

AMERICAN JOURNAL OF PHARMACY  
Volume 67, #10, October, 1895

Botanical Medicine Monographs and Sundry

**REPORT ON TANNIN FROM AN EXUDATION OF  
*PTEROCARPUS DRACO*, LINNE, AND KNOWN IN  
JAMAICA AS DRAGON'S BLOOD.**

BY HENRY TRIMBLE.

The origin of this product was described in the Bulletin of the Botanical Department, Jamaica, No. 45, July, 1893. As there stated the tree is about thirty feet high, and when an incision is made in the bark, drops of red sap ooze out, which flow slowly down the bark and gradually harden.

The sample received by me from Mr. Fawcett was in small garnet-red pieces, transparent at the edges, and breaking with a resinous fracture. It much resembled the eucalyptus kino received from Australia.

On account of its solubility in water the product closely resembled some other varieties of kino, as well as the one just mentioned from Australia.

Warm water dissolved 95.95 per cent. of it; the insoluble portion, 4.05 per cent., consisted chiefly of adhering bark fibre.

The ash amounted to 2.36 per cent., and was found to consist of potassium, calcium, magnesium, and sulphuric, carbonic and phosphoric acids. There were found 34.85 per cent. of tannin and 25.40 per cent. of moisture, which would indicate 46.71 per cent. of tannin in the absolutely dry substance. The balance consisted chiefly of gum. A complete statement, therefore, might be made as follows :

	Per Cent.
Tannin . . . . .	34.85
Moisture . . . . .	25.40
Ash . . . . .	2.36
Insoluble . . . . .	4.05
Gum, etc. . . . .	33.34
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	100.00

The tannin was separated from the gum with great difficulty, because of the ready solubility of each in water, and because the tannin caused some of the gum to go into solution in absolute alcohol, and also in a mixture of alcohol and ether. Agitation of the water solution with acetic ether, even in the presence of salt, did not serve to separate the tannin from the gum, as the latter substance seemed to withhold the former. The close association of the two principles was finally broken up to some extent by agitation of the coarsely powdered sample with sand and acetone. Upon allowing the mixture to rest, the gum separated as a jelly-like mass. The acetone solution when separated, and the solvent recovered by distillation, left the tannin in a porous condition, but still admixed with some gum. From this residue the greater part of the still adhering gum was separated by treatment with absolute alcohol. The solution was filtered from the gum left undissolved by that solvent and distilled to dryness, and the residue rendered porous by solution in a mixture of alcohol and ether and subsequent rapid vaporization of those solvents by distillation under reduced pressure.

The ultimate composition of the pure tannin will be seen by the following average of three analyses :

	Per Cent.
Carbon . . . . .	58.91
Hydrogen . . . . .	4.80
Oxygen . . . . .	36.29
	<hr style="width: 10%; margin: 0 auto;"/>
	100.00

An aqueous solution of the tannin gave the following reactions:

- Lime water . . . . . Purplish-pink color, becoming a brownish ppt.
- Bromine water . . . . . Yellow ppt.
- Ferric chloride . . . . . Green ppt. and color.

The composition, as well as the reactions, indicate it to be very closely related to oak bark tannin, if not identical with it. The sample does not agree in composition or properties with the dragon's blood from the East Indies; it does, however, closely resemble the kinos, and should more properly be classed with them.

It will, no doubt, if found in sufficient quantity, have some use in medicine as a kino, and it might be used, in case its price should warrant it, in the manufacture of leather, although such substances containing gum usually make a soft product.

## SIAM GAMBOGE.<sup>1</sup>

The tree yielding Siam gamboge (*Garcinia Hanburii*, Hook. f.) is closely related to *G. Morella*, Desrouss., of Ceylon and Southern India. The former is a moderately large tree. The flowers are dioecious, the petals in both male and female flowers are fleshy and yellow. The fruit is the size of a crab-apple, yellowish green when ripe. The tree is found on islands on the east coast of the Gulf of Siam, as well as on the mainland of Cambodia and Cochin China. It is from these localities that practically the whole of the gamboge of commerce is obtained.

