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 ART. IV.—SILK AND THE SILK CULTURE.\*

**NOTE.**—At very great expense in collecting and compiling information, and in engravings, we have procured the "Silk Treatise," whose publication commences with the present No. of the Review. The writer has been engaged for nearly one year in preparing it, and many years in collecting the matter. The whole subject will be comprised in three parts, and is commended to all who wish well to the advancement of the industry of their country.—EDITOR.

ORIGIN OF THE SILK INDUSTRY; EARLY HISTORY; SKETCHES OF PROGRESS; PECULIAR VIEWS AND PRACTICES OF THE CHINESE IN THE PRESERVATION OF EGGS; CULTIVATION OF THE MULBERRY TREE; CONSTRUCTION OF FADING APARTMENTS; MANAGEMENT OF THE SILK WORM; COCONONERIES, ETC., ETC., ILLUSTRATED BY CUTS; INTRODUCTION OF SILK CULTURE IN OTHER COUNTRIES; HISTORY OF SILK IN THE UNITED STATES; NATURAL FACILITIES OF THE U. S. FOR MAKING SILK; ADVANTAGES OF SOUTHERN AND WESTERN STATES; COMMUNICATIONS FROM PRACTICAL MEN; GENERAL SUGGESTIONS ON THE SUBJECT.

It is the *duty*, as it is the *interest*, of all nations, to guard carefully their *resources*. They should not only aim at the perfection of those

\* NEW YORK CITY, December, 1847.

J. D. B. DE BOW, Esq.

I received not long since, through my friend the Hon. Edmund Burke, of the Patent Office, your letter of recent date, in which you solicit for publication my views on the subject of *Silk Culture*. I am ready to improve every medium through which I can contribute to the advancement of this interesting and important pursuit. It gives me great pleasure, sir, to comply with your wish, and am exceedingly gratified to know that you have considered this a subject of sufficient importance to occupy the columns of your Review. In my opinion, sir, they cannot contain matter of more intrinsic value, or that which more intimately concerns your readers and the general public. The business has had its advocates since an early day in our history, and silk of superior quality has been making for more than a century past. Innumerable obstacles have retarded its progress from the beginning, but enough has been done to establish beyond cavil the fact that the United States in climate and soil, and *all* their natural facilities are peculiarly adapted to the production of silk—and our people equally adapted to its manufacture into the most beautiful and finished fabrics of which the article is susceptible. I believe there are not *ten men* in this nation, who, if they have examined the subject with care, will dispute this position. It has been too often and too

arts and occupations with which their citizens are already familiar, but offer every consistent encouragement for the introduction of other and new branches of industry which may be made to contribute to the supply of their own necessities and luxuries, or produce articles valuable for commerce. It is pre-eminently important that, "We, the People of the United States," by the blessing of heaven the most free, the most popular, the most thriving nation of the earth, should *live within our means*. If this is good policy for individuals and corporations, it is infinitely more so when applied to States and nations. Well would it have been for us had we long ago conceived, practically, the importance of this great truth. Land and labor are with us the only legitimate sources of wealth, and our evident interests demand the exercise of such a policy as shall secure the steadiest employment, and lead to the development of these, our *natural capital*. Unpardonable disgrace should attend indifference or neglect in these respects. Unemployed labor, or labor injudiciously or unprofitably employed, should be considered a calamity as carefully to be avoided as famine, pestilence, or war.

We cannot conceive of greater inconsistency than that of sending from three to fifteen thousand miles for any article of our consumption which our own labor and skill, in the appropriate use of means which nature has provided might create. And yet it cannot be denied, this *monstrous incongruity* has attached itself to our government and people ever since our independence; and that in reference to an article of immensely more value in the aggregate than any other product of human industry.

That article is Silk, the beauty and richness of which were not overprised when in the reign of Tiberius (A. D. 14) its use was restricted by sumptuary laws to women of rank and fashion, to whom the considerations of cost were trifling; or, when (A. D. 222.) the famed voluptuary of Syria, Heliogabalus, in the extremity of his extravagance as charged upon him by Roman authors; he wore a *halosericum*, a garment made entirely of silk; nor, when its purchase required the payment of its weight in gold, which was assigned by Aurelian (A. D. 273) as a reason for his refusing his empress so great a luxury. This great mistake has cost us *hundreds of millions of dollars*, and continues every year to extract from us \$12,000,000 to \$15,000,000 of our best money.

Now all this might have been avoided had we adopted the principle here inculcated. But for this political insanity we should at this day have realized the prediction so often made, that we should become "the greatest silk producing country of the earth," supplying

amply demonstrated under the most untoward circumstances to admit of a single doubt.

I herewith transmit the manuscript copy of a brief treatise on the culture of silk, which has been prepared in accordance with your expressed desire.

