tion. The critical gas pressure for obtaining this maximum rectification was noted to be the same as when used in the previous rectifier, namely, 100 lb. per square inch (7 kg. per sq. cm.).

The only advantage favoring the use of mercury as an electrode was that of constant stability at overload for short periods. For longer periods of overload, however, the device failed to perform its functions, owing, perhaps, to the short-circuiting of the electrodes with mercury vapor.

The only disadvantage experienced in the use of aluminum as one of the electrodes was that of pitted surfaces noted at its operating surface. This was undoubtedly due to the low melting temperature. It was found from actual experience that as soon as the aluminum surface began to pit the efficiency of the instrument was considerably lowered and it was thus necessary to face down its working surfaces every time this efficiency decreased. In order to avoid this detrimental effect, it was necessary to use a rotating aluminum disk so as to give a new sparking surface at all times during the operation of the instrument. Fig. 4 shows the construction of the instrument used. The aluminum disk was rotated by a motor.

In this case an iron-pointed electrode was utilized for the second electrode, and the admitted gas was passed through the cylinder as indicated. The insulated knob was fastened to the iron-pointed electrode to allow of gap adjustment between the aluminum disk and the pointed electrode. Very satisfactory results for continuous operation were obtained with this instrument, and it is the only means by which satisfactory results were obtained for continuous operation in rectifying high voltages. The investigation has by no means been completed. Further investigation will be made and additional data on this subject will be given in the near future.

The Anay, a New Edible-fruited Relative of the Avocado.

By S. F. Blake, Bureau of Plant Industry.

One of the most interesting results of the explorations in search of new and desirable avocados and related fruits, carried on in Central America for several years past by Wilson Popenoe, of the Office of Seed and Plant Introduction, is the discovery of the anay. Guided by the reports of natives, Mr. Popenoe first met with the species on September 23, 1916, when two trees were found at the entrance to the Finca El Compro-miso, half a mile from Mazatenango, Guatemala, at an elevation of about 365 meters. Other trees were known to the natives in the nearby forest, and were visited by them at the proper season to secure the fruit. The two trees seen by Mr. Popenoe had been left to provide shade for young coffee trees when the forest was cleared. They were about 22 meters high, with the tall and slender trunk bare of branches for a considerable distance, and an open rounded crown. On this occasion Mr. Popenoe, being unable to find a native venturesome enough to climb the trees, had to content himself with pieces of the bark and with some of the fruits, which were lying in profusion on the ground. He also secured leaves from sucker shoots at the base of one tree, but comparison with specimens secured from the same tree on a later trip shows that these belong to some other plant.

The fruits of the anay, which ripen in August and September, are very similar in external appearance to those of certain types of avocado (*Persea americana*). They are 10 to 15 cm. long, ellipsoid-pyriform, sometimes curved, sometimes pointed at apex, often with sharply defined neck, with the body slightly compressed, and smooth, glossy, purplish black surface. The skin is very thin and membranous, adhering closely to the firm, oily, rather scanty flesh. This is divided into two zones of color, equal in thickness, the outer pale green, the inner greenish cream-color, both being more sharply defined than is ordinarily the case in the cultivated avocado. The flesh has a rich, bland flavor, like that of a very good avocado, but faintly sweetish. The large, above seed, with the pointed end toward the base of the fruit, has a thick, almost fibrous, outer seed coat and a membranous inner one closely including the cotyledons, but not always reaching to their apex. The pubescent plumule lies immediately at the base of the cotyledons, while in the avocado it is located some distance above this point. The fruits fall while still hard, ripening in two or three days, and germinating freely on the ground beneath the parent tree. Most of the specimens found by Mr. Popenoe had been attacked by insects, which tunneled through the seeds.

The notes from which this description of the fruit has been drawn up were made by Mr. Popenoe on his first visit to the trees. On a later visit, on January 17, 1917, a mozo was found who ascended one of the trees by means of a nearby palm and threw down branchlets with leaves, young fruit and a very few flowers. Study of these shows that the anay is not a *Persea*, as Mr. Popenoe at first supposed, but an undescribed species of the genus *Hufelandia*, which is at once distinguished from the avocado (*Persea americana*) and its near relatives by the fact that the anthers are 2-celled instead of 4-celled.

Since collecting the anay at Mazatenango, on the west coast of Guatemala, Mr. Popenoe has found it at Chamà, on the Rio Chisoy in the Usumacinta basin in Alta Verapaz, northeastern Guatemala, at an altitude of about 300 meters, although no specimens were obtained. It is the belief of Mr. Popenoe that the name of the old Maya settlement Anaité, farther north in the same valley near the ruins of Menché Tinamit and Yaxchilan, has reference to the former abundance of the anay in the same region.