Gamboge is a gum resin yielded by the bark of the two species above mentioned. It is a powerful cathartic medicine, but its principal use is as a pigment in water-color painting. It is also used to give color to lacquer varnish for brasswork, etc. The most recent account of Siam gamboge is contained in a report on the trade of Siam for the year 1893, published by the Foreign Office (Annual Reports, 1895, No. 1,520). Mr. de Bunsen, Her Majesty's Charge-d'Affaires at Bangkok, was good enough to communicate to Kew specimens of the leaves of the gamboge trees, collected on the spot by Mr. Beckett, and, although the material is not quite complete, there is little doubt they belong to *Garcinia Hanburii*, Hook. f. The extract from the report is as follows:

"Gamboge is, next to gum benjamin, perhaps, the most interesting of Siamese products. Whilst gum benjamin is peculiar to a small belt of land in the north, gamboge is a resinous product, indigenous only in the islands and the seacoast of the Gulf of Siam lying between the tenth and twelfth degrees of north latitude.<sup>2</sup> I recently had the opportunity of paying a visit to this part of Siam, and it may be of interest to describe the character of the tree and the mode of extracting the resin. The tree is known locally as ('Ton Rong.' It is found only in the islands of Koh Chang, Koh Kong and Koh Rong, and the mainland of the Indo-Chinese peninsula opposite these islands. The trees grow to the height of some fifty feet, and are straight stemmed with no lower branches, owing probably to the dense shade of the forests in which they grow. None of those I saw had a diameter of more than 12 inches. Ten years' growth is said to be required before the tree is ready for tapping. This is carried on by the Cambodian and Siamese islanders in the rainy months, from June to October, when the sap is vigorous, by cutting a

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<sup>1</sup> Kew Bulletin, June and July, 1895

<sup>2</sup> The heavy rainfall of this coast seems necessary to the existence of the tree.

spiral line round the trunk from a height of some 10 feet downwards to the ground. Down these grooves the resin wells out of the bark and trickles in a viscous stream into hollow bamboos placed at the base of the tree, and from these it is decanted into smaller bamboos, where it is left for about one month to solidify. To remove the gamboge, the bamboo is placed over a red-hot fire, and the bamboo husk cracking off, there is left an article known as 'pipe' gamboge. The trees can be tapped two or three times during one season, and at the end of the season their trunks present a curious network of intercepting spirals.

Care must be taken to prevent the rain-water mixing with the resin in the grooves, as any mixture of water causes honey-combing and black discoloration, and a consequent depreciation of from 20 to 30 ticals (2*l.*) per picul in value.

The most valuable gamboge is that which is the least honeycombed or discolored, and is all the more difficult to obtain, considering the period of heavy rains during which the resin is extracted.

The bamboos contain on an average rather less than 1 lb. of gamboge, or about 170 bamboos to the picul. The price asked by the pickers themselves is at the rate of 2 ticals (3*s.*) for five bamboos full, and the local price is at the rate of 2 ticals (3*s.*) for three, or 65 ticals (4*l.* 18*s.*) per hundred, or about 8*l.* 7*s.* per picul.

The whole output is sold to local Chinese traders and taken by sailing boat to Bangkok.

### **SIAM BENZOIN.<sup>3</sup>**

Benzoin is also known in English commerce as Gum Benjamin. It is a gum resin obtained by incision in the bark of trees in Sumatra and Siam. Benzoin is used as a stimulant and expectorant in chronic bronchitis. It is also one of the principal ingredients in Friar's Balsam, and is largely used for incense. Sumatra benzoin is yielded by *Styrax Benzoin*, Dry., a well-known tree. Plants of this species are under cultivation at Kew, and many have lately been distributed to botanical establishments in the tropics of the New World. Of the tree yielding Siam benzoin we know very little. As long ago as 1865 Sir R. H.

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<sup>3</sup> Kew Bulletin, June and July, 1895.

Schomburgk, then British Consul at Bangkok, was asked to investigate the subject, but although able to give, at second hand, a very interesting account of the mode of collecting the resin, he was unable to obtain botanical specimens of the tree yielding it. Of late years renewed efforts have been made to solve the problem.

Captain Hicks, of Bangkok, was successful in obtaining a few small plants of "gum benjamin from the Northern Laos States" in 1882. The survivors of these were presented to the Botanic Gardens at Singapore by Mr. Jamie. A fuller account of Captain Hicks' efforts is given by Mr. E. M. Holmes, F.L.S., in the *Pharmaceutical Journal*, XIV, 3, P. 355. The locality from which the plants were obtained was given as "Suang Rabang." This we now know is a misprint for Luang Prabang, a district in the extreme northeast of the Shan States of Siam, bordering on Tran Ninh, in the French territory of Anam. In the hope that the Siam benzoin tree might possibly extend to the Shan States of Burma, an application was addressed by Kew to the India Office in 1889, and as a result a careful inquiry was made by the Government of India, in Tenna-serim, Upper Burma, and the adjoining Shan States. In 1890 it was reported that "the efforts made to trace the existence of the plant in these localities have been unsuccessful."

