FLOWERS.—THEIR INDUSTRIAL AND MEDICINAL USES.

Of all the parts of plants used in medicine or the industrial arts, the floral organs are those which would appear to be of the very least importance; yet they constitute, in many cases, objects of much greater commercial value than one would naturally suppose. Leaving out of view entirely the immense number of cultivated flowers sold in all our populous cities for ornamental purposes exclusively, there remain a very great number that enter commerce in greater or less quantities for various other and more practical uses. Among such products we may mention, for instance, safflower, saffron, pyrethrum, camomile, roses, violets, and a host of others of less importance.

Safflower (*Carthamus tinctorius*), from the colored petals of which is extracted carthamine, extensively used in dyeing, comes in part from Southern Europe, India, and China. Lyons, France, is the most important consumer of this tinctorial product, using it in great quantities for dyeing silks. The pink saucers of the shops are prepared with a thin coating of carthamine, and from the same product is derived the vegetable rouge of commerce.

Saffron (*Crocus sativus*), although growing in many countries, is cultivated for commercial purposes in the largest quantities in France and Spain. What is known in commerce as "saffron" are the stigmas of the flowers. It takes about 30,000 flowers to produce two pounds of the fresh stigmas, which when dried become reduced to one fifth of that weight. Pereira states that it takes nine flowers to make a grain of saffron, such as found in commerce, and about 4,320 flowers to produce an ounce. It is asserted that in order to obtain one pound of dried saffron, 107,520 flowers are necessary; some authorities even place the number as high as 200,000. Saffron is used in medicine. It is a native of Greece and Asia Minor; large quantities are raised in Egypt, Persia, and Cashmere, whence it is shipped to India. Much of the drug we obtain is imported from Gibraltar, packed in canisters. Parcels are also brought from Triest and other Mediterranean ports. The Spanish product is usually considered the best.

Roses are used both in perfumery and medicine. Extensive rose farms exist at Shiraz, in Persia; at Ghazepore, in India; Adrianople, in Turkey in Europe; Broussa and Uslak, in Turkey in Asia. The cultivators in Turkey are principally the Christian inhabitants of the low countries of the Balkan, between Selimno and Carloya, as far as Philippopolis, in Bulgaria, about 200 miles from Constantinople. In good seasons this district yields 75,000 ounces; but in bad seasons only 20,000 to 30,000 ounces of attar are obtained. Roses are also cultivated to a large extent in England, near Mitcham, in Surrey, to make rose water.

It is estimated that it takes 2,000 roses to yield one drachm of attar, or 3,000 pounds of the petals to obtain one ounce. The species of rose cultivated for its oil or attar is the Provence or hundred-leaved rose (*Rosa centifolia*); the rose principally used in medicine is the French rose (*Rosa gallica*).

Without going into details regarding the cultivation of all the other flowers used in perfumery, we may state, as an evidence of the commercial importance of this art, that one of the large perfumers of Grasse and Paris alone uses annually 80,000 pounds of orange flowers, 60,000 pounds of cassia flowers, 54,000 pounds of rose leaves, 32,000 pounds of violets, 20,000 pounds of tuberoses, 16,000 pounds of lilacs, besides an enormous quantity of the fragrant portions of other plants.

Lavender is grown to an enormous extent at Mitcham, in Surrey, which is the seat of its production, from a commercial standpoint. Immense quantities are also produced in France, but the superior odor of the English product causes it to realize in market four times the price of the French article. The flowers are the parts used, both in medicine and perfumery. Half a hundredweight of good flowers yield by distillation from 14 to 16 ounces of essential oil.

The flowers of the common American elder (*Sambucus canadensis*) and the allied European species (*S. nigra*) are used in medicine and perfumery, for the latter use being distilled to form elder flower water.

The cloves of commerce are the unexpanded flower buds of the *Caryophyllus aromaticus*, a tree a native of the Moluccas and other islands in the China seas. The average annual crop of cloves from each tree is, according to Burnett, 2 or 2½ pounds; but a fine tree has been known to yield 125 pounds of this spice in a single season; and as 5,000 buds only weigh one pound, there must have been at least 625,000 flowers upon this single tree.

Several species of pyrethrum are cultivated in Europe (as *P. roseum* and *P. carneum*) for the sake of their flowers, which when powdered come into commerce under the name of "Persian insect powder." That which comes from the Caucasus is considered the best. The valuable insecticide properties of this powder have rendered it a highly important article of commerce. Over 500 tons are annually consumed in Russia alone.

The camomile (*Anthemis nobilis*) is a native of Europe, and grows wild in all the temperate parts of the Continent; it is largely cultivated for the sake of its flowers, which are extensively used in medicine under the name of Roman camomiles. These, as found in our shops, are imported from England and Germany. From the latter country are also exported, in considerable quantities, what are known as German camomiles (*Matricaria camomilla*), which are principally used by our German population.

