the brain—the right side—the faculty of expressing ideas by speech. If we developed both sides of our body equally, not only would there be the benefit that we could write or work with the left hand as well as with the right, but we should have two brains instead of one, and would not be deprived of the power of speech through disease of one side of the brain."

HOW A GREAT DISCOVERY WAS MADE.

M. Claude Collas, a celebrated French chemist, communicates to *Les Mondes* an interesting paper on how discoveries are made. To M. Collas is due the honor of first recognizing nitro-benzol, or, as it is better known, essence of mirbane, a yellowish oil derived from coal tar, having a very sweet taste and an odor strongly resembling that of bitter almonds, which latter peculiarity has led to its extended use in perfumery. In telling the story of how he found this substance, he says that, during the year 1848, he was engaged in researches with a view of utilizing industrially the quantities of light oil which, having no employment and hence very small value, filled up the cisterns in gas houses. It was at that time worth about one cent a pound. After vainly endeavoring to solve the problem for some time, M. Collas was about to relinquish the task, when it occurred to him to treat the oil in the same manner as gun cotton, that is, with a mixture of monohydrated nitric acid and sulphuric acid. "After the operation, the acids being separated by water," he says, "I was astonished to find at the bottom of my vessel a yellow button. The oil, at first lighter than the water, had become heavier, and hence sunk. I touched it with my finger and rubbed it on my hand, when the strong characteristic odor at once became forcibly apparent. I had found an essence which, at the cheapest, could replace a substance in great demand, and which was worth, instead of five centimes (one cent), fifty francs (ten dollars), a pound."

This discovery of mirbane was, however, only the prelude of the greater one, subsequently made, of the magnificent colors which could be derived from the aniline obtained by its deoxidation by means of nascent hydrogen evolved from iron filings and acetic acid. In 1856 Perkin obtained from aniline the beautiful violet color known as mauve, and since then the dyes thus derived have been produced to such an extent that their value to industry is almost beyond calculation. The little button of mirbane, however, in the modest laboratory of a Parisian apothecary, was the germ from which the whole grand series sprang.

There seems to be a kind of fatality about great discoveries which brings them forth in its own time. Men stumble across valuable ideas, and learn important truths too soon, which lie dead during their life time, only to be appreciated by the world after their death. The history of arts and sciences abounds in examples. Faraday, in 1825, found benzol in the tarry residues of gas works, but that illustrious chemist obtained neither fame nor profit for his discovery, which would doubtless have remained buried in the archives of the British Royal Institution until the attention of the scientific and industrial world was drawn to the chemical properties of the substance, almost forty years later. Again, it often happens that discoveries escape those who are, by accident, placed in the very position to seize upon them. M. Collas cites, as evidence of this, the case of a French chemist who, in 1846, made a yellow dye for silk by the action of nitric acid on coal oil. The peculiar odor of the mirbane, which he must have produced, escaped him, and he failed to recognize the new substance which he had obtained.

THE ORIGINATION OF SCREW PROPULSION.

In our columns of correspondence this week is an interesting letter from Mr. C. H. Delamater, proprietor of the well known Delamater Iron Works in this city, relative to the subject of the first practical application of the screw propeller to marine propulsion. Mr. Delamater considers that the practical establishment of the art is due to Captain John Ericsson, and tacitly takes exception to the reference in our recent biographical notice of Sir Francis Pettit Smith, in which we ascribed a large share of the honor, of introducing the propeller, to that inventor. The subject is a very interesting one, and the issue raised renders a slight historical retrospect necessary to the formation of an intelligent opinion.

It is certain that, for many years previous to the date of either Smith's or Ericsson's patents (1836), experiments had been made proving that vessels could be propelled through the water by means of a screw. But the inventors were either deficient in persistency of effort, or they found that, as is very often the case, the times were not ripe for the introduction of so radical an innovation. It is, therefore, a fact that, when Smith and Ericsson took up the subject, no vessel of the kind was in actual employment; and so far as past experiments extended, the simple fact of their abandonment, or rather non-continuation, held out a prospect for future inventors far from encouraging.

As our correspondent states, Ericsson's patent was obtained about a month and a half subsequently to that of Smith, but while the first trial of Smith's boat was made in May, 1836, immediately on the granting of protection, Ericsson's experiment did not take place until April 30, 1837. The Ogden, built by Ericsson in the latter year, was undoubtedly successful, but Smith's first vessel was equally so, for she made a voyage of 400 miles, and averaged a speed of 8 knots per hour. Hence, while both ships proved the value of the invention, Smith's was undoubtedly first in so doing, in point of time.

