THE OPIUM INDUSTRY.

It is doubtful whether there is a more valuable remedy than opium in the materia medica. Contrary to the usual belief of the layman, opium and its chief constituent derivatives, codeine, morphine, apomorphine, and heroin, are not used for anæsthetic purposes alone; opium possesses medicinal properties which are of inestimable value in many diseases. It is almost trite to cite opium as an example of how abuse can convert a valuable and beneficial agent into a destructive power of the most degrading nature. This is undoubtedly truer of opium in the case of the Western races than in that of the Oriental ones; and it is claimed that the smoking of the drug, as practised moderately by the Chinese in comfortable circumstances, has not materially affected them, especially in respect to longevity; but the immoderate use of opium is most destructive even to the Chinese or Malays of the poorer classes, who are not constitutionally so well able to resist the terrible inroads of the drug upon the system and the mind.

In the very oldest records of the Arabs we find mention of the poppy, and proof that the use of the juice of the plant is one of the most ancient of practices. At first opium was undoubtedly used as a medicine alone. Theophrastus was familiar with it, and Dioscorides, as early as 77 A. D., wrote a learned paper on its properties and uses. Up to the twelfth century, Asia Minor was the source of supply, and from then on it was gradually distributed over the globe. The Chinese first obtained the drug in the thirteenth century, using it merely as a medicine; but gradually its insidious effects were realized, and it became so important a drug in a commercial sense, that in 1757 the great monopoly was secured in India by the East India Company. The business rapidly increased from 1,000 chests in 1776 to nearly 5,000 in 1790. At this time the Emperor Kea King fully realized the effect the drug was having upon his people, and in 1786 its importation was forbidden. Chinese caught smoking were flogged and otherwise severely punished; but this did not have the desired effect, and thereafter those who were detected using it were transported or beheaded. Even this did not affect the sale, and in 1825 the importation of opium into China had increased to nearly 17,000 chests. In 1839 the Chinese government made a desperate effort to drive off the English opium sellers by ordering away the British opium ships. The order not being complied with, nearly 30,000 chests of opium were destroyed, entailing a loss of $10,000,000. This act led to the war, and the final Treaty of Nankin in 1842.

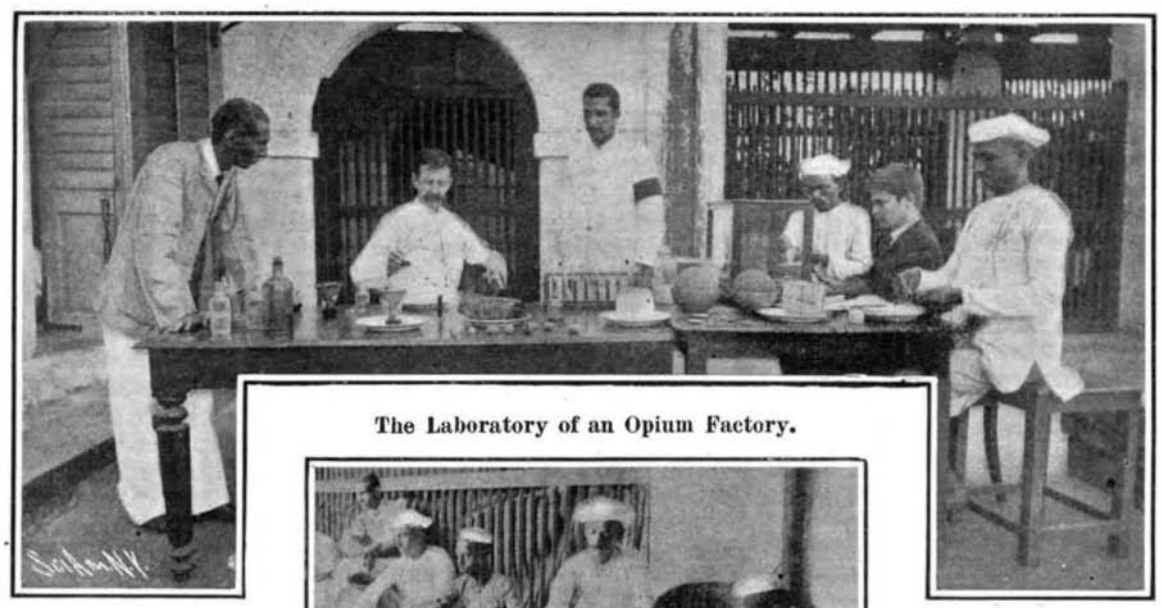
Some idea of the importance of the trade and the amount used can be seen from the fact that in Macedonia the crop is estimated at 140,000 pounds yearly; in Bengal, where it is a government monopoly, the output is equal to nearly 100,000 chests, valued at some $60,000,000; Persia produces about 10,000 chests, and Egypt about $10,000 worth annually, while it is said that Mozambique has 60,000 acres under cultivation for this purpose. Opium has been raised in Virginia, Tennessee, and California, as well as parts of Central Europe; but owing to the lack of cheap labor and the uncertainty of the crop because of frosts, the opium industry in these regions has never assumed profitable proportions.