In the hope that it may be instrumental in awakening favorable public notice; and turning to this enterprise the attention its importance demands, it is respectfully submitted by,

Sir, your most obedient servant,

A. C. VAN EPPS.

our own demands not only, but exporting largely of the raw material to Europe. With our national treasure unembarrassed, and our citizens generally engaged in remunerating pursuits; the addition of new staples seems not so imperative, although sound policy would then demand it, but the fact is far otherwise. The absorbing question among politicians for the last three years has been, how shall we increase the *revenue* of the country? And how has this question been disposed of? Has it been settled to the interests of the government, the content and prosperity of the people? Has any thing been proposed likely to effect the object?

An alteration of the postage laws has been resorted to, and the duties on imports changed—some contending that a *high tariff*—and others a *low tariff*—or *no tariff at all*, would better answer the end in view; but still increasing embarrassment is the cry—and for aught we can see, must continue to be—who knows how long?

We must have a system of postage agreeable to the people, and duties so arranged as to favor home productions and manufactures to the fullest extent—but after all, we must fall back upon the *pockets of the people*; for if there be not gold there, nor in their hands the means to produce it, we look in vain for it in the treasury, from any and every channel.

If then the profitable employment of the citizen and the prosperity of the government are so nearly identical, it becomes at once an important inquiry whether the energies of our people are fully developed; and if not, what new object of industry can be adopted with a view of increasing their staple products and augmenting their income. These questions have received a good share of attention, and under improved systems of cultivation which have been introduced, our lands have yielded an increased abundance—with a corresponding increase in their quality and variety. The culture of Silk, however, by far the most important subject claiming our attention at the present time, has been almost totally neglected by both government and people. It is the object of the following essay to present this subject anew to the consideration of our people and the regard of the government; and we can but believe, that the representations here made, and the arguments adduced, will have the desired effect. The writer has been so long and so deeply interested in this subject, that it would not be strange, if in the expression of his views some extreme opinions should be advanced—but we believe no such *extremes*, should they occur, will be found detrimental to the general good. It has been our aim to render every part of our work as correct and practical as possible. All the sources of information to which we have had recourse are of the most established and reliable character.

We would not close our remarks here, without expressing our gratification that the pages of the Commercial Review have been most generously offered for the discussion of the Silk Question. We rejoice exceedingly that so popular and influential an instrumentality should at this crisis come forward for the advocacy of a great and noble enterprise in which the whole nation is interested. Its circu-

lation too, being principally in those parts of our country where the business can be most readily introduced and carried to the greatest perfection; adds greatly to its value as a channel of public communication. It will afford us much pleasure to answer, as we shall be able, any inquiries which this treatise may elicit, and to aid in every possible way the advancement of Silk culture at the "South and West," and generally.

The discovery that the web of the *silk worm* could be converted into fabrics; and that this uncomely insect could be made to pay tribute to the necessities and luxuries of mankind, was second to none other recorded in the history of the world. When the length of time during which silk has been made and used, is considered, and the great value always attached to it, it is impossible to conceive the immense aggregation of wealth which has been involved directly or indirectly in its production, manufacture and employment as an article of apparel. If we combine all other substances ever employed for the raiment of the human family, their value can hardly exceed, if indeed it equal, that of the single article of silk.

When the empress *Si-ling-chi*\* was watching the curious operations of this insignificant insect in the forests of Northern China, over *four thousand years ago*; and even when she succeeded in domesticating the worm, unwinding the fibre and converting it into an article of dress; she could have formed little conception of the variety of its subsequent uses, or the extent to which it was destined to mingle in the commerce of nations then unborn, and in portions of the earth unknown for many centuries afterwards. It is almost incredible now, with the statistics of *four thousand five hundred years* before us, that, from the eggs of an insect so minute, that at its hatching, thirty thousand scarcely weigh one ounce; should originate an article of such unequalled magnitude as that of Silk. Millions of persons are employed in cultivating the mulberry tree and rearing the silk worm; and other millions in the operation of filatures and manufactories; while thousands of ships, and magnificent storerooms, with their numerous attendants, are required for its conveyance and distribution through innumerable avenues to the hands of its consumers; whose number equals the entire population of the civilized world—for *who does not wear silk?*

Very appropriately has the Empress, in whose hands this industry

\* All who have ever written on this subject accord to this Empress, the wife of *Ho-ang-ti*, the credit of having first examined the cocoon of the silk worm with the view of ascertaining its nature, and the possibility of its being rendered valuable.

Their own authors under the several dates noted, write as follows: "The lawful wife of the Emperor (*Ho-ang-ti*), named *Si-ling-chi*, began the culture of Silk." (Book on Silk Worms.)

This great Prince, (*Ho-ang-ti*) was desirous that *Si-ling-chi*, his legitimate wife, should contribute to the happiness of his people. He charged her to examine the silk worms, and test the practicability of using the thread. *Si-ling-chi* had a large number of these worms collected, which she fed herself, in a place prepared solely for that purpose, and discovered not only the means of raising them, but also the manner of reeling the silk and employing it to make garments." History of China, by P. Mailla—written, according to the Chinese Chronology, 2602 years before Christ.

had its origin, been styled and deified as the *Goddess of Silk Worms*; and we can almost justify the yearly homage paid to this goddess by the Chinese peasantry.