The yellow flowers of dyer's broom or dyer's weed (*Genista tinctoria*) are used for dyeing yellow. Both these and the seeds have been used in medicine. The plant grows wild in Europe, and is sometimes cultivated in this country.

In the East the petals of the *Hibiscus rosasinensis* are used as a dye; upon being bruised they turn either black or purple, the black being so intense as to be used for blacking boots; hence the plant is sometimes called the shoeblack plant. The flowers are likewise used for coloring liquors, and are very often employed by women as a hair dye.

The flowers of other genera of the mallow tribe, such as *Malva sylvestris*, *M. rotundifolia*, *Althæa officinalis*, and *A. ficifolia*, are made use of in medicine as demulcents; and the flowers of still another member of the tribe, *Abutilon esculentus*, are cooked and used as food in Brazil.

The number of flowers that are used as food is small; among these we may mention the artichoke (*Cynara scolymus*), the undeveloped flower heads of which furnish a much prized dish. A thistle (*Gondelia Tournefortii*), similar to the artichoke, occurs abundantly in Palestine, and its undeveloped flower heads are brought to the markets of Jerusalem under the name of cardi, and are much sought after as a vegetable. In many parts of India the flowers of a sapotaceous tree (*Bassia latifolia*) form a really important article of food. The blossoms are very numerous and succulent, and are eaten raw. They are also sun dried and sold in the bazaars. A single tree affords from 200 to 400 pounds of the flowers. The flowers of another species (*B. longifolia*) are employed in a similar manner by the natives of Mysore and Malabar; they are either dried and roasted and then eaten, or bruised and boiled to a jelly and made into small balls to be traded for other food. The unopened flower buds of the caper bush (*Capparis spinosa*), a creeping plant of Southern Europe, when pickled in vinegar constitute the condiment known in commerce as capers. It was known to the ancient Greeks, and the renowned Phryne, at the first period of her residence in Athens, was a dealer in capers. The flower buds of *Zygophyllum fabago*, a native of the Cape of Good Hope, are used instead of capers, or substituted for them. Long pepper (*Chavica roxburghii*), which in chemical compositions and qualities resembles black pepper, and is used for the same purposes, consists of the immature spikes of flowers gathered and dried in the sun.

Koosso, highly valued in Abyssinia as a vermifuge, and used more or less in Europe and America for the same purpose, consists of the flowers of *Brayera anthelmintica*, a tree about 20 feet high belonging to the family of Rosaceæ, growing on the table land of Abyssinia at an elevation of six or seven thousand feet above the sea. Wormseed, or *semen contra*, also extensively used as an anthelmintic, consists of the small unexpanded flowers of a plant (*Artemisia Judaica*, or *A. glomerata*) growing in Palestine and Arabia. From these are extracted the active principle *santonine* of the drug shops. The well-known household remedy, arnica, consists of the flowers of a composite plant, *Arnica montana*, indigenous to the mountainous districts of Europe and Siberia. This remedy is in such universal use as to make it an article of considerable commercial importance. Among other flowers, gathered and sold in more or less varying quantities for medical purposes, may be mentioned the *Marigold* (*Calendula officinalis*), formerly in repute as a remedial agent, but now chiefly used to adulterate saffron; European centaury (*Erythræa centaurium*), red poppy (*Papaver Rhœas*), rosemary, mullein, lily of the valley, clove pink, dogwood (*Cornus florida*), and blue violet (*Viola cucullata*).

In Switzerland and Germany, the flowers of the linden (*Tilia Europæa*) are considered a sovereign remedy for headaches; and the flowers of this, or allied species, are also sold in our own drug stores. In Cairo the extremely odoriferous flowers of *Santolina fragrantissima*, called by the native name Babourug or Zeysoum, are sold extensively for the same uses as camomile.

The peculiar fragrance of the finer and more costly teas which we obtain from China is due to the artificial perfume obtained from contact with many odoriferous flowers, largely used in the Celestial Empire for that purpose. The flowers principally employed are the Chulan (*Chloranthus inconspicuus*), *Aglaia odorata*, the Cape jessamine (*Gardenia florida*), and the fragrant olive (*Olea fragrans*).

There are a few other flowers used by the inhabitants of various countries, for one purpose and another; but since their use is entirely local, and they have not become articles of commercial value, we omit them.

THE CHLORINATION OF COPPER.

A noted instance of special legislation was the establishment, twelve or fourteen years since, of practically prohibitory duties on foreign ores of copper, with the result of the salvation of the Lake Superior copper interests, whose mines produced metallic copper, but the annihilation, almost, of all those interests related to the production of the metal from the mineral ores.

