silver fish. Gold fish take equal rank with silver fish in efficiency, but preference is given to the latter because it is much less expensive, and also rather hardier. Next in rank are sun-fish, with mud minnows and top minnows in the order named.

The use of oil is recommended only in such cases as cannot be successfully treated otherwise. Ordinary fuel oil is the best, because it is the cheapest. Experiments with Phinotas prove it to be an exceedingly effective oil; five gallons were put around the edges of a pond about 50 feet square, and it at once cleared the waters of all life. The oil being heavier than fresh water, first sank to the bottom and then rose in minute globules which broke and spread over the surface in a thin film; the water was thus thoroughly treated from top to bottom. The pond was examined from time to time for a month, when it was found to contain only a few *Anopheles* which were about four days old. This time, then, can be taken as the average effective period of Phinotas; for although the pond had but a slight flow, a number of hard showers fell during the month.

The following suggestions, which were distributed among the residents of the North Shore, it would be well for every one bothered with mosquitoes to observe:

"By far the best method is to do away entirely with all standing water. Rain barrels are often more of a habit than a necessity; and through oversight, tubs, buckets, tin cans and a large variety of other things are often left to hold water for days at a time, and so to breed mosquitoes. Turning these bottom up or abolishing them altogether strikes at the root of the matter.

"One or two fish put in a rain barrel will live very nicely and will keep it quite free from larvæ. Gold fish and silver fish are best for this purpose, but ordinary minnows are very good.

"Another scheme is to make a covering for the barrel, so that the female mosquito cannot get in to lay her eggs. The objection to this is often that the cover is not tight enough to be effective.

"Ordinarily, rain-water is used only for laundry purposes, and in this case enough common kerosene to make a good film on the surface will be effective if renewed every week. This is easily done, but is apt to be forgotten unless some definite time is taken, as, for example, every wash day.

"Tubs for dogs, cattle, etc., may be rendered safe by *thoroughly* sun-drying them once a week.

"Utmost care should be observed in the matter of disposing of tin cans, etc. Pools in barnyards or other places should be filled up or drained. Roof spouting, where apt to be filled with leaves, needs careful attention, as do all sorts of drains. Fountains may either be well stocked with fish or the water drawn off once a week and the basins dried. Greenhouse tanks are always troublesome when present, unless they are attended to by oiling or fish. Saucers of profusely watered flower-pots and dishes or tubs of water plants form still other breeding places."

SIR WILLIAM CROOKES ON RADIUM.

The following letter from Sir William Crookes to the editor of the London Times will probably interest our readers:

To the Editor of the Times.

Sir: In the presence of a mystery like that of radium any reasonable attempt at explanation will be welcome, so I will ask your permission to revive a hypothesis I ventured to submit to the British Association in my presidential address in 1898. Speaking of the radio-active bodies then just discovered by M. and Mme. Curie, I drew attention to the large amount of energy locked up in the molecular motions of quiescent air at ordinary pressure and temperature, which, according to some calculations by Dr. Johnstone Stoney, amounts to about 140,000 foot pounds in each cubic yard of air; and I conjectured that radio-active bodies of high atomic weight might draw upon this store of energy in somewhat the same manner as Maxwell imagined when he invented his celebrated "Demons" to explain a similar problem. I said it was not difficult so to modify this hypothesis as to reduce it to the level of an inflexible law, and thus bring it within the ken of a philosopher in search of a new tool. I suggested that the atomic structure of radio-active bodies was such as to enable them to throw off the slow-moving molecules of the air with little exchange of energy, while the quick-moving missiles would be arrested, with their energy reduced and that of the target correspondingly increased. (A similar sifting of the swift-moving molecules is common enough, and is effected by liquids whenever they evaporate into free air.) The energy thus gained by the radio-active body would raise its temperature, while the surrounding air would get cooler. I suggested that the energy thus gained by the radio-active body was employed partly in dissociating some of the gaseous molecules (or inducing some other condition which would have the effect of rendering the neighboring air a conductor of electricity) and partly in originating undulations through the ether, which, as they take their rise in phenomena so disconnected as the impacts of molecules, must furnish a large contingent of Stokesian pulses of short wave-length. The shortness in the case of these waves appears to approach, without attaining, the extreme shortness of ordinary Röntgen rays.

