ularly true when weak solutions are used; and when the potency is greatly increased, the tenacity of the timber is impaired. In Germany 1.91 per cent is considered the proper strength for railway-sleepers. Several suggestions have been made to confine the zinc in the timber. Mr. W. Thelmany proposed to subject the timber to a subsequent bath of chloride of barium, with the view of producing an insoluble sulphate of baryta. It is doubtful, however, if the re-action would go on in the minute sap-ducts of the wood. Another process is that of Mr. Wellhouse, who also employs a double solution, the first being chloride of zinc to which a little glue is added, and the second a solution of tannin. It is claimed that the latter, upon coming in contact with the glue, forms small particles or films of artificial leather, which plug up the mouth of the sap ducts, and prevent the zinc being washed out. Certain experiments which have been made seem to confirm the idea. Another plan consists in using a solution of chloride of zinc and gypsum. The gypsum crystallizes and hardens inside the sap-ducts, and forms partitions to hold the zinc within the cells There are three burnettizing works in the United States; and the cost of the process is about five dollars per thousand feet board measure, or from twenty to twenty-five cents a sleeper.

Creosoting is so well understood that it scarcely needs description. It is in almost universal use for sleepers for English railways, and no other process has been commercially proved capable of resisting the *Teredo navalis* and *Limnoria tenebrans*. In England and Holland from ten to twelve pounds of creosote-oil per cubic foot of timber are found sufficient for harbor purposes; the French use nineteen pounds for the same purpose; and a similar quantity has been found necessary in the Gulf of Mexico, where the marine worms cut off an unprepared pile in eight months. The creosoting process needs to be well done to be effective, and for ordinary purposes from eight to twelve pounds are required per cubic foot of timber.

It was generally considered that the presence of heavy oils in the creosote was objectionable, and therefore engineers were accustomed to specify that not more than 10 per cent should be present. This view has been controverted by others, who take the view that it is only the heavy oil which can be relied upon to exert a continuous preservative action, the creosote itself being liable to become dissipated in course of time. This view receives confirmation by the good results of the preservative process introduced by Mr. Henry Aitken of Falkirk. This consists simply in soaking timber in melted naphthaline for a period varying from two to twelve hours, depending on the bulk of the piece. A temperature of 180° to 200° F. is all that is required for the process, and is most easily obtained by placing steam-pipes in the bottom of the tank which contains the material. Simple as the process is, that is not its chief merit. A more valuable feature is that it can be applied to green timber, thus doing away with the long and expensive process of seasoning. The naphthaline makes its way through the pores of the wood, decomposing the albuminoid compounds, and displacing both sap and water. It then becomes fixed, and the whole substance is permeated with solid antiseptic of a permanent character.

Aitken's process was introduced in 1882, and three years afterwards an account was given in *Engineering* (July 3, 1885) of certain trials that had been made to demonstrate its utility. Among these were mentioned the construction of some railway-wagons for the North British Railway. These were made from logs taken direct from the timber-pond and naphthalized. The logs were cut up and worked in the usual way; for, unlike creosoting, the Aitken process does not render timber more difficult to cut, neither does it interfere with painting or varnishing. The wagons have, up to the present, shown no signs of decay, and all the joints are tight. When taken apart, the tenons still show the chisel marks, demonstrating that they have not been working in the mortises. On the same railway there were placed sleepers and keys, and after seven years these are still perfectly fresh. One of these keys is in perfect condition, and does not appear to have been touched since it was first driven. Four years ago fencing-slabs of poor Swedish timber, some already beginning to decay, were naphthalized and put down, and to-day they are in as good a condition as ever.

In coal-pits equally good results have been obtained; and larch timbering, which usually becomes quite rotten in five years, has remained perfectly sound. White ants and the *Teredo* do not find naphthaline more palatable than creosote, for samples laid in the harbor of Colombo have been carefully avoided by both pests.

In England there are only two methods of preserving timber in general use; namely, careful seasoning and creosoting. The latter is only applicable to rough work, such as sleepers, fencing-posts, and the like; while the former is expensive, and is only moderately successful in the case of soft timber. It remains to be seen if the Aitken process will take rank with the others and obtain general acceptance. It is full of promise, and, if it fulfils only a part of what appears to have been proved for it experimentally, will be a valuable addition to the means of fighting the deteriorating influences of time and weather. For many purposes hard woods are employed simply on account of their great durability; the cheap, soft woods being, in other respects, equally well suited. If the soft woods can have their lives prolonged, a great saving can be effected in most cases. The sudden seasoning said to be effected by naphthaline, without sensibly hardening the wood or rendering it difficult to work, deserves to be carefully investigated, as it would liberate an immense amount of capital now lying idle, besides preventing the annoyance resulting from the use of half-seasoned timber. Every thing that offers to cheapen production is worth trying in these times of fierce international competition.

THE FORESTS OF ANNAM.

