All kinds of supplies could be sent up from Brisbane or Sydney to any portion of the colony in a week. Here also a well organized force could be raised from the local troops, many of whom are good bushmen and accustomed to hard work in the tropics. But let us hope that their services will not be required, and that New Guinea will peaceably settle down into an orderly and prosperous colony.—*Ill. Nav. and Mil. Mag.*

GOLDIE'S BIRTHWORT.

Aristolochia Goldieana.

HAVING announced the flowering of this interesting plant recently in the Royal Gardens, Kew, we have thought it advisable to again bring it under the notice of our readers, because it happens to be one of the few gigantic beauties that may be grown in any garden where the warmth of a stove is at command. The aristolochias are not in any special degree popular, and the "giants" of the vegetable kingdom are not in favor as subjects suited for cultivation in gardens generally. We should not, for example, recommend the titanic *amorphophallus*, or the *rafflesia* or *welwitschia* for addition to any amateur's choice collection, but the plant before us may be grown in a ten-inch pot, and will flower sufficiently often to pay for the attention it requires, and, all things considered, it might be pronounced a quite "proper" plant for a stove of moderate dimensions, wherein room can be found for a few curiosities of more than average interest. As the

GOLDIE'S BIRTHWORT—ARISTOLOCHIA GOLDIEANA.

flowers of this plant are exquisitely beautiful—far beyond the suggestion of the best figures that have appeared—and measure over a foot in diameter at the margin of the limb, it must certainly be entered in the list of "wonderful" things that one can afford to wait for a reasonable length of time, and will not soon forget when the gratification has been secured of a display of its floral capabilities. The plant so admirably flowered by Mr. Watson at Kew might, as we remarked at the time, have been crumpled up into a man's hand, although the flower must rank with the largest that nature produces.—*The Gardeners' Magazine.*

MUSHROOM CULTURE.

THERE has been lately a good deal of discussion in the pages of the gardening press on the interesting subject of mushroom growing, and as the opinions therein expressed are somewhat diversified and conflicting, I am induced to offer a few remarks with reference to my own actual experience.

I altogether waive the scientific part of the subject. I will leave that to others, preferring to stick to the practical part, as one best calculated to be of tangible benefit to growers in general. I give the following account of my procedure, with the one simple object of perchance being of some little help to those who may possibly have sometimes failed in their attempts to produce paying crops of this much coveted esculent, believing as I do that a free circulation of opinion and more especially of actual experience and results among English growers, not only on the subject of mushrooms, but on all other matters connected with the market produce of garden and glasshouse, would at least assist

in stemming the flood of foreign importations, and thus benefit the hard working British growers.

I am a grower of mushrooms for market on a moderate scale, and have no reason to complain of want of success hitherto in a pecuniary point of view. I have no properly constructed houses, but grow the mushrooms on the floors of unheated sheds in summer, and in the paths of my glasshouses all the year round, and the following includes my *modus operandi*.

Preparation of Manure.—This I procure in large quantities at a time, or say I have four empty beds that I wish made up, I procure the manure for these all at one time, and just as it is thrown from the stables. This I throw into a heap in the open air, without removing a single straw, no matter how rough and strawy the mass may be. This heap I turn, on an average, three times a week, and it is exposed during the time to all weathers. If the heap be very rough and strawy, it will be sure to heat dry and white, especially if no rain falls during the process of turning and "making." In this case I add water freely during the act of turning, which assists in the making. During high winds the process of heating is retarded, and when this occurs I tread the heap hard down, and shelter the weather side with boarding, which I have always at hand. The process of making, if the dung is long, generally occupies about four weeks; if shorter, about three. When the dung, from the effects of turning and watering, becomes moderately short, brown-colored, hot, and moist, but not wet, it is ready to be put into the beds.

But rather than go to the expense of bringing fresh loam from great distances, I would prefer to use ordinary garden soil.