Apparently, the first authentic information respecting the district in which the tree is to be found is contained in a recent report by Mr. Beckett, forwarded to the foreign office by Mr. de Bunsen on the Trade of Siam for 1893 (Foreign Office, Annual Series, 1895, No. 1520). The following extract shows that Siam benzoin is obtained from an extremely circumscribed locality on the east bank of the river Mekong, in territory now occupied by the French. It is feared that the trade in this article will be ultimately diverted to Tonquin, which is nearer to the source of supply than Bangkok.

"Of gum benjamin, 319 piculs, or nearly 20 tons, figure in the export list, valued at 21,005 dollars, or 2,713*l*. This valuable resin is also a product of the east bank of the Mekong, and is interesting as being confined to a narrow zone of forest-clad hill country to the east of Luang Prabang, lying between 19th and 21st degrees of north latitude and longitude east 102 to 105. Some three-fifths finds its way to Bangkok by way of Nan, and the remainder by way of Nongkhai and Korat. The French occupation of Luang Prabang does not seem as yet to have caused any perceptible effect on the Bangkok export of gum benjamin

beyond enhancing local prices, but with the completion of new roads, already initiated by the French with a view to speedier communication between Luring Prabang and Tonquin, Bangkok exporters, who are chiefly British, have well-founded fears lest the gum benjamin trade be diverted entirely from Bangkok to Hanoi. The whole of the Bangkok export goes to the London market and thence to France and Belgium, to be manipulated into balsam. A small quantity is used locally for frankincense.

"Prices during 1890 were bad, first-class gum benjamin fetching 125 ticals per picul (or about 165*l* per ton); 45 ticals per picul (about 40*l* per ton). The good quality known to buyers as 'bold, blocky, almondy,' was scarce."<sup>4</sup>

As the result of independent inquiry made at the instance of Kew by the India Office, the following further information has been received. This was obtained through the Siamese Minister of the Interior at Bangkok. It affords, therefore, an account of Siam benzoin from the purely native point of view. All the accounts agree in ascribing the region of the benzoin trees to the left bank of the Mekong River, in what is now French territory. This is a tract of upland country east and northeast of the important town of Luang Prabang:

INDIA OFFICE TO ROYAL GARDENS, KEW.

INDIA OFFICE, WHITEHALL, LONDON, S. W.

July 30, 1895.

SIR :—In continuance of previous correspondence, I am directed by the Secretary of State for India to forward herewith for your , information a copy of a letter, and its enclosure, regarding the tree producing Siam benzoin. It is suggested that the memorandum on the Siam benzoin may be found suitable for publication in the Kew Bulletin. I am, etc.,

(Signed) A. N. WOLLASTON. The Director, Assistant Secretary, Royal Gardens, Kew. Revenue and Statistics Department.

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<sup>4</sup> The remainder of this article is taken from a continuation in the Kew Bulletin for August.

No. 606.—2 F.—7, dated Rangoon, May 30, 1895.

From the Revenue Secretary to the Chief Commissioner of Burma.

To the Secretary to the Government of India, Revenue and Agricultural Department.

With reference to the correspondence concerning the steps taken with the view of identifying the plant or tree which produces the resin known as "Siam benzoin," I am directed to submit, for the information of the Government of India, a copy of a memorandum regarding the tree that produces this resin, and on the gum benjamin industry in Siam, prepared in Bangkok under the orders of the Siamese Minister of the Interior, and forwarded to the Chief Commissioner by Mr. J. G. Scott, in April, 1894. \* \* \*

Mr. Scott stated that the area in which the gum benjamin trees were found was said to be all on the left bank of the Mekong, and, therefore, in what is now French territory. \* \* \*

Mr. Scott further remarked: "The great Siam benzoin tract is Hna Pan Htang, Ha Htang Hôk, the upland country east and northeast of Luang Prabang. \* \* \*