If the importance of this discovery was not at *first* realized, that they did not long continue ignorant on the subject, is apparent in the *fact* that it became at once the favorite pursuit of the most distinguished, and was introduced at each recurring season by royal example; and before it had time to acquire a name, it was surrounded by the government with every possible protection which the ingenuity of that jealous nation could devise. So successfully was this protective policy adopted and adhered to, that, up to the middle of the sixth century, it does not appear to have been supposed, beyond the confines of China, that silk was the product of a worm. Even the Persians, who had long controlled the carrying trade between China and other countries of Asia, do not appear to have dreamed of the origin of the precious commodities composing their commerce; and, but for the most ingenious stratagem by which it was wrested from them, it is difficult to determine how long it must have remained a secret. Towards the close of the sixth century, this product of the Chinese had become so universally admired, and so highly valued, that, notwithstanding the exorbitant prices exacted for it, it was impossible to obtain a supply. With a view of opening a new medium of communication, Marcus Antoninus undertook to supplant the Persian monopoly—but his embassy was rejected, in common with all other applications for foreign intercourse by any except those whose integrity had been thoroughly tested and approved. This movement excited the spleen of the monopolists, and its failure encouraged their avarice. The passion for dress which the Romans carried with them to Constantinople, served to increase the demand for silk beyond all precedent—and the Persians, in their dreams of gain, carried their impositions beyond all endurance.

This was a crisis of the greatest interest in the history of silk, and calls for particular notice. An eminent author, in reference to the same period, writes as follows: "A war with the Persians occurring in the reign of Justinian, induced that monarch to obtain supplies from a more eligible channel. Through a deficiency of the requisite experience and qualifications necessary for so difficult an undertaking, Elasban, King of Axuma, and Esimiphæus, Governor of the Hermorites, in Arabia, to whom, for this purpose, Justinian had made application, failed to fulfil their engagements; and silk, in consequence, rose at Constantinople to a height before unknown. This the partial supplies usually afforded by the Phœnician manufacturers, would have considerably relieved, had not Justinian, with a blind rapacity, that, in his aim to augment the revenue, effectually defeated itself, imposed heavy duties on the importations, which became absolutely prohibitory. In consequence, the merchants were ruined, the scarcity of silk was equivalent to absolute privation, and the failure of a revenue, whose increase was contemplated by Justinian, was a practical sarcasm on his avarice."

Thus we have, in the history of silk, arrived at a very important

and memorable crisis. Silk was produced, even from the earliest ages, in regions congenial to its culture, where, in consequence of the blessings it confers, the inhabitants proclaim themselves *celestial*, but assiduously withhold all knowledge from what the benefit is derived.

An insect, as if in some land of enchantment, labors, spins, and dies; and without leaving itself even a sarcophagus, bequeaths its house, more valuable to man than the proud monuments of the Egyptian architect, its robes, more golden than Jason's fleece, and all its estate, by the bale and cargo, to the men of Hesperian climes, who know not either of its existence, or the mystery of its operations. The elegance of the fabrics is admired by all; Europe invites the commerce; a difficulty unmanageable in the ordinary course of things occurs; a crisis arrives; THE OLD EPOCH IS CLOSED, and a NEW ERA, most important in its history, ARRIVES. How frequently has relief come, not only at the moment of extremity, but by the most unexpected means. Justinian failed in his diplomatic application to the Arabian princes, as well as his predecessor had done at the Chinese Court; and his very attempt to force a trade was the means of its almost total extinction. But how could it have been foreseen that what emperors, ambassadors, and merchants failed to accomplish, would be effected by means so unlikely as by two comparatively obscure Nestorian monks? The preachers of the doctrine of Nestor, exiled by the government of Byzantium, had fled to India; and missions, convents, and bishoprics, by their patriarch resident in Persia, had been, according to the testimony of Cosmas, established in every direction. Two of the monks penetrated to the country of the Seres. With curious eye they had observed the dress of the Chinese; the manufactures of the silken fabrics; and the millions of insects, whose education was the care of queens, converting the leaves of a tree into silk. All the manipulations requisite, from the embryo state of the little animal, to the production of the costly material, were marked with intense interest.