Watering.—This, I often think, is the most important point in mushroom growing, especially under glass roofs, and where there is no foliage above to protect the beds from the rays of the sun. When I first began mushroom growing in the paths of my houses, this question of watering puzzled me greatly. My beds were continually getting dry, and I kept as continually watering them. I felt that all this was wrong; so, until I could think out a better plan, I covered my beds with a thin coating of clean straw all over, which answered fairly well, the straw preventing such rapid evaporation as took place before. There was, however, this to be said against it: first, that one could not see when the mushrooms made their first appearance on a newly formed bed, which we are anxious to do; secondly, when the mushrooms had to be gathered, there was always a great deal of trouble attached to the removal and replacement of the straw; and, thirdly, the straw proved to be an undoubted shelter for woodlice and slugs. After a little thought, I hit upon a plan which I at once adopted, and have had working for some years with very satisfactory results. I shall here attempt to describe it. The paths of the houses are, of course, excavated to the depth required for the reception of the dung, and lined on each side with brick walls, one brick thick. Fixed into these, at intervals of 6 feet, are crossbeams, 3 inches by 3 inches, and on the top of these, in the middle of the bed, and nailed to the cross pieces, runs a thick plank that will not spring. This is used as a gangway, or place to walk and wheel on. Lengths of wood of the same dimensions as the cross pieces are fixed on the top of the walls, running the whole length of the bed. On these are hinged shutters, made of wood, an inch in thickness, on each side of the gangway, and 6 feet long, or so that each shutter will catch on the cross-bars for support when down, and so wide as to fit closely to the gangway, and the arrangement is complete.

For examination of the bed, watering, weeding, and gathering crop, all that is required is to raise a shutter where you please—by the way, they are all fitted with wooden handles, firmly secured—and set it back. It then stands upright, having for support the greater part of the thickness of the wall plate. When the examination is over, the shutters are gently laid back in their places, and all is darkness and comfort underneath.

This arrangement is a little expensive at first, but that is soon covered by the saving of labor and the greater comfort in working the beds. With this arrangement the workpeople can walk on the gangway and shutters over the whole surface of the beds in prosecuting the work of training vines or tomatoes as the case may be; whereas, with only a single plank running up the middle, slips of the feet were constantly occurring, much to the detriment of the mushrooms underneath.

After spawning and moulding, the beds are allowed, of course, to remain without water till nearly the end of the sixth week, when they receive a gentle sprinkling of tepid water daily till the moisture reaches the manure, after which the mushrooms soon appear. When this takes place, the boarding on top of the beds is kept wetted by the syringe three or four times a day, according to the weather, which has a wonderful effect in keeping the beds below in a uniform state of moisture.

I may mention that when I began to grow mushrooms first in my glasshouses, I had the bottoms of the beds concreted, but partial and sometimes total failure was the result. Judging the cause, I had the concrete removed, with good crops as a result.

In conclusion, I may state that my average yield of mushrooms per square foot of bed is about 1½ lb., which yields a satisfactory profit.—*Market Gardener.*

THE MEDICINAL USES OF LEAVES.

By P. L. SIMMONDS, F.L.S.

IT is strange how assiduous and successful both civilized and savage man have been in utilizing for some economic purpose every portion of various plants. Roots, stems, barks, saps, and exudations, leaves, flowers, fruit, and seeds are alike applied to some useful employment; especially has this been the case in pharmacy and medicine. To take one branch of vegetation, the foliage of plants, what a curious investigation for study does it offer in the form, color, texture, and qualities of various leaves, and the employment of some for food, for dyeing and tanning, for textile manufacturing and other economic applications, and for their medicinal properties. It is the last division I propose to consider here. Through the vulgar error of undervaluing what is common, we are apt to pass leaves by as of little worth. A close scrutiny and careful examination would convince us of the economic importance of these foliose organs. Their dietetic uses are alone of great importance, if we consider merely culinary vegetables, tea, and tobacco.

In glancing through various botanical and medical works, I have jotted down the various leaves which have a medicinal or healing reputation, and the list becomes an extensive one. Not that all these have any established reputation, for only a small number are included or recognized in the various national pharmacopœias, but their employment points to some generally conceived opinion as to their useful properties.

I have not thought it necessary to arrange these under their genera and families, but merely note them as described, under the belief that some among them may be found worthy of closer attention.

The leaves of *Asteracantha longifolia* are used in India as a diuretic.

The foliage of the *Eucalypts* of Australia, especially *E. amygdalina*, *citriodora*, *globulus* and others, yields a large supply of an antiseptic volatile oil of excellent, lemon-like fragrance. Cigars made of the leaves have been recommended in asthma.

The leaves of *Pilocarpus Pinnatifolius* are famed as an agreeable, powerful, and quickly acting sudorific, and also recommended as a specific in diphtheria, as well as in typhoid fever.

The foliage of *Leonotis Leonorus* has some therapeutic properties; the leaves when used like tobacco are highly sternutative.