Opium is fundamentally the dried juice of the unripe capsules of the *Papaver somniferum*, often known as the common poppy and less generally as the white poppy, though the latter appellation is really appropriate to one of its varieties alone. All varieties of the poppy are capable of producing opium, though the quantity and quality of that from certain kinds is very much inferior to that from others, particularly the variety mentioned above. The plant was discovered probably by the Arabs, and carried from Arabia over large portions of the globe. It is now found throughout the south and middle of Europe, in Great Britain, and the United States, principally as a garden plant. In India its cultivation for opium is carried on in various parts of the country, as much as a million acres being under cultivation for this purpose. But the chief opium district is a large tract on the Ganges in Bengal, and the accompanying illustrations are of various phases of the industry as carried on in an opium factory in Patna. For the profitable cultivation a rich soil is requisite, and in India the fields are usually located in the neighborhood of villages, where manure can be easily obtained. The soil should be fine and loose when the seed is sown, and the subsequent cultivation consists chiefly in thinning and weeding. In certain localities irrigation is practised. Mild, moist weather with night dews is considered most favorable by the native growers during the time of the collection of the opium. Very dry weather has been found to diminish the juice, and heavy rain is injurious. In India the seed is sown in the beginning of November; the plant flowers late in January or early in February, and within three or four weeks after this the poppy heads are approximately the size of hen's eggs and are ready for the manufacturer. Prior to this, however, the fallen petals of the flowers are carefully gathered and sorted according to condition in three grades. They are then heated over a slow fire, and formed into thin cakes to be used for covering the drug in later stages of its preparation.