In 1838 Smith's successful operation of his plan before the Lords of the Admiralty resulted in the building of the Archimedes, and the making of a long voyage around England and to various points of Europe. In 1840 and 1841 the Rattler was built for the navy, and in the same years merchant vessels were constructed at Newcastle, Londonderry, and Hull. These ships were fitted with double-threaded screws set in the dead wood. Ericsson's vessels, however, had the blade screw, similar to that now employed. It will be seen that the course of the two inventors was very nearly parallel up to 1839, when Ericsson built the Stockton and started her across the Atlantic. The successful completion of that voyage resulted in the purchase of the vessel by the Delaware and Raritan Canal Company, and her subsequent use as a steam tug in the Delaware and Schuylkill rivers. While Smith was comparatively successful at the outset in gaining the support of the British authorities, Ericsson was not so. In face, however, of heavy odds, he was the first, as our correspondent states, to place a boat in actual commercial use in England, equally the first similarly to introduce screw propulsion in America, and also in France. Bourne, in his "History of Screw Propulsion," in summing up the respective merits of Smith and Ericsson, leans to the side of the former in ascribing the weight of praise. Ericsson, he says, had the advantage of being a skilled mechanical engineer, while Smith was merely an amateur; but in almost the following sentence he renders the effect of this assertion nugatory, by stating that Smith accepted expedients known to engineers as his starting point, and hence submitted to the use of gearing in bringing up the speed of his screw, while Ericsson "threw the dogmas of the engineers to the winds and coupled the engine immediately to the propeller." Smith, however, showed great genius and resolute perseverance, and, so far as simple priority of time is considered, it is true that he maintained the lead; but the credit for this, in our belief, falls far short of that due to Ericsson for his extended practical applications of the system. Both courses of the two inventors were remarkable for successful issues. It may even, says Bourne, be probable that the exertions of either would have sufficed to introduce the screw into practical operation, but their simultaneous prosecution of the same object was not nevertheless a waste of power. The progress of each, therefore, was stimulated by that of the other, and their united force acted more powerfully upon the public, and procured for the screw a readier and wider introduction than could otherwise have been expected. Neither invented the screw, but both revived it.

While, however, opinions may be and probably will be divided as to the question above discussed, so far as Ericsson and Smith are concerned, a careful search through various authorities reveals the fact that to neither is justly due the credit of first practically demonstrating the ability of screw-propelled vessels to make sea voyages, a merit which Mr. Delamater seems to claim for Ericsson. That honor is due to Robert L. Stevens, of Hoboken, one, says Mr. Scott Russell, to whom "America owes the greatest share of her present highly improved steam navigation. Mr. Stevens' father, Colonel John Stevens, was associated with Livingstone in his experiments, previous to the connection of the latter with Fulton, and had persevered in his experiments during Livingstone's absence in France.

Fulton's boat, however, was first ready, and obtained an exclusive privilege from the State of New York. Being excluded from the Hudson and all waters of the State, Stevens conceived the bold idea of taking his steamboat by sea to the Delaware. He did so, and thus not only demonstrated the possibility of screw propulsion, but he used a bladed screw in the open sea. The engines and screw used are still in existence. To Stevens, then, is due the credit of being first in the field to prove the practicability of the system; to Smith that of first, after a long period of years, reviving it and re-demonstrating its value; while to Ericsson, finally, is due not merely also its revivification, but in addition the first practical application of screw propulsion to the necessities and requirements of commerce in three great countries.

ARTESIAN WELLS.

A recent question which appeared in our column of answers to queries, regarding the greatest depth attained in the boring of artesian wells, has elicited some interesting letters from our correspondents. We find it necessary from the information given by one writer to revise the statement that the well in Louisville, Ky., 2,086 feet in depth, is the deepest in the country, as the bore sunk for Belcher's sugar refinery in St. Louis has penetrated 2,200 feet, while that excavated for the insane asylum in the same city has reached the enormous depth of 3,843 feet, or in that locality, 3,000 feet below the level of the sea. This would give a water pressure at the bottom of 1,293 pounds to the square inch. Another correspondent, however, tells us of a bore in the old world which is deeper than the one last mentioned by several hundred feet. It is situated in the village of Speren burg, some twenty miles from Berlin. The government, it seems, in order to obtain a supply of rock salt, began the sinking of a shaft 16 feet in diameter. At a depth of 280 feet salt was reached, but excavations were continued, the diameter being reduced to 13 inches for 4,194 feet, at which point work was discontinued, the bit still remaining in the salt deposit, which thus exhibits the prodigious thickness of 3,907 feet.