Matico, the dried leaves of *Artanthe elongata*, serves

Making up the Beds.—These I fill up to a depth of 12 inches with the prepared dung. The mass is well shaken up as it is brought into the house, and as evenly laid down as possible, and is then at once trodden down firm; the depth of dung, when hard trodden down, will usually be about 9 inches. I consider this quite enough, and any more merely a waste of manure. I can remember once running rather short of dung, and forming a bed that, when trodden down, was not more than 6 inches thick, and it did quite as well as the thicker ones put down at the same time.

Spawning.—My rule is to insert the spawn the moment I find the heat is not on the rise, which I find out by the thermometer, but I do not hesitate to spawn in a good strong heat, believing that to be much better than to allow the beds to fall to anything like a low degree of temperature. I use the spawn in goodly pieces, and at the rate of about 1 bushel to 50 square feet. These pieces are tucked in, as it were, under the dung with the aid of pointed pieces of iron three-fourths inch in diameter and about a foot long. With such instruments the work of spawning can be got through very rapidly.

Soiling the Beds.—This work I perform the moment the beds are spawned, putting on a layer of about two inches in thickness when rammed down, which is done at once. I use fresh loam when I can get it, but when not procurable I use ordinary garden mould, and after an experience extending over some years, I must confess that so far as regards the quantity of mushrooms produced, the one kind of soil seems to be quite as efficacious as the other. The only advantage maiden mould has over ordinary garden soil is that it produces fewer weeds, which of course is a consideration.

as a powerful styptic and for other medicinal purposes.

The foliage of *Artemisia Abrotanum* is used in domestic medicine, and also as a condiment.

The leaves of *Hamamelis virginica* are renowned in the States for their medicinal properties.

The leaves of *cinnamon*, of the *camphor tree* and of *Tetranthera laurifolia* are used to make aromatic baths for persons suffering from rheumatism.

Bhang consists of the larger leaves and capsules of Indian hemp, which are used for making intoxicating drinks, and a sort of intoxicating conserve or confection, called *majoon*.

The betel leaf (*Chavica Betel*) acts as a powerful stimulant to the salivary glands and digestive organs. Its use is, therefore, conducive to health, and has been found to be an excellent preservative against scurvy in long sea voyages.

The fresh juice of the leaves of *Clerodendron viscosum* is used as a vermifuge, and also as a bitter tonic and febrifuge in malarious fevers.

The leaves of *Datura Stramonium* are applied to boils and ulcers, and are smoked with tobacco for asthma. Those of *Datura alba* and *D. fastuosa* act as anti-spasmodics.

The leaves of *Eupatorium Ayapana* have been employed for tea in the Mauritius, and the expressed juice from them is used internally as an astringent.

The leaves of *Savinilus Saponaria* are employed by the creoles in the Mauritius in constipation.

Buchu leaves are the produce of *Barosma betulina* or *crenata*. In trade this valuable drug is sometimes adulterated by the substitution of leaves of less powerful sorts of the same family of plants, which, although of a similar smell, are by no means equal to it in their therapeutical effects: 94,265 pounds of buchu leaves, valued at £1,307, were shipped from the Cape Colony in 1884.

By some authorities, *B. serratifolia*, Willdenow, is said to furnish the buchu leaves. *B. crenulata*, Hooker, is only a variety of this species. *Empleurum serrulatum*, Solander, also yields some, which are easily distinguished by the linear-lanceolate serrated leaves.

The leaves of the *Ferronia elephantum* are aromatic and carminative. In Mohammedan medical works they are described as astringent.

The fresh juice, diluted, of the leaves of *Egle Marmelos* is largely used in Bengal as an antibilious and febrifuge, and also as a vehicle for other febrifuges. Made into poultices, it is used for treating ophthalmia.

The leaves of *Aschynomene Sesban* are much used in India as a poultice to promote absorption.

The viscid mucilage obtained from the fresh leaves of *Aloe indica* is also used by the natives as an excellent demulcent, especially in gonorrhœa.

The fresh leaves of *Cassia alata*, when bruised and mixed with lime juice, have been found to act with decided efficacy in ringworm and other similar affections of the skin. Made into a plaster, combined with sandal wood, the leaves of *Cassia Sophora* are used as a similar specific.

The dried leaves of several species of *Cassia* are largely used in the East, in combination with other drugs, for their purgative properties; and the leaflets constitute the senna of commerce. *Cassia acutifolia* furnishes part of the Alexandria senna; *C. angustifolia* yields Mecca and some of the Bombay senna; *C. obovata* some of the African senna, which is less esteemed and less collected than the other species. *C. elongata* produces several varieties of East Indian. *Cassia Absus* is also one of the sources of medicinal senna leaves.