#### MEMORANDUM REGARDING THE TREE THAT PRODUCES RESIN, AND ON THE GUM BENJAMIN INDUSTRY IN SIAM.

The gum benjamin tree is large and tall, and has a heart similar to that of the "teng rang" (a species of *Shorea*) and "phayom" (a kind of mahogany). In its general character, and in the form of its leaves, it resembles the "takieu" tree (a forest tree of hard wood, used for making dug-out boats). The gum benjamin tree is propagated from the original fruit. This, when fallen and lying upon the ground, takes root and sprouts after the fashion of the "phayom" and "gang" trees. As regards the trunk of the gum benjamin tree, there is no one who uses it. Gum benjamin trees are generally found on elevated ground and do not like the plains country. They grow in isolated patches, like the forests of "teng-rang" and teak. A forest patch of gum benjamin usually contains from fifty to sixty trees and upwards, and the tree is found generally in large numbers along the high hills in the extensive forest region of Slua Phan, Tangslok, and the borders of Müang Theng in the province of

Luang Prabang. It is rarely met with in other countries, except those outside the provinces immediately contiguous to Siam. The Siamese Thai, Annamites and Tongsoos, who have settled in the above-mentioned provinces, have worked out and traded in the gum benjamin from an early period for successive generations, and these are scattered amongst the ..neighboring people, as well as being frequently found in Siam also. The season for working the gum benjamin is from the eighth or ninth months (July and August) to the tenth and twelfth months (September and November), when the season ends. Thenceforward is the period during which the gum benjamin is bought and sold. The gum benjamin is worked after the following methods : So many trees are notched, so as to form a girdle around the stem. An interval of three months is allowed to elapse between the period of notching and that of picking the gum benjamin dammar, which wells out of the trunk and collects in the notches. By means of a sharpened stick or the point of a knife this is picked out, bark and all, and gathered at once in baskets. It is then sorted and divided into different classes, according to choice. Picking cannot commence before the interval of three months has elapsed, as the dammar that has trickled out into the notches would not have had time to harden. It would still be soft and sticky, and if picked at the time would become dirty, owing to the bark coming off with it; nor would it be of such value either, as, being sticky, it would cling to other things and the full benefit would not be derived, such as would be the case if it were properly dry. For this reason the gum benjamin must be left for three months after the notching, in order that all the gum possible may well out, and it may become dry and hard. Among the people above-mentioned the picking and sale of gum benjamin is generally considered as one way of obtaining a livelihood, for the gum has a value and is reckoned as a marketable commodity. And even if the people have no other occupation than selling gum benjamin, that by itself is sufficient as a means of livelihood. The period during which the gum benjamin is sold is not necessarily confined to the eighth or ninth months. The reason for selecting that season is because the people of those parts have many other things to do; for instance, they have to plow the fields and reap their rice harvest. In the eighth and ninth months their work on the paddy fields is finished, and they can therefore turn their attention to gum benjamin. For this reason there is a special season. Their paddy fields are their first care, and then the gum benjamin trade. Those who have no business with plowing paddy fields and planting rice can, if they wish, work continuously at gum benjamin, at all seasons and during every month of the year. The gum



benjamin trade requires no very great outlay of capital. All the implements required are one large axe, a rice basket and an open woven basket. If a person wishes to work alone, without servants to assist him, he can do so; for in the first stages there is nothing much that requires to be lifted or carried. The only labor necessary would be when the gum benjamin is being picked and placed in baskets, and has to be carried to the temporary or permanent home of the picker. The profits gained on any one particular occasion or another can hardly be gauged accurately. Those who work out much sell at a large profit; those who work out little sell at smaller profit. One catty (133 1/3 pounds) and upwards would be considered a large output. Picked gum benjamin is sorted into three classes. The best class, and that which fetches a high price, is called "slua," and is that which is sold in large lumps, and is not dirtied by the presence of bark. The second class is that left over from the first class, and is in somewhat smaller lumps than the latter, and has some, but not much, bark attached to it. This is inferior in quality to Class I, and is half the value. That is to say, if Class I is sold at 75 ticals, Class II would sell at 37 1/2 ticals. The third class is that left over from Class II. This class has bark attached to it, is soiled with dust and dirt, and is in small, fine pieces. It is called "mun," and is half the value of Class II. The price of gum benjamin, as sold in the jungle districts where the gum is worked, is as follows: Class I, one Chinese catty (66 2/3 pounds), 100 or about 75 ticals. Class II, half the price of Class I. Class III, half the price of Class II. The price in Bangkok is: Class I, one Chinese catty, 260 ticals, as it has always been.