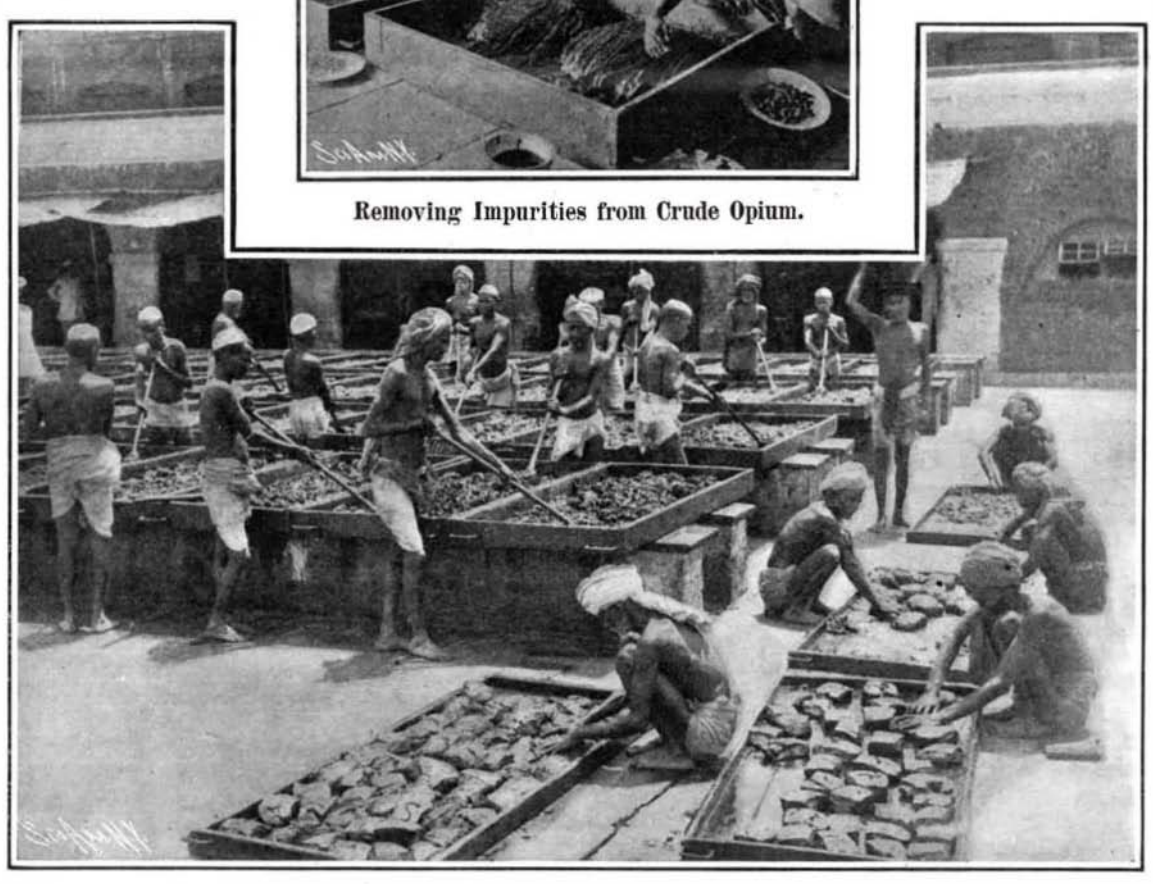
The poppy grower now begins to collect his harvest, and the first step in the operation is the making of a number of perpendicular wounds in each poppy head, care being taken not to penetrate the cavity, by means of a small four or five pronged iron instrument called a *nushtur*. The incising is always performed in the afternoon, and early on the following morning the milky juice which has exuded from the cuts is gathered by scraping it off with a small trowel-like scoop, called a *sittooha*. The gatherer places the juice in an earthen vessel, called a *kurrace*, and lets it stand, stirring it occasionally for a period of several weeks, until the collector for the opium factory visits his village, and the opium is weighed, graded, and purchased.

The compound of the opium factory contains many hundred earthen jars of crude opium, which has been freed by hand of larger impurities, each jar containing one maund or nearly 82 pounds, and all separated into lots of a hundred jars. After a rigorous examination by the superintendent, the jars are carried by native workers to a large room containing a number of stone cisterns or vats with walls raised about five feet above the floor, and with narrow passages between every three or four vats. The vats each hold 2,100 maunds, or over 150,000 pounds of opium. Into these vats the jars are emptied. The vats are filled to the brim with the soft, mahogany-colored substance, which here and there hardens to a glistening crust. The jars are scraped out by hand, and when broken the shards are carefully washed and cleaned, so that no speck of the valuable substance shall be wasted. The workers enter the vats, and so that they shall not sink into the opium as into so much quicksand, they stand upon planks which serve as rafts, and then scoop up brass basins full of the substance and hand these to women carriers, who take them to the official weigher. After being weighed, the opium is thoroughly mixed in shallow vats by coolies, who use rake-like implements for the purpose. After this it is trampled by the feet of others, who walk around and around in the vats. Curiously enough, no ill effects have ever been noticed in these coolies, who sometimes walk for periods of four or five hours in the opium.