The secret was out! two monks in possession of it—the knowledge to benefit myriads was entrusted to two—the perils of traversing a vast continent were yet to be encountered—a risk was to be incurred—no insurance was affected, but that of Providence: thus all was safe; and the two monks, our benefactors, bequeathed a mystery hid for ages, as a legacy to a western hemisphere. Aware of the solicitude of the Europeans on this subject, the monks repaired to Constantinople, and first revealed to the emperor the secret that *silk* was produced by insects, whose eggs might be conveyed to his dominions. Were we to indulge in the conjecture what, most naturally on such a momentous occasion, was the passion chiefly excited in Justinian, at this important juncture, when a report, than which none could be more interesting to the secular concerns of man, was first announced to his ears, our charity might have inclined us to point to philanthropy, had we not ascertained the character of the man. With him, on several occasions, self was a universe, and all within it his minions, whose interests were to be consulted precisely to the point



where they concerned his own. By the promise of a great reward, the monks were induced to return to China, elude the vigilance of their jealousy, obtain the eggs, and to confine within the narrow precincts of a hollow cane, what was subsequently to create machines and factories, fill warehouses and ships, and become inexhaustible mines of wealth to nations. They succeeded; and in the year 552, they were in Constantinople, and their cane, like Noah's ark, contained a family, whose posterity are now filling regions wider than those peopled, within the same time, by Shem, Ham and Japhet. "The insects thus produced" says Lardner, "were the progenitors of all the generations of *silk worms*, which have since been reared, in Europe and the western parts of Asia;"—to which may now be added America and Africa—"of the countless myriads whose constant and successive labors are engaged in supplying a great and ever increasing demand. A canful of eggs thus became the means of establishing a manufacture which fashion and luxury had already rendered important, and of saving vast sums annually to European nations, which in this respect had been so long dependent on, and obliged to submit to, the exactions of their oriental neighbors."

No sooner is this new and interesting colony in Europe, than the avarice of Justinian seizes the cradle of the infant concern. His own treasurer had the control, the monks the direction, weavers brought from Tyre and Berytus, were the creatures of the new monopoly, and his became the prerogative to fix the price which his subjects should pay for the indulgence of their vanity. The price of silk, by this means, became eight times more exorbitant than before the introduction of the silk worms; an ounce weight of a fabric of *common colors* could not be purchased for less than six pieces of gold, but the royal purple was of quadruple value. Fortunately for the public good, the oppressors of mankind live not forever: Justinian died; and the monopoly ceased. The people of western Asia and Europeans discovered that, neither the mulberry tree nor silk worm, wanted either Chinese climes, or the care of a Justinian to foster them. Mulberries were planted in all directions; and the insects fell to work with haste as eager, as if they had never known that their ancestors had been silk worms royal to his highness Justinian. After the death of this emperor, (A. D. 565,) we find the culture and manufacture of silk transferred to Greece, especially Peloponnesus, and to the cities of Athens, Thebes, and Corinth. Soon after, the Venetians entered into commercial relations with the Grecian empire, and conducted the carrying trade, for several centuries, to the western parts of Europe. Such was the estimation in which this manufacture was then held, as appears from the example of Charlemagne in the year 790, sending two silken vests to Offa, King of Mercia, that it was considered worthy of being made a royal gift. Greece, notwithstanding all discouragements consequent upon the continued and rapid decline of the Roman empire, continued to excel all other nations of Europe in the quality of her manufactures. She alone, for near 600 years, possessed the valuable breed of silk worms; soon produced wrought silks adequate to her own consumption; a recourse

to Persia for a supply ceased, and a material change followed in her intercourse with India.

We deem it unnecessary to dwell at greater length here upon this part of our subject, and shall therefore give our attention to that which will be more interesting and profitable: the means by which the Chinese attain so much perfection, and secure such uniform success. Disease amongst silk worms there is so uncommon as scarcely to have attracted the attention of their authors; it would hardly be supposed from what they say, that the silk worm is subject to ailments of any kind. It is positively asserted that they do not lose one worm out of a hundred by disease; which seems to have been a matter of much surprise in France, where the most successful establishments calculate upon a loss of fifty per cent. It is very reasonable to suppose that, in this extended experience, we shall find some peculiar processes by which they are secured against the casualties common to other countries.

The very circumstances under which the silk worm was abstracted from China, precludes the possibility of any very extensive and accurate knowledge of its management, and every attempt to obtain such information since has been fruitless until within the present century.

When the spirit of *inquiry* and *inquisitiveness* can no longer be controlled, and *valuable secrets* are not safe through the possession of walled empires. Access has at length been obtained to Chinese libraries; and works treating extensively and minutely of this entire subject have been carefully reviewed. They form a part of their works upon agriculture, of which there are several hundreds, included in a collection of one hundred and sixty thousand volumes of the most valuable publications in the Chinese language; but among all this immense library and the twelve thousand volumes composing the royal library, there are but three books devoted exclusively to silk culture as a distinct branch of their industry. These were written long since and have passed, in fact, through a new edition within the last two or three hundred years. To the essential parts of all these works we have incidental access through recent translations into the French language by M. Stanislas Julien, at the instance of the Minister of Public Works, of Agriculture and Commerce; to which is prefixed a valuable introduction by M. Camille Beauvais. While in manuscript this translation underwent a most critical examination by M. Louis Hebert, whom the French government employed for some time upon the coast of China with the special design of studying the methods of those countries, and of bringing back any precious varieties of mulberry trees and silk worms which were unknown to French culturists. This with other works of great value treating of this subject, are included in a collection of one of these,\* to which particular reference will be made in another part of this treatise, is work on "Filatures," by M. Ferrier, inculcating precisely the views we have entertained and urged for the last three years,