The gum benjamin trees that grow in the jungle districts referred to are not the subject of disputed ownership by one person more than another. Any one who wishes to work gum benjamin has merely to go into the jungle, search for and notch as many trees as he pleases, like people, for example, who go into the jungle to cut posts for their houses. Nor is there any tax or other emolument accruing to the country from either the trunk or the gum of the gum benjamin tree; nor is the gum benjamin trade one in the prosecution of which much thieving or fighting arises, whether it is because there are many people together at a time, or because, being in the jungle where there are fierce tigers, one man cannot steal along alone by himself, but is obliged to travel with parties, and so robbery and theft are rendered impossible, is uncertain. This gum is sweet-scented, and is much used in mixing either with medicines or scents of various kinds. For whichever of these purposes it is sold, it always fetches a high price, like other valuable commodities,

and for that reason gum benjamin is an article of commerce which merchants have bought and sold from time immemorial to the present day.

## **NOTES ON CURING CACAO.**

BY W. CRADWICK, Superintendent of Hope Gardens.

The following instructions to those who grow cacao on a small scale have been issued by the Department of Public Gardens and Plantations, Jamaica, and appeared in the *Bulletin* of that department for July, 1895 :

The first important point to be observed when about to cure cacao is that it must be quite ripe, but not over-ripe. The pods must have attained their full color, whatever it may be, but if the beans shake about easily then the pod is over-ripe. The reason is, that if the beans are not ripe, the mucilaginous matter covering the beans is not properly developed into the stage when it will readily ferment. If left to get over-ripe, the mucilage commences to liquify.

The best vessel in which a small cultivator can ferment cacao is an ordinary flour barrel. To prepare this for the reception of cacao beans, first bore about a dozen holes, each a half an inch in diameter, in the bottom of the barrel; then place about ten inches of banana trash in the bottom of the barrel. Line the sides also thickly with trash, and have a sufficient quantity on hand to cover the beans when placed in the barrel. When the barrel is ready,, break the whole of the pods and place the beans in the barrel, covering with the banana trash. The beans must be left to ferment for two days, then remove one-third of the beans, lay them in a heap on the floor, and mix them thoroughly. Remove the balance of the beans, and mix them also, but do not put the two heaps together. After placing fresh trash in the barrel, put the beans which were at the top back into the bottom of the barrel, and those which were at the bottom, place at the top. Cover with the trash in the same way as before, and leave for two more days, when the beans should be treated in exactly the same way as before. They should then be left for two more days, when they should be taken out and washed thoroughly.

On the day the beans are finally removed from the barrel the work should be commenced very early in the morning, so as to get all the sun possible on the first day, for the beans mildew very quickly. They should be washed immediately after they are taken out of the barrel, as this helps to keep them plump.

The proper amount of cacao to ferment in one barrel is the quantity of beans obtained from 1,000 ordinary sized pods. If many more than this number are put into one barrel the fermentation is too great, and the beans turn black.

If a less quantity, say, below 700 pods, is to be fermented, the green trash and more of it must be used, and a weight not exceeding 28 pounds placed on top, which helps the fermentation. During the time of drying the cacao it is not desirable to expose it after the first two days to the extreme heat of the midday sun; it is better to take it in about nine o'clock, and then put it out again between three and four o'clock. Those who use the evaporators are warned against an excessively high temperature.

Great care must be taken when removing the pods from the trees that they be cut off with a good, sharp knife, not pulled off. If pulled off, the little knob at the base of the stem of the pod is injured, and the tree will not bear from the same spot the following year. If the pods are cut off carefully, the tree goes on bearing from the same spot year after year.

## **THE FUTURE OF THE TURPENTINE INDUSTRY.**

In a communication to *Garden and Forest* of July 10, 1895, L. J. Vance gives his opinions of the "Future of the Long-leaf Pine Belt," and as this is intimately connected with the turpentine industry, we reproduce it as follows :

A few weeks ago, when I was in the pine district of the South, every evening the sky was illumined by a dull red glare, and in the daytime the horizon was obscured by a thin veil of smoky haze. The cause of this was the turpentine industry, which has now reached its busiest season.

Few people who have not been in what is called "the long-leaf pine belt" of the South can have any real idea of the extent of the damage done to

the country by the turpentine workers and by the lumbermen, both of whom conduct their business on what has been bluntly called "the robbing system." They have left immense areas of land robbed not only of its natural resources, but in a worse condition for clearing and culture than before their invasion. Such is, without doubt, the case of many square miles in the two Carolinas, in Georgia, in Alabama and in Louisiana.