Although the fact of emission of heat by radium is in itself sufficiently remarkable, this heat is probably only a small portion of the energy radium is constantly sending into space. It is at the same time hurling off material particles which reveal their impact on a screen by luminous scintillations. Stop these by a glass or mica screen, and torrents of Röntgen rays still pour out from a few milligrammes of radium salt, in quantity sufficient to exhibit to a company all the phenomena of Röntgen rays, and with energy enough to produce a nasty blister on the flesh, if kept near it for an hour.

In conclusion, if it is not too much trespassing on your space, I should like to express the great admiration which I have, in common with all English men of science, at the brilliant discovery of radium, and its unique properties—the crowning point of the long and painstaking series of researches on radio-active bodies undertaken by Prof. Curie and his talented coadjutor, Mme. Curie.

I remain, Sir, your obedient servant,

William Crookes.

In a subsequent letter to the Times, Sir William Crookes writes:

"According to the hypothesis I ventured to formulate, I have little doubt that radium would cease to show its peculiar properties in a perfect vacuum. But such experiments at present are impossible of performance. What we call a 'high vacuum' is only a vacuum by courtesy. Most experiments in so-called high vacua have been performed at an exhaustion of about a millionth of an atmosphere, at which the phenomena of the radiometer, radiant matter, X-rays, and electric non-conduction can be observed. But what does an exhaustion to the millionth of an atmosphere really mean? Practically nothing! It may seem that when the originally tenuous air is reduced to the millionth part of its bulk, so little will be left that we are justified in neglecting the trifling residue and in applying the term vacuum to space from which the air has been so nearly removed. This, however, is a fallacy due to our difficulty in grasping the meaning of high numbers. In the present case the original number is so high that division by a million appears to make a scarcely appreciable difference. For instance:

"A glass bulb similar to those used in high vacua experiments, five inches in diameter, contains more than a quadrillion (1,000000,000000,000000,000000) molecules. Now, when the bulb is exhausted to the millionth of an atmosphere, it still contains more than a trillion (1,000000,000000,000000) molecules — quite enough matter to produce all the effects demanded by my hypothesis."

"EGYPTIANIZED" CLAY.

A discovery which gives good promise of affecting the clay industry and its various branches has been made by Mr. E. G. Acheson, of Niagara Falls. While experimenting in crucible manufacture, Mr. Acheson had occasion to search for a clay possessing certain qualities. He experimented with domestic and foreign clays, and wondered why German clays were esteemed superior to American. He realized that in some manner Nature had given them different treatment; that something had been mixed with them, possibly through water, that increased their plasticity. He began a series of experiments, and gathered all the information he could in regard to clays. Among other facts that commanded his attention was the seventh verse of the fifth chapter of Exodus, which reads:

"Ye shall no more give the people straw to make brick, as heretofore; let them go and gather straw for themselves."

The twelfth verse of the same chapter and book also interested him, for it reads:

"So the people were scattered abroad throughout all the land of Egypt to gather stubble instead of straw."

Mr. Acheson secured a quantity of straw, and had it sent to his laboratory. There he boiled it in hot water, and the liquid he obtained was of dark red color. This liquid he used in the treatment of clay, and found that it was excellent for increasing the plasticity. He sought out the principle, and determined that the agent was tannin. He treated other clays with water in which tannin was in solution, and realized that he had found the secret and made a most important discovery.

The name given by Mr. Acheson to clay treated by his process is "Egyptianized clay." He has discovered that it is practicable so to treat clay and other earthy materials as to insure greater strength in the products made therefrom, also to greatly reduce the shrinkage and warping in the process of drying and baking, and also to increase the solubility and the plasticity of the material. By his process, non-plastic clays may be rendered plastic, and plastic clays made more plastic by treatment with tannin or an agent having the astringent tannin principles.