\* More than a hundred volumes of valuable French works recently presented to the American Institute, by M. Vattemare.



and which alone can secure the success of silk culture in any country. From the work first named, together with a book of Chinese painting prepared for Dr. Stebbins, of Northampton, Mass., which have been fully explained to us by *Sum-Sing*, a Chinese artist of the Chinese Junk recently in this city, who is entirely familiar with the production of silk in his native country; we shall be able to give a very full and correct exposition of the principal methods practiced in China. We shall do so more in compliance with a general curiosity to know of their management, than from faith in the superiority of their practices. In their cultivation of the mulberry tree and treatment of the worm—we can learn much; but their care of the eggs which we shall notice elsewhere, consists of a routine of unmeaning attentions, which one would suppose must prove entirely destructive to the embryo worm.

In every branch of the business we may learn much from their excesses. If they are *extremely* careful, it will be found a less dangerous error than the irregular and *careless* manner in which it has been managed in this country as well as in many parts of Italy and France.\* We shall first notice their treatment of the mulberry. No expedients have been left untried that were calculated to lead to the general propagation of this tree. In some provinces men were compelled to do it; while others succeeded better by liberal bounties. Hence we read: Tehin-in, being Governor of the province of Kiente, ordered every man in the nation to plant fifteen feet on each acre, with mulberries.

The emperor gave to each man twenty acres of land, on condition of their planting fifty feet with mulberries; (*Memoirs upon provisions and Commerce*.) When the agricultural labors are terminated, or when rain prevents persons from working in the fields, every thing must be taught relative to the mulberry-tree. (*Annals of Northern China*.)

The emperor *Hien-tsong*, who ascended the throne in 806, ordered all the inhabitants of the country to plant two feet with mulberries in each acre of their grounds. (*Annals of the dynasty of Thang*.)

The first emperor of the dynasty of Song (960) promulgated a decree to prevent the destruction of the mulberry and jujube trees. (The leaves of the latter may be used for feeding silk worms.) [*History of the dynasty of Song*.] If among the people, men are found who grub up the uncultivated ground and plant a great quantity of mulberry trees, only the ancient tax shall be exacted from them. (Same work.)

Their works abound with similar passages showing the care ever exercised to promote the most extensive growth of the mulberry tree of which several varieties are used corresponding with the character of the climate and soil, of the province for which they are designed. The most common and generally approved appears to be a white mulberry bearing an abundance of thick, glossy leaves about as large as a man's hand. In preserving seed, the largest fruit is selected

\* And the fact that success has attended the efforts of culturists in this country in spite of all hindrances, is an evidence of its uncommon congeniality.

and both ends cut off, the seeds of the middle only being considered fit for use. These are washed, dried in the sun and immediately planted in a bed of rich earth, previously prepared for the purpose. These are kept carefully watered and free from weeds. In the spring the small trees are taken up and transplanted in grounds suitably prepared. They are planted in rows four feet apart each way, and cultivated with a hoe and spade. In the spring of the year, when they are considered sufficiently matured, they are again removed and planted into permanent orchards, where they are set about thirty feet apart. Another mode is to gather the fruit, which is ripe in June, crush the pulp with the hands, and wash several times; when the seed is separated it must be dried in the shade. Ten acres of fertile land, or better, land for a long time uncultivated is prepared, where the mulberry seed, mixed with millet seed, is sown and left to grow up together. The millet ripens and is removed by the reapers and the mulberries either removed or allowed to remain upon the same ground.

The tops are cut off and the foliage from the shoots starting the following spring is used for feeding. Another writer says in substance as follows: When the time for sowing has come, the seed must be mixed with ashes from the branches of the mulberry tree, and then soaked until they become soft. The next day the seed must be washed with care, and those that float rejected. The full seed must be exposed to the sun until the water absorbed is entirely evaporated, when they are sown and do not fail to flourish. In another work the subject is treated differently still conflicting somewhat with the preceding. We can give only the ideas. None but new seed should be used. This should be sown in the shade or covered with a sort of tent. The shade of hemp is unfavorable, that of millet still more so. Between each plant five to seven inches should be left, and kept carefully watered until they attain the height of three feet, the shade should then be removed. In November the trees should be cut even with the ground, dry grass spread over them and burned; taking care not to have the fire too hot or long continued. The ground is then covered with decomposed vegetable manure. In the spring the surface is raked clean and the trees kept well watered. Fine shoots spring up early, many of which, by fall, attain the height of six or seven feet. A distinction is made between these and a smaller growth, and each is treated in a different manner: the larger growth being generally preferred to those of a still larger variety—and are termed dwarf mulberry trees. The ground to receive these is prepared as follows: The location must be well cultivated and manured. In one acre about two-hundred and fifty holes are dug each two feet square and two deep, into which is spread about a half bushel of well rotted manure, mixed with an equal quantity of earth all made soft by water. Into this compost the tree is firmly placed, the top of the stalk cut off even with the surface of the earth and the hole filled with well decayed earth.