The result is that the most bare and barren places in all the South are those that have been visited by the army of turpentine gatherers. Every Northern visitor familiar with well-ordered and cultivated farmlands and houses is struck by the great, tracts of Southern country on which there is no vegetation of any value. These wastes are deserted and uninhabited, except here and there by the negro's lonely cabin.

The loss from fires is enormous. The turpentine workers are so careless and indifferent as to allow fires to run through the tracts in which they have worked. The resin on the scarified surface of the trees burns like kerosene; a spark, a blaze, and all at once a disastrous conflagration is sweeping through the pine forests with great fury, destroying millions of feet of marketable timber, and leaving hundreds of acres a scene of awful ruin.

This is no highly-colored story, but a plain statement of what has been going on in the pine belt for years. Now and then protests have been raised against the reckless manner in which these forests are being destroyed, and yet very little has been done either by private or by public action to protect one of the greatest resources of the Southern States.

This is the more remarkable when we consider the enormous wealth represented by the long-leaf pine belt. There is a strip of pine forest about one hundred miles wide that begins in North Carolina and follows the Atlantic and Gulf Coast plain to Texas, crossing six States, and covering an area of about 130,000 square miles. At a rough estimate, there may be 50,000,000,000 feet standing in this area, and if we take the values of timber and turpentine, the annual product of the forests of the South will approach in value the product of her cotton fields.

The pineries of the South, now yield naval stores worth nearly \$10,000,000 a year. The total production amounts to 340,000 casks of

spirits of turpentine, and 1,490,000 barrels of resin. In order to produce this enormous yield, some 2,500,000 acres of pine forest are being worked, and nearly 1,000,000 acres of virgin forest are invaded annually. Now, no one will claim that these pineries are inexhaustible, for there has actually been a decline in the production of naval stores within the past eight or ten years. The reckless cutting and tapping of trees have made great inroads into the magnificent stretch of pine. Railroads have opened up many new tracts of timber, the old water-mills have been replaced by steam saw-mills, and, when the supply in the neighborhood was exhausted, tram-roads have been built or the steam mills taken to new territory. Thus, the work of consumption and denudation has been carried on to such an extent that fears are just now beginning to be entertained that these valuable forests will be sacrificed to the greed for immediate and temporary gain.

The truth is, the long-leaf pine belt is the backbone of the South Atlantic States. For 150 years it has been the chief resource of the people who dwell in the belt. The production of pitch and tar was begun in North Carolina during colonial days, and, as the State took the lead in the industry, its people were called "tar heels." There has been a heavy decline in the production of naval stores in North Carolina. This decline, amounting to fully 40 per cent., is due simply to the exhaustion of the pine forests. Of course, much has been written on the destructive agency of the turpentine industry, and many suggestions have been made regarding changes and improvements which are necessary. It is agreed that the turpentine industry, as carried on in the United States, results in great loss and damage, directly and indirectly. Compared with the way in which the French gather turpentine, our methods seem crude, wasteful and almost irrational.

The American turpentine workers still continue to follow the old-time methods of tapping the trees for their sap. They have made few changes, and have adopted few improvements. They cut a deep, broad "box" at the base of the tree, and then the surface above the box is laid bare. The trees are worked for four or five seasons, when they become practically exhausted of their sap. The forest is then abandoned to the elements, to the bark-beetles and pine-borers, and, finally, the splendid trees are blown, burned or cut down. The French turpentine worker cuts no deep box into the tree, but uses a pail, into which the resin or crude turpentine is conducted by a gutter. He makes only a small chip about three or four inches wide, and this is enlarged from time to time. After

five seasons' working, the trees are given a rest of several years, and so, by alternating periods of tapping and of rest, a tree can be profitably worked for fully fifty years. The French also take measures to regenerate their pine forests and to keep the trees strong and uniform.

If our turpentine workers understood the first principles of forestry they would modify their destructive methods. With more knowledge based on experience, the day will come when the Southern people will see that good husbandry consists in management, not destruction, of their forest resources; that some precautions and some protection are necessary against fire, as well as individual greed; that the present policy of the turpentine workers is lamentably wasteful and short-sighted; in other words, that it is more profitable to work the pine forests for fifty years, instead of five years; and, finally, that the lumber and turpentine industries, while changing the face of Nature, and even the climate of the country, are slowly, but surely, making loss and trouble for this and succeeding generations.