A decoction or infusion of the leaves of *C. auriculata* is much esteemed as a cooling medicine by the Singalese, and also as a substitute for tea.

The leaves of *C. Tora* are used as an aperient; both leaves and seed constitute a valuable remedy in skin diseases, chiefly ringworm and itch.

The pulp of the leaves of *Aloe vera* is in native practice applied to boils, and is regarded as acting powerfully on the uterus, and to be useful as an emmenagogue.

Dr. White states that the leaves and tops of *Artimisia vulgaris* are used in nervous and spasmodic affections connected with debility.

The leaves of *Hydrocotyle asiatica* have been made official in India. They are given in infusion to children in bowel complaints and fevers, and are described as alterative and tonic, and when locally applied, stimulant. They are used in leprosy with good results. In secondary or constitutional syphilis, they are of great value. In ulcers and skin diseases, they are prescribed both internally and externally. On the Coromandel coast, the leaves are applied to bruises.

The dried leaves of *Hyoscyamus niger* are anodyne, sedative, and antispasmodic. A preparation from the leaves is useful in nervous irritability, mental excitement, sleeplessness, and various other mental disorders.

The aromatic leaves of *Laurus nobilis* possess tonic and febrifugal properties and are in much request for various condiments.

The expressed juice of the leaves of *Eugenia Jambolana* is employed alone or in combination with other astringents in dysentery.

The leaves of *Ferula Narthex* possess sudorific and carminative properties.

The leaves of *Acacia Lebbek* are used for rheumatism in fomentations or baths.

The leaves and young shoots of *Persica vulgaris*, in infusion, are said to be stomachic and vermifugal.

An infusion of the leaves of *Caryophyllus aromaticus* is given as a carminative in disorders of the stomach and colic.

The leaves of *Vinea rosea* have been found useful in cholera, dysentery, and cutaneous diseases.

The leaves of *Ocimum gratissimum* are employed in aromatic baths; sometimes with tobacco leaves in rheumatic complaints and paralysis.

The leaves of *Faham* (*Angræcum fragrans*), made into a beverage, are considered pectoral and stomachic. Dried, they are smoked in cases of asthma.

The leaves of lemon grass, *Andropogon Schœnanthus*, also make a pleasant warm and diaphoretic infusion—a grateful drink in febrile affections.

The leaves of *Arctostaphylos glauca* are used medicinally; when chewed, they excite the flow of the saliva and give a peculiar, strongly astringent, slightly bitter taste afterward.

The leaves of *Larrea americana*, sometimes called

the creosote bush, are highly esteemed in California by the natives as a tonic and corrective of the system. They are sticky, with a strongly scented gum or resin.

A decoction of the leaves of a species of *Melaleuca* is much used in China as a tonic.

The leaves of the *Guava tree*, *Psidium pomiferum*, in decoction, were considered a remedy in the time of cholera in the Mauritius against vomiting and diarrhœa.

The leaves of *Argyrea speciosa* are employed for headache.

Pari leaves (*Cissampelos Pareira*) are said to possess the virtue of congealing water.

The bruised leaves of *Saponaria officinalis* form a lather, which much resembles that of soap when agitated in the water, and is similarly efficacious in removing grease spots.

The leaves of *Erythroxylon Coca*, having been scorched and well dried, are used for chewing, mixed with a little lime. Taken in moderation, they have a most extraordinary effect as a nervous stimulant. There are many medicinal preparations made from coca leaves.

The leaves of the Baobab tree, *Adansonia digitata*, are eaten by the Africans with their food, and are said to restrain excessive perspiration. A strong decoction of the leaves of *Dodonæa salicifolia* is employed as a gargle, or injected in the throat.

The leaves of the plantain, *Musa paradisiaca*, are antiseptic, and heal old ulcers and putrefying sores.

A lotion of the leaves of *Sesamum indicum* is used as a hair wash by the Asiatics, and is supposed to promote the growth of the hair and to make it black. As the leaves contain a quantity of mucilage, they are employed in North America to make a demulcent drink for catarrh.

The leaves of *Cinnamomum Tamala* and *C. albi-florum* possess carminative and stomachic properties, and are much used as a condiment in India.

The leaves of *Caryodaphne densiflora* are gratefully aromatic, and are used in infusion like tea, against spasms of the bowels. There are many other aromatic leaves, which are used by cooks and confectioners for flavoring food. The leaves of *Premna integrifolia* are bitter and carminative, and rubbed along with pepper, are administered in India in colds and fevers.