The next day this is tramped down so as only to leave the hole half full; the remainder filled and slightly packed. A small hill is made over the top of the stalk, which must previously be burned

with a hot iron, so that the shoots will all start from buds under ground, this giving them greater strength and security against winds and storms. Several buds will send out trees, and in order that they may not become too thick, only two branches are cut down close to the ground every year, and earth covered over, so that all the new sprouts of the succeeding year may start from buds under the ground. As the roots become strong, a greater number of branches are allowed to remain, until, in a few years an immense mass of foliage is produced, and the quantity of roots formed, is astonishing.

The plantation of Dr. Stettins, of Northampton, Mass. is a good illustration of this method of culture. He has a small orchard of Canton mulberries, which from June to November present a most beautiful sight; and the amount of foliage produced is incredible.

This variety of mulberry was procured directly from China—for Dr. S., and is doubtless the same variety preferred in the best silk producing districts of that Empire. It was recognized as such, by a native Chinese, who recently examined it—pronouncing it the *same*, only presenting an appearance of greater thrift and perfection. It corresponds very nearly to the *Moretti*—if indeed, it be not the same, which some of our best judges believe.

From these seedlings, cuttings are taken; and in this way the mulberry tree can be multiplied indefinitely. A general preference is to be given to this mode of propagation, as the variety of the tree can thus be retained in its vigor. In this something like the following practice is observed. The ground is selected and prepared for the cuttings, as for trees just described; and soon after the buds begin to start in early spring, branches are cut about one foot in length and each end burnt. A part of the buds if there are more than three or four are removed. The only danger to be guarded against, as attending this method, is the effect of the suns of mid-summer—but if proper care is taken, a single plant is seldom lost. It is a pretty general practice to plant a few hemp seeds on the sun side of the hills to afford a shade. The following spring the trees with the cuttings attached, are taken up and removed to the grounds where they are to remain, and there planted with the same care as before, in rows about twenty-five feet apart, and ten feet apart in the rows. The ground between the rows may be ploughed; but never between the trees. The foliage is used the second year. In another work a more particular account is given nearly as follows: Towards the end of Autumn when the cultivators have much leisure, the grounds intended to be planted with mulberries the following spring, must be selected and all the holes dug and supplied with manure, so as to diminish the work of the spring when so many other things demand attention. The grounds should be raised on the south in order to retain the snows of winter and the rains of spring. In the last month of the year (January) the branches intended for planting in the spring, should be cut and the wounded part scarred by passing it quickly through the fire. They are then bound into bundles of about forty five each, and laid in a hole, prepared for the purpose, about the length of the trees, and three or four feet deep. Bundles of rice straw are placed between those of the trees. These deposits of bran-

ches are covered with a thick bed of earth, and thus preserved in perfect safety. After *Tchun-fen* (21st of March) the holes prepared in the autumn, are opened—manure, earth and water mixed in, and twenty or thirty millet seeds planted at the south side. The trees are then removed for planting. Each branch is bent up in the shape of a hoop and tied in that position by a straw rope; and thus planted in the middle of the hole, and covered with three or four inches of earth. If the buds are started two or three inches they are covered deeper, and the earth packed firmly around them with little hillocks of light earth on the top. They must be shaded and kept moist. The trees from the buds grow rapidly and make it necessary to remove some of the lateral branches. At three years old they become fine trees. Some persons who wish dwarf trees, cut off only the extremities of the branches and plant them upright, so that the top just arises out of the ground. When this is done, several twigs are put together and thus planted. Others place the boughs in a reddish mud and plant it in a small square hole. These thrive well.

We cannot notice further this part of the work though much more is said, but with immaterial variation from what we have already given. These observations give a general impression of the plans pursued as well as they can be determined from this translation, which is in many parts quite crude and indefinite. None of the practices described, strike us as possessing peculiar excellence—but one important principle is carried out by every cultivator; a principle very imperfectly appreciated amongst us—it is, that the mulberry tree, to produce good and abundant foliage, must have the advantage of rich soil and careful cultivation. They not only select the best lands for their plantations but manure plentifully besides. Liquid manures are highly recommended and extensively used; also the sweepings of the cocooneries, ashes of rice straw, various aquatic plants, and paste made of beans, hemp and cotton seeds—besides the ordinary manures. Great use is also made of the sediments of canals and ponds which are often drained for this purpose. The plantations are generally surrounded with walls or hedges to prevent injury by animals. The earth around the trees is kept perfectly clean and loose, by frequent weeding and the use of the hoe and spade. No noxious plants or trees are allowed in the enclosure. Neighboring cultivators not unfrequently associate together for the purpose of managing the business to better advantage by a division of labor. Their orchards in such cases are included in one large enclosure proportionally subdivided by light hedgeries, to prevent disputes, to which they are so much inclined. Grafting and budding are practiced to a considerable extent and are thought greatly to improve the quality of the foliage. The leaves thus produced are larger and thicker and seem to contain less unwholesome juice.