It has been found, not only by Mr. Acheson, but by experts of the highest standing in the country, that clay so treated is changed in a most remarkable manner. So little as one-half of one per cent of tannin develops a wonderful effect, requiring 13 per cent less water to make the clay soft. The maximum effect of the process and treatment, however, seems to be obtained by the use of two per cent of tannin in a ten-day treatment. The treatment consists merely in keeping the clay wet with water, so that tannin is dissolved. In the burned form the strength of the clay is increased 50 per cent, while in the sun-dried form it is increased in tensile strength 350 per cent. Tests on several clays show this to be true. It is also observed that the Acheson treatment removes the crackling tendencies of many clays. In cases where clay articles are to be made of a certain size, they can be made more exact by the Acheson process, as there is less shrinkage. All parts intended to carry loads may be greatly increased in strength, while there is decreased porosity. Many of the plastic clays are off color, but non-plastic clays of desired color will be brought into service by the Acheson process. As the sun-dried clay is made stronger than the burned article, it is evident that there will be a big saving in coal bills. In making glass pots it now takes months to "age" or temper the clay, while with the Acheson process the maximum effect is obtained in a ten-day treatment. It is told of the Chinese that the people of one generation prepare the clay for the use of the next, all of which time is spent in making the clay plastic. Under the Acheson process the results are said to be more pronounced in ten days than obtained by old methods in years.

SCIENCE NOTES.

Horseshoeing has evidently been reduced to a science. At least that is what we may infer from the fact that the National Association of Master Horseshoers intends to establish a college devoted to the trade. The purpose of the institution, it must be confessed, is admirable. A course in horse anatomy, the study of elementary chemistry and metallurgy, and the rudiments of veterinary surgery are to be included in the curriculum.

Recent British Admiralty charts give the eastern limits of the Gulf Stream in different months as follows:

January: The stream does not reach to the eastward of 20 deg. W. and a southeasterly set is apparent off Ireland.

February: In latitude 55 deg. N. it reaches 15 deg. W.; a southeasterly set is found to the westward of Ireland, etc.

March: It has advanced to the coast of Ireland.

April: In 55 deg. N. its limit has receded to 20 deg. W. and the Iceland south-going current begins to show itself north of 55 deg. N.

May: The Gulf Stream and Davies's Strait cold current commingle in 47 deg. N., 27 deg. W., etc.

June: Gulf Stream to 15 deg. W. in 52 deg. N.

July: To the south of 56 deg. N. it joins the Iceland and Denmark strait current in about 48 deg. N.

August: It extends to the north of Ireland.

September: It extends to the north of Scotland.

October: It is found in 10 deg. W. at 59 deg. N.

November: The stream is traceable to 19 deg. W. in 59 deg. N.

December: It is difficult to trace the stream east of 40 deg. N. in 45 deg. W.

Prof. F. D. Baker, a noted biologist, who is connected with the Stanford University, of California, has just returned to San Francisco from an extended trip to Central America, where he has made a very careful study of the forests of Nicaragua. The most important discovery made was the finding and classification of a tree from which a substitute for cork has been derived. Prof. Baker found the woods of Nicaragua to contain three hundred distinct varieties of trees. For the last few years a bark which is a good substitute for cork has been shipped to the United States, but it has never been scientifically ascertained from what species of tree this bark has been obtained. Prof. Baker found that the bark came from the roots of the *anona*, a tree that very closely resembles the ordinary cottonwood of the United States. The *anona* grows along the watercourses and in the lowlands. Specimens were brought back of the fauna of the western slopes of the Coast Range in Nicaragua. Prof. Baker, while absent, made a careful investigation of the various diseases to which coffee and the coffee plant is liable in Central America. On this important subject, as well as the matter of his very interesting tree and biological discoveries, Prof. Baker will soon submit a somewhat elaborate report.