long-lived one fell off only 3 per cent. One lamp that burned 735 hours showed a gradual increase in candle power of 2 per cent. The long-lived lamp mentioned showed an increase in candle power for the first 400 hours, followed by a gradual and slight falling off in candle power for the balance of its life. Starting with 37 candle power and 37 watts, after 200 hours this lamp began to show an increase in candle power without, however, any increase in current. At the end of 400 hours the candle power had run up to 40. During the next 100 hours it fell again to 37, and then declined gradually to 35½ at the end of 1,230 hours, while the consumption was diminished about half a watt. As these lamps that were given a life test were rather crudely made in the laboratory, and as they had been submitted to tests of various kinds before undergoing it, this probably accounts for the non-uniformity of the results obtained. The break in the filament occurred at the same place in each lamp, i. e., near the cement terminals, and it was due, the inventors believe, to a cause which can be corrected when the lamp is made commercially. Filaments of 30 candle power have been made for voltages of from 100 to 115 and of about the same length as the carbon filament of the ordinary lamp.

From the foregoing description of the Helion filament and the tests which have been made with it, one can see that it is apparently a very marked improvement over the filament now generally used, giving as it does approximately twice as much light with half the current consumption, and furnishing a much whiter light at that. The fact that it can be used in the ordinary vacuum lamp bulb is a point in its favor, as it can thus be readily employed wherever the ordinary incandescent lamp is at present in service.

THE JAMAICAN EARTHQUAKE.

From the meager details available at the time of this writing, it would appear that the recent earthquake which destroyed Kingston, Jamaica, was hardly less destructive in severity and extent than that which resulted in the destruction of San Francisco, or the subsequent one which effected such terrible devastation at Valparaiso. The past twelvemonth has been signalized by a series of natural phenomena which have been seldom equaled in any similar period within the history of mankind. Beginning with the terrible volcanic outburst of Vesuvius, various points of the earth's surface have been convulsed by volcanic outbursts or earth tremors, which have had the most disastrous effect, and have resulted in great loss of life and vast destruction of property. These various cataclysms have not occurred, furthermore, in a single so-called volcanic or earthquake belt. They have taken place in the most widely-separated localities, and our seismologists have not been able to ascribe their origin satisfactorily to a common cause. Whether or not it is merely coincidence that these happenings should all have taken place within a twelvemonth, or whether there is some great underlying action with which we are unfamiliar, and which has given rise to them, is still unexplained.

From the information at hand, it seems that the earthquake which destroyed Kingston consisted of a great number of shocks, with a shock of maximum intensity near the beginning of the series of tremors. The light architecture prevalent in the southern city was poorly adapted to resist a convulsion of this character, and even more substantially-built edifices collapsed under the exceptional severity of the earthquake. The usual accompaniment of tidal wave and Stygian darkness due to dust was present in this case too, and added to the general horror of the situation. It has been estimated that hundreds of lives were lost and that the damage to property will be found to reach many millions of dollars. The bottom of the harbor has sunk many feet, and there is danger, apparently, that the entire city—or rather what is left of it—may gradually sink into the sea.

While we are reluctant to ascribe a common origin to all these recent seismological phenomena, there may be some cause beyond our knowledge which has compelled vast internal changes in the structure of the earth, resulting in these alterations and readjustments upon the surface thereof. For instance, such cause might be found in the recent sunspot maximum. It must be remembered that a slip of a few inches only in rock strata which are poorly balanced or under heavy strain is sufficient to cause an earthquake of the greatest extent and intensity.

Prof. John Milne, the great English seismic authority, has advanced a theory to account for recent disturbances of this character manifested here and abroad in various parts of the world, which has been held tenable by Sir Norman Lockyer and Prof. Archenbold. Prof. Milne declares that the disturbances are due not to a merely normal readjustment of the earth's strata or to the shifting of the surface to meet a gradual contraction in the size of the globe, but are caused by displacement of the globe itself from its true axis and are really due to the jar incident to the subsequent swing back of the earth upon that true axis. It is conceivable that such a return movement to the axis as well as the original distortion would cause a tremendous strain upon the crust, and could easily account for the most terrific seismic convulsions imaginable. Sir Norman Lockyer declares further that the deviation from the true axis, a fact which, by the way, can be scientifically proven, is due to the great sunspots which recently sent more energy to the earth than at any other time during the thirty-five years sunspot period, and which, through the great differences in the corresponding temperatures, caused the formation of vast ice-masses at one or the other of the poles, of such weight that the distortion takes place, to be subsequently remedied by other variations.