This requires a good deal of trouble, but we are inclined to think the plan a good one, where it is intended to have permanent orchards. It is being extensively introduced in the south of France.\*

\* The first nursery we have ever seen any where was that of Mr. L. P. Finiells in this city. These trees were grafted white mulberries imported from the Cevennes Mountains in France, and for some time occupied a garden in Broadway; and were removed a year or two since we think, to some part of Long Island.

The construction of feeding apartments next claims our attention. These are generally built in secluded locations and near or over the water when it can conveniently be done; that they may have the advantage of extreme quietness, and freedom from impure air and injurious insects. They are so constructed as to admit of the most perfect ventilation and yet as perfectly to prevent the admission of external air, when unsuited to the health of the worm: and always so as to govern the degree of light.

The greatest importance is attached to a uniform temperature, and means provided for securing it. In the center of the building is constructed an oven, of which the following is a description. In the middle of the house, a hole must be dug, of which the size must be proportioned to the dimensions of the house.

The ordinary size of this hole is about four feet square. On the four sides, a square brick wall, cemented with mortar, must be raised two feet in height. Cow dung, well dried, must be taken and reduced to powder, and the bottom of the hole covered with a bed of this powder three or four inches thick. On and in the middle of this, a layer of small pieces of dry wood must be spread, at least five inches in diameter, which has been cut in the last month of the year. Mulberry, elms, acacia, or any kind of hard solid wood may be used. Upon this another bed of powder must be spread, well beaten down, so as to fill all the openings between the sticks; for if any space be left, the fire would produce a flame which would be injurious, besides causing too rapid a consumption of the fuel. With these alternate layers, the hole must be filled and packed down as tight as possible, and then rounded up with the same. Seven or eight days before the hatching of the worms, five coals must be put on the top and covered over with hot ashes. The mixture readily takes fire, and emits, for six or seven days, a black and yellow smoke. One day before the hatching of the worms, the door must be opened to dissipate the smoke, and then carefully shut. From that time the whole contents of the oven are on fire, emitting no smoke, and can be preserved for a month or two without becoming extinguished or materially diminished. The warmth produced is mild and agreeable, and it can hardly be perceived that there is a fire in the apartment. It is well to surround the top of the oven, to the height of one or two feet, with a high brick wall, so that the heat may ascend to the middle of the room, and there spread in an equal manner. This will also prevent those persons who attend the silk room at night from falling into the oven. The house being constructed of dry materials, readily becomes warm and retains the heat. When the worms are to be removed from the nursery, the old paper on the windows must be replaced by that which is perfectly white and clean. The windows are covered with screens or mats, to prevent the escape of heat, and regulate the admission of light. Connected with the main building is a nursery, carefully constructed, for hatching and feeding the young worms. It is generally built fronting the south. These are fitted up with numerous small frames and shelves, and only light enough admitted to distinguish the moulting from the feeding worms; and this is obtained mainly through dormer win-



dows above the frames. Even with the ground, pipes, or air conductors, communicating with the outside, must be placed at regular intervals, and arranged so as to be opened and shut at pleasure. The nursery building is also provided with an oven similar to the one described, only smaller, and also a small stove in each corner, in niches prepared for the purpose.

The internal arrangements for feeding do not vary much in different provinces. We shall refer to only two, which are more generally used than any others, as they are considered the best. One consists of frames two feet long and two feet wide, supported at the ends by slats fastened to upright posts extending from the floor to the beams or ceiling. The one at the bottom prevents the dampness of the ground from ascending, and the one on the top screens from the dust of the apartment. The other arrangement, which appears to be an excellent one,—especially for nurseries,—is represented in the cut, which will be given in next No. of Review.

The construction of this frame is very simple; the hurdles, which are made of split bamboo, very light and easily handled, admitting an unobstructed circulation of air through and around the frames.

With this reference to the feeding apartments, we shall notice, very briefly, the methods of hatching, feeding, and the general management of the silk worm from the egg.

The time of hatching corresponds very nearly with that of Virginia, and the eggs are retarded or forwarded to correspond with the character of the season. The care bestowed upon the eggs by the Chinese is almost incredible, and differs altogether from the practices of this country, and we can hardly be induced to attach to them any advantage.

From about the first of December up to the time of their hatching, they are subjected to repeated washings in brine and river water.

To these baths their authors attach great value, as securing uniform hatchings and vigor of constitution. The subject deserves a passing notice in this place.