The fresh juice of the leaves of *Ricinus communis* is used as an emetic in poisoning by opium and other narcotics, and in decoction or poultice may be used as a lactagogue.

The leaves of *Tamarindus indica*, crushed, with water, and expressed, yield an acid fluid, useful in bilious fever and some urinary complaints; made into a poultice, they are applied to reduce inflammatory swellings and to relieve pain.

The leaves of *Trichosanthes dioica* constitute a bitter tonic. In bilious fever, a decoction of the leaves, with coriander in equal parts, is given as a febrifuge and laxative.

The dried leaves of *Tylophora asthmatica* are emetic, diaphoretic, and expectorant, useful in overloaded states of the stomach and other cases requiring emetics. It has also been found useful in dysentery, catarrh, and other affections in which ipecacuanha has to be employed.

The leaves of *Vitex Negundo* are aromatic, tonic, and vermifuge, and given in decoction, with the addition of long pepper, in catarrhal fever, with heaviness of head and dullness of hearing. A pillow stuffed with the leaves is placed under the head to relieve headache. The juice of the leaves is applied to ulcers.

The bruised leaves and ground root of *Withania somnifera* are employed as a local application to carbuncles, ulcers and painful swellings.

The leaves of *Aristolochia indica* are famed as an alexipharmic.

The leaves of *Clematis mauritiana* applied to the skin serve as a blister, and are recommended in rheumatism, lumbago, and other affections of the skin.

The foliage of *Athæa officinalis* is much used for medicinal purposes in France. In the Mauritius the leaves of the *Waltheria indica*, also known as "Guimauve," are used for their mucilage.

An infusion of the leaves of *Zizyphus Jujuba* is a popular medicine in Mauritius in cases of asthma and oppression.

The leaves of *Psoralea glandulosa* are regarded as a powerful vermifuge and a good stomachic.

The leaves of *Cajanus striatus*, roasted and powdered, are a powerful diuretic, and are given in derangements of the stomach, colic, etc. The bruised leaves are effectual in hemorrhages.

The leaves of *Melia Azadirachta* are stimulant, and applied to ulcers and skin diseases of long standing. They are also used in the form of poultices, to disperse glandular tumors, and in the form of a pulp, in cases of pustular eruptions and small-pox. The leaves of another species, *M. Azedarach*, have similar properties, and are used internally and externally in leprosy and scrofula.

The juice of the tender leaves of *Nerium odoratum* forms in India a remedy for ophthalmia. A decoction of the leaves is said to reduce swellings.

The juice of the leaves of *Ocimum Basilicum* forms an excellent nostrum for the cure of ringworm, and the bruised leaves for scorpion stings.

The mucilage of the fresh leaves and stems of *Pedali-murex* is highly valued by the people of Southern India as a medicine in gonorrhœa and dysuria. The leaves have an odor of musk; when fresh and stirred in water, they render it mucilaginous. Buttermilk in India is often fraudulently thickened by the use of these leaves.

The leaves of *Ptychotes involucreta* are used by the natives of India as a condiment and also as a stomachic and carminative in flatulency and other similar diseases. Though of an unpleasant smell, the leaves are now and then used as a substitute for parsley by Europeans.

A decoction of the leaves of *Uncaria Gambir* is evaporated by fuel and solar heat, and contains a large percentage of tannin, hence it enters largely into commerce for dyeing and tanning.

The powder of the dried leaves of *Lygodium flexuosum* is used with alleged success as a powerful errhine in obstinate headache.

The juice of the fresh leaves of *Momordica Charantia*,

mixed with warm water, has been successfully used as an anthelmintic.

The leaves of *Vitex trifolia* are considered useful as an external application to all rheumatic pains, sprains, etc. The powdered leaves have been given with success in cases of intermittent fevers.

The leaves of *Polanisia icosandra*, bruised and applied to the skin, act as a counter irritant, and in delicate constitutions, as a blister.

The leaves of *Erythrina indica* are used in cases of fever by the natives of India, and are sometimes applied externally, to disperse venereal buboes and relieve pains on the joints.

The leaves of species of *Euphorbia*, when warmed, are applied over the hypogastric region, and are said to promote the secretion of urine. The juice is used as a diuretic, and for relieving asthmatic attacks, and when warmed and dropped into the ear, has been found to give great relief in earache.