At the time of this legislation the cost of mining the metal from the Lake Superior ores was considerably greater than was that for its production from the sulphurets, but for successful and profitable working of these last a mixture of carbonates of copper was requisite; and these were obtained only from Africa and the west coast of South America.

The treatment of the Lake Superior ores is a very simple matter, only stamping and washing to liberate the metal from the matrix being required to prepare it for the melting and refining furnaces, the reasons for the higher cost in the production of the metal lying in the facts that the ore contains, generally, but a small percentage of copper (consequently for a ton of copper a good deal of ore has to be mined), and that the mining is a slow and difficult matter. The treatment of the sulphurets, on the other hand, involved several roasting and melting processes and the use of the carbonates and of fluxes of various kinds as preliminaries to the refining process; but the ores worked contained copper largely in excess of those of Lake Superior. It will be seen that the chief investment of capital in the one case is for the mining plant, and, in the other, for the furnace or reducing plant. In the one case the expense is large and constantly increasing, in the other confined to repairs.

Doubtless the great falling off in the demand for this metal which was consequent upon the conditions obtaining shortly after the close of the war, and simultaneous with the adverse legislation spoken of, had, more than anything else, to do with the quiet submission of the copper manufacturers to this change of tariff.

When these old companies were floating on the full tide of pecuniary success, several new processes for reducing sulphurets without the aid of the carbonates were presented to them, but rejected without thorough investigation, either because their working would involve almost entire change of costly plant, or that the control of the market, which they held, converted them into conservative opponents of all innovations, and when the tide suddenly ebbed they became sadly indifferent to all progress.

But now, as in year after year new and rich mines of sulphurets have been discovered, until we can boast of more abundant and valuable deposits than are found in any other country, we cannot understand why these interests have not sought out some process which will make them independent of tariffs and enable them to compete successfully with the Lake Superior operators.

In the chlorination of gold and silver ores containing copper—which plan is daily becoming more approved—we find indication of the true method for our copper sulphurets. The chlorination of the copper in these ores precedes that of the more precious metals, and it is readily precipitated from the solution and melted and refined for use as a precipitant of the gold and silver; but as its production in such cases is only a collateral or secondary matter, no safe estimates of the cost of the operation can be made.

Nevertheless, chlorination is to our mind the process which is destined to give proper value to our mines of sulphurets. We have given much thought to the matter, and have informed ourselves of the various ways practiced or proposed for effecting the chlorination and recovering the metal. The roasting with salt in reverberatory furnaces; the plain roasting and subsequent treatment with chlorine gas; the oxidation, in a powdered condition, in a downward column of flame and instant plunging in a bath of alkaline chlorides; the proposed chlorination by dropping the powdered ore and salt together, through a heated upright furnace, on a dry hearth—these and other plans have received our attention; and while some crudities, some lack of completeness may be found in each of them, we are satisfied that patience and intelligence would soon discover and remedy them in most instances.

We do not hesitate, therefore, to advocate the principle of chlorination, nor to recommend its thorough investigation to owners of copper mines, nor to state that the greatest economy, the closest working, seems to lie in the direction of the preliminary pulverization of the ores.

Whether the metal shall be precipitated with iron or lime or other matter having stronger affinity than copper for chlorine will depend upon the character of the solution.

Testing the "Captive" Balloon.

THE commission appointed by the French Government to test the rope used by M. Giffard in the construction of his captive balloon have made their experiments. The rope is conical, the heaviest end being uppermost, so that if any breakage should take place it will not be very near to the car, but close to the earth. The resistance of the smaller end has been found equal to a tension of 24,000 kilos. exerted by hydraulic pressure, and is smaller than anticipated. It had been suggested by Mr. Newall to employ a wire rope of his own make, which would have had a much greater resistance with a smaller weight; but the suggestion was lost, M. Giffard fearing some electric discharge might ignite the gas.

The commission has given its authorization to admit the public, but under the condition that the pressure should be limited to a quarter of the breaking strain—8,000 kilos. The ascending power is generally about 12,000 lbs. The difference left to bear the pressure of the wind will be about 5,000 lbs. for a balloon whose surface is 4 x 1,170 square yards. The breaking of the rope answers to a resistance of 50,000 lbs., or about 10 lbs. per square foot of a plane; it can bear very high wind, and need fear only a tempest. Some observations have already been made by M. Tissandier, but in a somewhat rough manner. An anemometer will be constructed in the car, and its readings will be compared with the readings at the steelyard, to which the rope is attached.

AT the close of the year 1877 there were 716 blast furnaces in the United States which were either blowing or in a condition to blow. Of these, 270 were in blast, and 446 out. On the 1st of July, 1878, six months later, of 708 furnaces reporting, 248 were in blast, and 460 were idle. Of the idle furnaces, 202 were charcoal, 130 anthracite, and 128 bituminous; of those blowing, 64 were charcoal, 95 anthracite, and 89 bituminous.