After being mixed thoroughly in this manner, the opium is allowed to stand for some time, and is then weighed into tin vessels and carried to the caking room, where it is packed for the Chinese trade. Here the weighers sit in iron cages, weighing out opium in just the right amounts to the packer's assistants, who carry the pats of opium on platters to the men who do the actual packing. Each packer sits at a bench with a brass cup on a tray before him. Near this is a pat of opium on the platter, a small cup of liquid opium or lewa, and a pile of the pancake-like poppy-leaf wrappers, as well as a tin box full of tickets with his number printed thereon. The assistant kneels before him, holding a wrapper which the packer takes, tears to a convenient size and deftly arranges in the cup, smearing it over with the liquid opium. Leaves are added bit by bit, until a bed of the requisite thickness has been formed. The opium is then placed in the cup, the edge of the leaf drawn up, and in a few moments it has all been arranged into a nearly perfect and evenly-covered sphere. The sphere is, of course, still soft and pulpy, and is called a cake. The cake is handed to the assistant, who takes it to the examiner. When the latter has passed it, it is covered or dusted with a sort of bran of dried poppy leaves, and is then fitted in an earthen cup and placed in the storeroom to mature for some six months. At the end of this period, the cakes are packed in wooden chests, and



The Laboratory of an Opium Factory.



Removing Impurities from Crude Opium.

Manufacturing Excise Opium.

THE OPIUM INDUSTRY.

sent to Calcutta for sale. The opium used in India itself is differently prepared, being first dried in the sun till it reaches a certain degree of hardness, and then pressed into large square blocks closely resembling cakes of brown transparent soap.

Santos Dumont's New Aeroplane.

Santos Dumont is now engaged in constructing a new aeroplane which will be built on the same general lines as the one with which he made his first flights at Paris and which we have already had occasion to speak of several times. The new aeroplane has the double wing form, which gave the first flyer the name of "bird of prey," and the spread of the wings from tip to tip is about the same as in the former one, this being 36.5 feet very nearly, instead of 39.8 feet as before. As before, the wings will be made up of canvas-covered cells resembling box-kite cells, covered with canvas, and the wings will be placed at an angle largely opened at the top. However, there is some difference this time in the material which is used for the wings. In order to make them more solid they are built, at least for the upper and lower bearing surface, of a thin mahogany board which the aeronaut considers will be an improvement. This time the wings are quite narrow, and measure only 60 centimeters in width. In the former aeroplane the width was 2.60 meters (9 feet). As regards the total carrying surface of the aeroplane, this is considerably smaller, and does not exceed 13 square meters (15.55 square yards). In spite of the use of heavier material for the construction it is found that on account of the diminution of the surface and also owing to the suppression of one of the rolling wheels placed under the aeroplane, the total weight of the flier is now lowered to about 30 kilogrammes (66 pounds). A new idea is that of driving the flyer in the opposite direction from the first one, and now the head will become the tail, and the propeller is to take the aeroplane forward instead of driving it from the rear as before. During the first trial it is intended to mount the 50 horse-power Levavasseur motor which formed part of the first flyer, and which we have already illustrated. After testing it with this power, Santos Dumont will then use the 100 horse-power motor of the same make which he had built recently. Like the former, it is constructed of aluminium very largely. A novelty in the flyer is the use of only one wheel to be mounted underneath the central framework. This is a small bicycle wheel with a rubber tire, and when upon the ground the pilot will sit so that he can touch the ground with his feet. The middle framework, of wood strips, is even shorter than before, with just enough room for the motor and the aeronaut's saddle. Santos Dumont considers that he will need a speed of 80 kilometers (50 miles) an hour so as to make the flyer sail up from the ground. This he may be able to reach even with the 50-horse-power motor, and with the 100 horse-power he expects to be in good condition for sailing. As there is not enough room around the present shed in the suburbs of Paris, he is constructing a new shed at St. Cyr, not far from Versailles, on a large tract of ground. The surrounding country is level and gives a good field for further experiments.

Scraping the Broken Jars.

War Balloons for the United States Army.

As the readers of the SCIENTIFIC AMERICAN are aware, certain of the European governments for years past have taken a very active interest in aeronautics for military purposes, and this science has been developed to a very great extent by the various armies of the Continental countries. Although our government has been slow to take the same interest in aerial navigation, the value of the balloon in war has finally been recognized, and the War Department has established an aeronautic corps as a regular branch of the army. The successful experiments made with war balloons, particularly in France and Germany, have prompted the government to conduct a series of tests at Fort Omaha, in Nebraska, where the aeronautic corps is to be stationed. The latter will be under the direction of Gen. James S. Allen, commander in chief of the Signal Corps.