Although by no means complete, this enumeration of the medicinal uses of leaves may be interesting in some quarters.—*Amer. Jour. Pharm.*

EXPERIMENTS ON THE PREPARATION OF BOILED LINSEED OIL.

By FRANK H. THORP, S.B.

THE composition and properties of the drying oils have been but little studied. About twenty-five years ago, Mulder* took up this subject and published his observations. Within the last few years other chemists have investigated the subject, but the particular changes which take place in the so-called "boiling" of linseed oil have received little attention.

The drying of this oil is due to its oxidation, and the oxidation is greatly hastened by the "boiling." The drier, or substance added to the raw oil, partially oxidizes the oil during the boiling, and when a thin layer of the boiled oil is exposed to the air it rapidly hardens owing to the further oxidation of the oil. The drier dissolved in the oil acts, perhaps, as a carrier of oxygen from the air to the oil.

The driers most commonly used are litharge, pyrolusite, borate of manganese, and zinc white. Recently the oxalate of manganese has been proposed for this purpose.†

According to Mulder, some of the linoleic acid is converted to linoleic anhydride during the boiling. This anhydride is a tough, elastic body. At the same time, some of the metal of the drier forms a salt with the remainder of the acid, and this salt gives hardness to the varnish.

Hazura and Bauer‡ find that the rate of oxidation, and consequent hardening of the oil, depends on the ratio of linoleic and linolenic acids present.

When linseed oil is oxidized, it undergoes very marked changes in its physical properties; the color becomes darker, the oil becomes more viscid, and there is an increase in weight, sometimes equalling eight per cent. Some carbon and hydrogen are also driven off. These changes occur also during the process of "boiling." According to Cloetz,§ the carbon and hydrogen eliminated do not all pass off as carbonic acid and water, but partly as an irritating vapor resembling acrolein. He has shown that the glyceryl is destroyed.

A good varnish must be thin enough to apply with the brush, must dry without cracking and with rapidity, and give a clear, colorless film, which should be somewhat flexible. Oil varnishes give tougher films than volatile varnishes.

PREPARATION OF BOILED OILS.

The oil used was a very light yellow cold-pressed, raw, Calcutta linseed oil. The same quantity of oil, 50 c. c., was used in each experiment unless otherwise noted. The weight of 50 c. c. of this oil was found to be 45.7 grammes. The quantity of drier used in each case was noted.

The general process of boiling in each case was as follows.

The measured oil was heated in glass beakers of about 150 c. c. capacity, which were set in a pan of fine sand as closely as they would stand without touching. The sand bath was heated by gas burners beneath. Thus from four to six beakers were heated at one time. By the use of a sand bath, the temperature of the oil could be regulated better than by direct heating, and the danger of the taking fire of the oil was reduced. By raising the sand around the beakers to about one-half the depth of the oil, the whole mass could be very evenly heated. The oil was frequently stirred during the heating. In the course of the experiments it was found that the size of the beaker and the quantity of oil used had a marked influence on the temperature. With a beaker of 250 c. c. capacity and containing 100 c. c. of oil, the temperature was found to be about 30° higher than in a beaker of 150 c. c. capacity containing 50 c. c. of oil, under similar conditions. The temperature in the larger beaker was also much more even.

As the presence of small quantities of water in the driers caused violent ebullition and frothing when they were added to the hot oil, they were carefully dried before being stirred into the hot oil. In those cases where the drier was added to the cold oil and slowly heated with the oil, it was seldom dried, as all water escaped before the oil was hot enough to froth or spatter. But salts with "water of crystallization" always caused some disturbance, since this water does not escape until the temperature is quite high. With clear raw oil there is no ebullition until a very high temperature is reached. At 220° small bubbles begin to show around the edge of the oil surface, and white irritating vapors of very disagreeable odor begin to come off. But active boiling of the oil does not take place under 360°, which was as hot as these oils were in any case heated. In general, the best results were obtained with temperatures between 230° and 275°.

LEAD SALTS.

Litharge.—Six experiments were made with quantities of litharge, varying from one-half of one per cent. to two per cent. of the weight of the oil, and temperatures varying from 220° to 300°. Two of these experiments yielded fairly good boiled oils. The first was

* Die Chemie der austrocknenden Oele, Berlin, 1867.

† Castetoz, Bull. de la Soc. Chimique, vol. I., pp. 597, 645.

‡ Monatsch., vol. ix., p. 459.

§ Bull. de la Soc. Chimique, vol. iii., p. 41.