial Photography," in which Mr. R. A. Gregory describes, among other celestial sights—

> "Regions of lucid matter, taking form,
> Brushes of fire, hazy gleams.
> Clusters and beds of worlds, and bee-like swarms
> Of suns, and starry streams."

Mr. Douglas Archibald describes "Clouds and Cloudscapes" in the *English Illustrated Magazine*, his article being accompanied by illustrations of the typical forms of clouds. *Scribner's* and *Longman's Magazines* have been received in addition to those already noted. The former contains a fine engraving of Signor Tito Lessi's painting, "Milton visiting Galileo," and a description of "Subtropical Florida," by Mr. C. R. Dodge; and students of anthropology will find interest in an account of "Savage Spiritualism," contributed to the latter.

THE CAMBRIDGE DIPLOMA IN AGRICULTURE.

THE question of agricultural education at Cambridge—of which the latest development is the establishment of a Diploma in Agriculture—is comparatively recent. The movement began some three years ago (in July, 1890) with a letter addressed by the President of the Board of Agriculture to the Duke of Devonshire in his capacity of Chancellor of the University. This led to the appointment of a University syndicate (*i.e.* committee), who framed a carefully weighed scheme of agricultural education and examination, the funds for which were to be supplied partly by the University and partly by the Cam-