The supply of water from an artesian well is practically inexhaustible. At Aire, in Artois, France, a well, bored over a century ago, has since then flowed steadily, the water rising 11 feet above the surface at the rate of 250 gallons per minute; and at Lillers, in the same country, one well has yielded a continuous steam since the year 1126. This fact, coupled with that of the large amount of water delivered, renders the artesian well of the greatest value for the irrigation of desert plains. Up to the present time, some seventy-five shafts have been sunk in the Desert of Sahara, yielding an aggregate of 600,000 gallons per hour. The effect of this supply is said to be plainly apparent upon the once barren soil of the desert. Two new villages have been built and 150,000 palm trees have been planted in more than 1,000 new gardens. Water, it is stated, is reached at a very slight depth, in some cases hardly 200 feet.

The success attending the efforts of the French engineers in Africa has led to the excavation of numerous wells in the dry alkali plains along the line of the Union Pacific Railroad. There is a desolate and arid section, extending along the Bitter Creek valley for a length of about 120 miles, and varying in width from 20 to 50 miles. Since the building of the road, water trains have been running over the whole distance, supplies being obtained from the Green and other rivers. The cost of running these trains was about $80,000 a year. It became therefore absolutely necessary to produce some other means for getting water for the locomotives, and to the miners working in the coal mines along the route. The only relief available was in boring artesian wells, and a correspondent of the *Tribune* says that, last year, six were begun. The subsequent success has been all that could be desired. The first well is at Separation, 724 miles from Omaha, and the last one is at Rock Springs, 832 miles. Another is in progress at Red Desert. The well at Rock Springs is 1,145 feet deep. There are layers of clay mixed with sandy loam, clear sand, and water-worn pebbles (in which the supply of water is usually found), layers of sandstone of varying degrees of density, and beds of sulphate of alumina and iron chemically combined, resembling the peculiar bluish clay of some of the surface soil. The Rock Springs well rises 26 feet above the surface, discharging at the latter 960 gallons per hour. The water in the various wells, it is said, sometimes holds in solution as much as 280 grains of mineral salts to the gallon, and hence produces undesirable effects on steam boilers. It is believed, however, that for agricultural purposes these salts could, with plenty of water, be washed out, when the result would be a remarkably productive soil, which would be as valuable as guano. A flowing well furnishing 1,000 gallons per hour will water a section of 640 acres.

An artesian well, we learn, is also in progress at Denver; it is already down 800 feet, and water has risen nearly to the surface. The government has appropriated $10,000 to sink one at Fort D. A. Russell, and it is now nearly 900 feet deep. A well 1,000 feet deep costs about $10,000; and out on the plains, this outlay would make a most productive farm and might be made the nucleus of a stock range of thousands of acres.

SCIENTIFIC AND PRACTICAL INFORMATION.

SOUTH AFRICAN DIAMONDS.

A note on the diamonds of South Africa was communicated to the geological section of the British Association, during its recent meeting at Bradford, by Professor Tennant. He said that the first diamond arrived in England from South Africa in 1867. It weighed 21 carats. Last year there was one of 110 carats, and this year one has been brought over which in its present rough state is larger than the Koh-I Noor itself, and which when cut down will probably be not much smaller than that celebrated gem. He gave a history of the Koh-I-Noor, showing how it has been reduced from its original weight of 787 carats to 102 carats, its present weight. It is a great mistake, said the speaker, to suppose that, because the diamond is the hardest substance known, it is not easily fractured. He showed by means of a diagram the fractures that had been made in the Koh-I-Noor, and remarked that the diamond is in fact one of the most brittle stones we know of.

ACTION OF LIGHT ON THE ELECTRIC RESISTANCE OF SELENIUM.

M. Sale, in experimenting on the electric conducting power of selenium, which varies with the degree of light to which it is exposed, as described on page 193 of our volume XXVIII, says that, after careful experiments, he concludes that the effect of the light is not produced by the chemical rays, since the maximum of diminution is observed in the maximum point of the red rays. Neither is the change in the resistance due to an augmentation in the temperature. While the effect also of the light is sensibly instantaneous, the return of the selenium to its normal resistance after the light is cut off is not so rapid. Finally it appears that there exists in the red rays, which are the most intense in heating properties, a power which, without modifying the temperature, changes the molecular conditions of the particles.

A NEW SIGN OF DEATH.

At the moment of death, there become disengaged from venous blood certain gases which are normally confined therein, and which form a pneumatosis or swelling of the veins. This action in the veins of the retina, says M. Bonchut, is easily appreciable by the ophthamoscope, and constitutes an immediate and certain sign of death. The pneumatosis is indicated by the interruption of the column of blood, and is comparable to that observed in an interrupted column of a colored alcohol thermometer.

T. W. Y. says: I recently witnessed the application of a known medical fact in an unusual way, namely: the vaccination of a dog to prevent distemper. The pus was inserted in the ear, when the pup was only a few days old, and the effect was about the same as when the operation is performed upon a child.