As has been stated before in these columns, the consideration of a terrible calamity of this character immediately calls to the mind of the New Yorker the thought of what would happen should a similar disturbance occur in this region. From the experience to be gathered in the San Francisco earthquake and from what has been learned on other occasions, it would seem that many of New York's great modern buildings would stand a fair chance of immunity unless the convulsion were one of extraordinary violence, for not only is the great majority of the later structures of the riveted steel-frame type, but the underlying formation, particularly of the island of Manhattan, offers a solid rock foundation of the most substantial nature. Little apprehension need be felt, however, for it is generally conceded by authorities on the subject that the city is not in any one of the various earthquake belts and that this vicinity is part of an area which, considered geologically, is past the formative period by many thousands of years.

METHOD FOR ELECTRO-DEPOSITION AND SEPARATION.

BY EDWARD C. BROADWELL.

There is an intermediate method between deposition from aqueous solutions and the high-temperature, chiefly endothermic, reactions rendered possible by the joulage of an arc or resistance electrical furnace.

A double borate or phosphate of barium or lithium and any metal the electro-positive nature of which does not exceed that of manganese furnishes a molten bath, from which the metal is easily deposited in pure carbon-free condition. Borates, phosphates, or silicates of the volatile alkaline metals, although giving good solvent baths, are useless if a perfectly smooth coating of the chem-energetic heavy earth metals is desired, as the greater part of the alkaline metal volatilizes, leaving the coating pitted.

While Mn, Cr, Mo, Ti, W, etc., produced by thermic reactions due to Winkler and perfected by Goldschmidt, can be had over 99 per cent purity, these metals are in infusible lumps, and only suitable for alloying.

In an endeavor to get metallic chromium in particular, as well as Mn, Mo, Ur, W, etc., in soft, pliable sheet form for tests as to their suitability (when shredded) for use as incandescent lamp filaments, I found, as claimed in several electro-chemical books and journals, that at even high E. M. F.'s these metals could be deposited only as pulverulent coats if at all; moreover, in either the arc or resistance furnaces, their carbides, which lack the qualification of infusibility at incandescent lamp temperatures, are always obtained, and for the purpose found useless.

In my initial experiments the ordinary blowpipe Pt wire loop was utilized as the retaining vessel and anode; the wire, being somewhat stouter than usually employed, was pushed through a clay pipestem, leaving enough of stem to seal in the glass rod as a handle, and around this pipestem, and curved so as to dip concentrically into the bead retained by the loop, was coiled a finer platinum wire, to act as the cathode, its tip being withdrawn from the bead and cut off and reimmersed in the bead as the work progressed.

My bead or electrolyte bath consisted of potassic fluoride, when the metals having a so-called higher solution pressure than manganese were to be deposited from the ore dissolved by the fused fluoride, and the borax or microsmic salt bead was found best for metals belonging to the iron, zinc, and heavy-metal groups. The oxide or roasted ore is picked up by the bead in the usual manner, and when the solution is complete and the bead clear, the fine curved Pt wire, previously connected to the negative pole of the generator, is then immersed and electrolysis begun. As practice, it is interesting to decolorize a blue cobalt bead, and if a milliamperemeter is handy, to estimate the amount of metal deposited. When two or more metals are in the bead or fusion, the metals, owing to non-interference of hydrogen, can be sharply separated by watching the inverse E. M. F. shown by the voltmeter when the external source of energy is cut out. In a potassic fluoride bead the complete and decisive separation of didymium into its nine more or less elements ought to be easily possible for the electro-chemist who is also master of the spectroscope; in fact, the separation into praseo and neo metal is within reach of the chemist who is not a physicist, as it is a matter of withdrawal of the old and substitution of a new cathode or wire tip the instant the potential difference across the bead or fusion suddenly jumps to a higher point, while the temperature is not varied.