The anay, both in the vicinity of Mazatenango and in the Usumacinta Valley, grows in moist regions at an elevation of only 300 to 365 meters. For this reason Mr. Popenoe believes that it will not succeed in California, but that it may do well in southern Florida. Young trees grown from seeds collected by Mr. Popenoe are now cultivated in the Plant Introduction Garden at Miami, under the Seed and Plant Introduction number 43,432, and their future will be watched with much interest. In its native haunts the species was reported by natives to flower in May, but from the specimens collected by Mr. Popenoe it is clear that the flowering season is December and January. The fruit ripens in August and September.—From *Jour. of Wash. Acad. of Science*.

Hints for Electric Welders.

In notes designed for instruction in electric welding by H. L. Unland occur certain suggestions which are worth repeating.

When carbon electrodes are used in arc welding the average length for efficient work should be from 9 to 12 inches. Metallic electrodes of low carbon steel should be about 18 inches long. At least 15 feet of extra flexible cable should be used to allow the operator full control of the electrode through the welding process.

Doubt is often expressed as to the current required for certain types of work. In general in the case of light work where the metallic electrode is used a current not greater than 125 amperes is necessary, while heavier work will stand 225 amperes without burning the electrode. Plates of $\frac{1}{4}$ -inch require 125 amperes. Heating with the carbon electrode necessitates the use of greater currents; light welding, 150 to 250 amperes; heavy welding and medium cutting, 400 to 600 amperes; very heavy work, 600 to 1,000 amperes.

Flux is not necessary to good arc welding and has a tendency to contaminate the weld if used. With the metallic electrode the work should be cut sharp—not over $\frac{1}{8}$ -inch in length. The current should be held within the limits suggested. Excessive current causes burnt or porous metal to be deposited.

In welding a seam the electrode should be moved in a circular path, advancing along the seam. The metal will adhere only to the surface actually played on by the arc, so care must be taken that the entire surface is covered.

The electrode must be connected with negative terminal, as it is difficult to maintain the arc with the polarity reversed. In starting the arc the electrode should be just touched to the arc and immediately withdrawn to the proper distance.

When welding with the carbon electrode an arc 1 to $1\frac{1}{2}$ inches is the average, but in cutting it should only be $\frac{1}{2}$ -inch.

The eyes of the welder should be thoroughly protected by a mask from the light of the arc, or serious burns to the interior of the eye will result. No chinks or holes in the mask should be permitted, since only a brief exposure of the eye is required to bring on painful results. The inside of the mask should be kept painted dull black to prevent reflection of the light from behind.—From *International Marine Engineering*.

Boring for Oil in Scotland.

After more than two months' preliminary work the actual sinking of the bore which is being put down for oil at West Calder, in East Lothian, has been started, and the fitting up of the plant neces-

sary for boring at another part of the shale and coal fields of the Lothians—near Dalkeith—has also been begun.

At West Calder the bore is being sunk through deposits of coal, shale and water. It is expected that the work will progress at a rate of about 40 ft. a day. Operations will be carried on in two shifts a day, each of 12 hours, so that there will be no interruption of work. Down to a depth of 650 ft. the bore will be 19 in. in diameter, less the thickness of the necessary casing. Afterwards, to a depth of 1,500 ft., the diameter will be $15\frac{1}{2}$ in., then between 1,500 ft. and about 2,200 or 2,300 ft. it will be $12\frac{1}{2}$ in. At any further depths that may be found necessary the diameter will decrease at a somewhat corresponding rate. It may be added that the experts who selected the position of the bore at West Calder are the same as were responsible for the selection of the position at Hardstoft, in Derbyshire. *Times Engineering Supplement* (London).

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Table of Contents

	PAGE
Symbiotes or Benevolent Microbes and Vitamines—By May Tevis	282
Coal Analyses Made at the Power Plant—By E. D. Hummel—Illustrated	284
Light and Color in Relation to Stage Effects	285
Wind Motors—By Capt. Paville C. Poulton. O. B. E. A. M. I. E. E. etc.	286
How Could a Rotating Body Such as the Sun Become a Magnet—By Sir Joseph Larmor	287
Concrete Mine Timbers	287
Mechanical Aids for the Sculptor—By Gordon Vander Veer—Illustrated	288
The Largest Clamshell Bucket	288
Submarine Acoustics—By F. Lloyd Howard—Illustrated	289
Electrical Conditions of the Earth and Atmosphere—By A. E. Holmes	290
Concerning Age	291
Coins of the Ages—By Howard Wood Curator of American Numismatic Society—Illustrated	292
Temperatures in Deep Mines	294
Rectifying High-Tension Alternating Currents—By Samuel Cohen—Illustrated	295
The Anay, a New Edible-fruited Relative of the Avocado—By S. F. Blake	296
Hints for Electric Welders	296
Boring for Oil in Scotland	296