THE forests of Annam have recently, says the French *Moniteur Official des Commerce*, been explored by one of the officials of the Forests Department, who was instructed by the French Government to examine and report upon them, particularly with reference to their extent and the possibility of their practical utilization. The first information obtained upon the subject relates to the forests of Nghê-An, in the province of Vinh. These forests, says the *Journal of the Society of Arts* (London), quoting from the above-named periodical, are situated in the mountains and at some considerable distance from the coast, covering almost the whole of the district watered by the Song Ca River, commencing at Luong, and its principal tributary the Song-Cong. The lower vegetation covering the soil, and the almost impenetrable network of tropical climbers which reach up to the higher branches of the trees, render it extremely difficult to penetrate far into the heart of the forests.

The woods met with in the forests of Nghê-An are very varied and numerous; but the most important, and those in which considerable trade is carried on, are the *go-liem*, or iron wood, and the *govan-tam*. The other descriptions of wood, although often more valuable, are much rarer, and therefore less frequently met with on the various markets. The *go-liem*, or iron wood, is hard but brittle, of a brownish-red color, and would last a very long time were it not for the injuries inflicted upon it by white ants, which attack and speedily destroy it. In spite of this, it is eagerly sought after, and is of great utility, being employed in the construction of columns for pagodas and houses, piles for bridges and platforms, furniture, coffins, junks, etc. Its weight is about 1,100 kilograms the cubic metre. It takes a good polish, and hardens in course of time. It is brought to market in logs of from five to eight metres in length, and sometimes, but less frequently, from ten to twelve metres in length. The *go-liem* is largely exported. The *govan-tam* is a yellowish-white wood, with a very fine grain. It is easily worked, is very light, and polishes well. It is used for the common kind of furniture, mouldings, boxes, and ordinary coffins, the hulls of junks and sampans, oars, etc. Its most frequent use is in ship-building.

Beyond these two descriptions, which, from a commercial point of view, are the most important, there are a number of other woods little used by the Annamites, either on account of their scarcity, or because they are considered to be little capable of being worked up. They are, however, says M. Thomé, well deserving of some attention, by reason of the fact that Europeans might find a use for this excellent raw material which the Asiatic appear incapable of doing.

The principal of these woods are the following. The *sanglé* is a yellowish-brown wood, which gets darker with time. It is a rare and very dear wood, not decaying under water, very heavy, and susceptible of a good polish. It is frequently employed in the construction of the better class of junks, and is sold in the markets in logs sawn through the middle. This is done because the purchaser, paying a high price for this particular description of wood, insists upon seeing the condition of it throughout. This wood has no sap, and it frequently attains a height of 18 metres. The *yé* is a rose-colored wood, scented, and capable of a good polish. It is light, and is not attacked by ants. There are two varieties of this wood,—the *yé-baï*, or white; and the *ye van*, or yellow. The *ven* is a dark-yellow wood, becoming brown with age. It is light, and is fit for ordinary carpenters' work. The *gavï* is a yellowish-white wood, heavy, and with long fibres. It is sold in planks from 12 to 15 metres long, and is used for framework and in the construction of junks. The *tio* is a red, hard, and heavy wood, with a coarse grain; and the *tine* is a purple-colored wood, tender, and with very fine grain. The latter, says M. Thomé, might well be used for cabinet-making. The *goï* is a red colored wood, and the tree attains a height of from 10 to 13 metres. It is useful in carpenters' and cabinet-makers' work. The *bop* is a white wood, extremely light (very much resembling cork), polishes well, and would be useful to joiners. The *meucque* is a light, white wood, used for making *sabots* for the Annamites. The *goo* is a very fine, light, and well-veined wood, becoming black with age, scarce in Nghê-An, but abundant in Ha-tinh. It is used for inlaying work. The oak, thus named because it resembles the European oak, is a heavy wood of mahogany color, has a good polish, and is used in cabinet-work.

Among the other principal woods in which a considerable trade is carried on, may be mentioned the bamboo, rattans, *cunao*, *vang sao* (a parasite plant used in Chinese medicine, and very expensive), and cinnamon. From the clearings to the banks of the river, the logs and planks of wood are dragged by buffaloes. Rafts are then formed, which descend the stream from Nghê-An and Ha-tinh in all seasons except when the waters are exceptionally swollen. During the dry season the streams have always a sufficient amount of water to allow the rafts to go down to the sea. The province of Nghê is one of the richest in Annam from a forest point of view; and the Song-Ca and Song-Cong, streams which traverse the forest region, form excellent means of transport for articles so heavy and cumbersome as timber.

GEM-MINING IN SIAM.