With larger quantities of oxide under test, a platinum crucible is needful; and when a carbon rod is concentrically immersed, without touching the inside of same, into a bath of fluoride, borate, or phosphate as above mentioned, but made basic by a slight excess of baric or lithic carbonate, the metal will be deposited as a smooth bright coating upon the inside of the crucible when the carbon rod is put in electrical contact with the crucible by a stout wire, i. e., we have here primary pyro-electrolysis, I think for the first time intentionally, although Castner undoubtedly got this effect with his iron carbide particles in his wonderful improvement in sodium manufacture.

The dissolving or rather oxidizing carbon rod in the above case furnishes the E. M. F. and hence the electric energy. With chromic borate made basic with lithic carbonate, as high as 0.07 volt is shown by the carbon, even over and above the back or inverse E. M. F. due to the tendency of the deposit to redissolve in the bath. When an external source of energy is used, and a platinum plate taken for the anode in a borate or phosphate bath containing an excess of B_2O_3 or P_2O_5, should the P. D. across the crucible attain 30 volts or more, there is deposited with the metal the element boron or phosphorus, thus giving the phosphids or borides and a loss of the crucible.

It is just possible chromium gun tubes and gas-engine cylinders are only a matter of the near future, and these articles cited as examples could only be manufactured by pyro-electric deposition, since a temperature of 5,400 deg. F. is required to fuse carbonless chromium, and an arc cannot be used or the metal will contain carbon, which even in small amounts greatly lowers the desired high fusion point, which allows of great resistance to erosion by intensely heated gases.

I have coated smooth tinplate sheet steel with a tough and beautifully uniform coat of pure chromium, which can be easily gotten from the steel by solution of the latter in alkaline bisulphites containing an excess of SO_2, and have hardened this stripped sheeting to chromic carbide by cementation for a couple of hours in hide charcoal, and find a material able to wear away carborundum as easily as a glass-hard file would a salmon brick.

For those who fractionate the photogenic oxides by the present tedious aqueous chemical methods, I am sure the above opens a new and valuable path, though it is evident metallurgy upon the large scale could hardly benefit by the above analytic methods.

THE BITE OF A GILA MONSTER.

In a recent issue of the SCIENTIFIC AMERICAN an article appeared written by D. Allen Willey describing and illustrating the Gila monster. The statement was made in the article that scientists had questioned whether its bite was fatally poisonous, as has been supposed. Mr. W. C. Barnes, of Las Vegas, N. M., claims to know of two cases, in one of which death resulted. Mr. Barnes writes as follows:

"The first man was in Tombstone, Ariz. The Gila was tied by the leg in a saloon as a curio, and a drunken gambler named Brown was teasing it. He carelessly stuck his first two fingers into its mouth, which immediately closed down on them, and could not be released until the reptile's head was cut off and the jaws cut apart. Brown suffered horrible agony for almost two days, and in spite of all efforts he died.

"The second case was in the fall of 1889. Walter Vail started from the 'Empire' ranch, near Benson, Ariz., to ride into town on horseback, some fifteen miles. A short distance from the ranch a monster was sluggishly dragging its way across the road. Thinking to take it in for a friend, he got down and killed it—or at least he thought he killed it. To carry it easily, he tied it on his saddle behind him, using his saddle strings for the purpose. As he loped along he thought to assure himself it hadn't dropped off by reaching around behind him with his right hand and feeling for the monster.

"It was there, and not nearly as dead as he thought. His first finger went into the reptile's mouth clear to the knuckle, and instantly those jaws with the long, sharp, dagger-like teeth closed on Vail's finger. With his left hand he managed to get his knife out and cut the saddle strings, and then had to dissect the head and jaws to get his finger from their grip.

"Vail then spurred his horse into Benson and found an engine in the yards. A hasty exchange of telegrams with the division superintendent and Tucson took place and in a few moments he was on the engine and racing over the road for Tucson, where an eminent surgeon resided at that time. Vail lay at death's door for two months and that finger to-day is useless and shriveled up from the effect of the bite."

At a mild red heat, good steel can be drawn out under the hammer to a fine point; at a bright red heat it will crumble under the hammer, and at a white heat it will fall to pieces.