It is the intention of the government to establish a complete aerial station at Fort Omaha for experimental purposes, and for the thorough training of the officers and men of the aeronautic division. A hydrogen-gas supply tank with the necessary accessories has already been constructed, and with the completion of the three large balloons ordered from the aeronaut Leo Stevens, the corps will be ready to begin its work.

The balloons are of the ordinary type, nearly spherical in form, and are not intended to be dirigible, as are the cigar-shaped balloons lately introduced by the French government, in accordance with the well-known forms favored by so many aeronautical investigators. The United States army balloons are simply large gas bags provided with the usual baskets, and are free to soar with the prevailing winds. Hitherto the only balloons experimented with by the War Department have been captive ones, useful merely to study the position of an enemy. While the present balloons are intended chiefly for signal work, they may also be made capable of carrying bombs to drop upon the opposing lines.

Manufacturing Lewa.

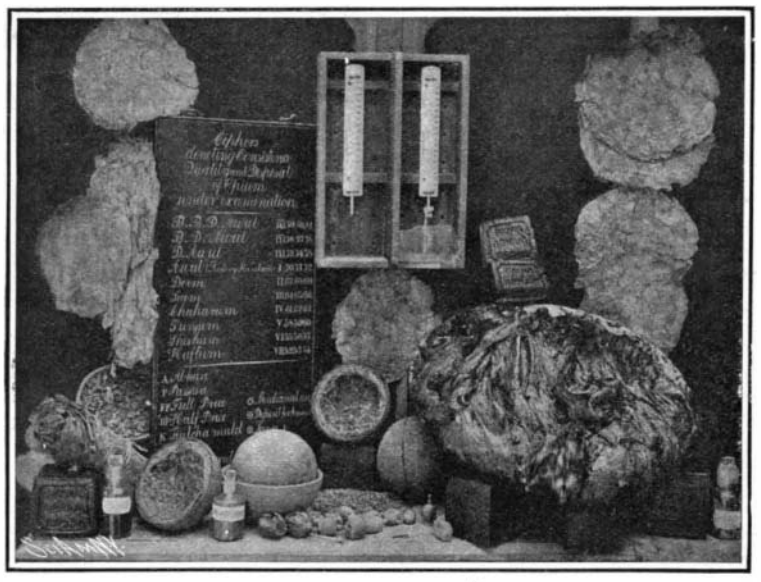
A New Arc Lamp.

A new arc lamp is brought out in Germany by the engineer Tito Carbone. It is provided with a magnetic device for blowing the arc, and this is said to give a great increase in the lighting power as well as to improve the quality of the light, and the latter resembles sunlight in color. The great lighting power of the lamp is caused by the special form which is given to the electromagnet which blows the arc. Owing to this form the arc is made to take a hemispherical shape and it is kept in this position, which assures a regular wear of the carbons. The length of the arc requires a high tension and for direct current 85 volts is needed, and 75 volts for alternating current. The Carbone lamp, with 16-inch carbons, will burn for 14 to 16 hours in spite of the small diameter of the carbons. For direct current it uses 7 to 9 millimeter carbons. About 10 amperes current is needed. Prof. Wedding, of Berlin, estimates the luminous intensity in the vertical direction and near the bottom to be 4,000 candle power, using a current of 10 amperes and 110 volts, this with a clear glass globe. Owing to the oblique position of the carbons, the arc and the crater can project almost all the light downward, which is an advantage. An automatic regulation of the arc is given by an electromagnetic device.

Weighing Opium.

The imambra connected with the Mohammedan mosque at Lucknow, India, says Valve World, contains the largest room in the world without columns, being 162 feet long, 54 feet wide, and 53 feet high. It was built during the great famine in 1784 to supply work for a starving people. It is a solid mass of concrete of simple form and still simpler construction. In its erection a mold or framework of timber and brick several feet in thickness was first made, which was then filled with concrete. The concrete was allowed about a year to set and dry, when the mold was removed. Although the building has been standing 122 years, it is said to show no signs of decay or deterioration.

Examining Opium.



Specimens of Crude and Manufactured Opium.

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