THE region in which gems, including rubies and sapphires, have for the past ten years been found, lies situated on the western side of the Cambodian peninsula, about 240 miles south-east of Bangkok, and covers approximately an area of 100 square miles. The centre of that district is Chantabun, a seaport with a good harbor, connected with Bangkok by a line of three small steamers running at regular intervals. It is stated in a recent report to the foreign office that within three hours' walk from Bangkok, to the north-west, is Ban Kacha, where rubies of a very inferior kind are still sought after by the local inhabitants, both Siamese and Chinese. Tongsoos, or natives of Pegu, and Burmese, do not work there. Again, twelve hours distant from Chantabun are the mines of Müang Krung, with a mining population of about 100 in all, mostly Tongsoos, with a few native Siamese and Chinese. Two days' journey from Chantabun, in a southerly direction, is the district of Krat, with mines from which rubies are extracted, and but few sapphires. The Tongsoo workers there number about 3,000. On the eastern side of the hill range, and three days' journey due east from Chantabun, midway between that town and Battambong, are the Phailin mines, the most extensive and most frequented of all. Here there are between 4,000 and 5,000 gem-seekers. Rubies and sapphires are both found, the latter being more abundant. The rubies at these diggings, although more rarely met with, are said to be of higher value than those discovered at other places in Siam. A stream which rises in the hill ranges passes through the neighborhood of the mines on its way to the Thale Sap and the Cambodia River. All three of these localities—Krung, Krat, and Phailin—have been, or shortly will be, conceded on mining leases.

The method of obtaining the precious stones, as described in the *Journal of the Society of Arts*, London, is identical at all the diggings in the region of Bangkok, and is as follows: The intending digger, on entering the district, pays three ticals (5s. 3d) to the head man,—a Burmese British subject appointed by the British Legation, and responsible to the governors of Battambong and Chantabun, according as the fees received are derived from the Phailin or Krat mines. Beyond this tax there is no further fee exacted. The Siamese Government claim no right to pre-empt gems found, or to purchase at market value all stones above a certain carat weight, as was the case in Burmah. The Tongsoo digger's first object is to discover a layer of soft, yellowish sand, in which both rubies and sapphires are deposited. This stratum lies at depths varying from a few inches to twenty feet on a bed of subsoil, on which no precious stones are found. A pit is dug until this corundum is exhausted; and the soil removed is then taken to a neighboring canal or stream, one of which runs in the proximity of the mines both at Phailin and Krat, where it is mixed with water, and passed through an ordinary hand-sieve. In his search for this peculiar alluvial deposit, which is generally free from any admixture of clayey earth, the digger has often to penetrate into the jungle that grows thickly around, combining the work of clearing with the occupation of gem-digging.

The Tongsoos do not appear to form themselves into companies for mutual assistance or division of profits. They work principally in twos and threes; and, if chance lead them to discover a gem of any value, they either undertake a sea-voyage to Rangoon or Calcutta for the purpose of obtaining a good price for it themselves with the dealers in precious stones at these places, or consign their acquisitions to an agent, while they themselves continue to search for more. A process of migration is continually going on among the Tongsoos of the different mines, the workers passing from one to the other, according to the reputation of a particular mine at certain periods.

No artificial or mechanical processes for the washing of the soil have as yet been introduced, nor have gems been discovered in fissure veins of soft material embedded in crevices of hard rock or in crystal form. Rubies and sapphires are found at all the diggings, often deposited side by side in the same layer or stratum of sand. The ruby of "pigeons' blood" color is rarely, if ever, met with. The color of the Siam ruby is usually light red of a dull hue. The sapphire is of a dark, dull blue, without any of the silken gloss which is the distinctive mark of the Burmah and Ceylon stone. Stones resembling garnets rather than rubies are found in the dried beds of water courses at Raheng, two hundred miles north of Bangkok; and there is every reason to believe that rubies also equal, if not superior, to those discovered in the south-east, exist throughout the Raheng district. Those hitherto obtained are the result merely of surface scratchings by the Tongsoo seekers.

NOTES AND NEWS.

THE encouragement received in New York since April 1 by George L. English & Co., mineralogists, has been such as to lead them to the decision to concentrate their entire business in the metropolis. It is their purpose, therefore, to transfer their Philadelphia stock to New York on Jan. 1, 1891. For the present they will remain at 739 and 741 Broadway, where, with new fixtures, a greatly enlarged stock, and an increased corps of assistants, they hope to merit and receive a growing patronage.

—The production of kirschwasser in Switzerland is carried on in the cantons that produce the best cherries; namely, Basle-Campagne, Bern, Aargau, Freyburg, Grisons, St. Gall, Lucerne, Upper Unterwalden, Soleure, Schwytz, Valais, Vaud, Zug, and Zurich; that is to say, in fourteen cantons out of twenty-two. The United States consul at Lucerne says that the principal distilleries are in the following cantons: Basle, Lucerne, Schwytz, and Zug. The others are small concerns, consisting of one, two, or at most three, stills. The manufacture of kirschwasser is also carried on to a great extent by the farmers. For the distillation of kirschwasser,