In a work entitled, HOANG-SING-TSENG, the author observes: The eighth day of the last moon, the eggs must be dipped in water where the ashes of the mulberry branches have been boiled, or the ashes of grass. They must be taken out at the expiration of one day. The twelfth day of the second moon, a bath must be given to the eggs, on the morning of the period called *Thsing ming*, (5th of April;) then they must be wrapped up in cotton paper, and deposited in the kitchen. Wait until the mulberry leaves are as large as a teaspoon, then envelope the eggs in cotton; covering them at night with garments that have been worn during the day; and in the morning wrap them in blankets.

When the eggs are hatched, the worms must be warmed by artificial heat; but so long as they are not out of the egg, they ought to be well taken care of, and hatched by the heat of the fire. When it is desirable to soak the leaves of paper, covered with eggs, the ashes of the mulberry must be used; the leaves should be moistened and



powdered with the ashes. Afterwards they must be rolled and soaked in water where a certain quantity of salt has been dissolved. If the rolls of paper swim, they must be kept under water by placing them under a China plate.

The papers ought to be taken out on the twenty-fourth day. They must then be washed in running water to remove the ashes. Afterwards, they can be hung up in the cool air, and the eggs will hatch in due time. The twelfth day of the second moon, leaves of the plants called *tsai* and *ye tsai*, blossoms of the leek, peach tree, and white beans, must be taken and crushed in water, and this used as a wash for the eggs.

Many persons preserve the eggs in bamboo boxes, where they are exposed to all the changes of the atmosphere. If they are subjected to sudden transitions from cold to extreme heat, or the contrary, it produces fatal results. The worms thus injured in the egg, have a yellow appearance on hatching, and are never worth the trouble of raising. They may be compared to a child that has contracted disease in the womb. At its birth it is weak and feeble; and such innate ailments generally extend through life.

When one wishes to preserve eggs by this method, the papers should be spread on bamboo boards, secure from the sun or wind. They should also be covered with silk cloth, to prevent butterflies or insects from the cotton plant eating them. In the winter, when there is a body of snow, the leaves containing the eggs should be spread upon the snow for twenty-four hours, and then placed on the boards and covered as before.

When spring comes, they must be attentively watched, and every change noted, that their hatching be properly provided for. Powdered cimabar must be taken, diluted in warm water, and the eggs bathed in it. The water should be kept at the temperature of the human body.

Before the eggs are hatched, the papers should be weighed, and the exact weight written on the back of the sheets. When they are hatched they should not be separated from the paper. Many persons, as soon as the worms appear, detach them from the paper by means of a small broom or quill; but these little beings, as delicate and slender as a hair, or bit of silk, cannot support the wounds given them by the broom or quill. The better way is to cut some tender leaves into small shreds, and lay them carefully on the worms, to which they will speedily attach themselves, and can be removed without hurt.

The business of the feeding is entrusted to persons who confine themselves exclusively in the silk rooms. These attendants are required to be scrupulously clean and particular, and to study every want of the worm, and meet them with a prompt and appropriate supply.

The following things are named as being offensive to the worms, and to be avoided:

- 1st. Silk worms do not like to eat damp leaves;
- 2d. They do not like to eat warm or wilted leaves;
- 3d. The newly hatched worms do not like the smell of fish fried in a pan;

- 4th. They do not like to be in the neighborhood of persons who pound rice in mortars ;
- 5th. They do not like to hear strokes on sonorous bodies ;
- 6th. They do not like men who smell of wine to give them food, or transfer them from place to place ;
- 7th. From the time they are hatched until maturity, silk worms dread smoke and odorous exhalations ;
- 8th. They do not like to have skin or hair burnt near them ;
- 9th. They do not like the smell of fish, musk, or the odor of certain herbaceous animals, such as the goat, &c. ;
- 10th. They do not like to have a window, exposed to the wind, to be opened during the day ;
- 11th. They do not like the rays of the setting sun ;
- 12th. They do not like, when the temperature of their habitation is warm, to have a sudden cold or violent wind introduced ;
- 13th. When their habitation is cold, they do not like a sudden change to extreme heat ;
- 14th. They do not like dirty or slovenly persons to attend them, or enter their room ;
- 15th. Care must be taken to keep all noxious effluvia and filth distant from their apartments.

When the worms are first hatched, they are fed with the most tender leaves, cut into fine shreds, and lightly spread over them with a sieve.

In the space of one hour (two of ours) they must receive four meals, making forty-eight feedings during the first day and night. Feed must be given, without fail, both day and night. If this course is pursued, it follows that they sooner attain their maturity than if they are neglected. When they can be made to mature in twenty-five days, the worms of a given space will furnish twenty-five ounces of silk. If twenty-eight days, only twenty ounces can be obtained. If the time be one month, or forty days, only ten ounces will be made. In feeding, the attendants are required to visit every frame with the greatest attention, and feed with perfect uniformity, that the worms of each day's hatching may not become irregular in their moultings.

The feedings are less frequent as the worms increase in size. It is common, beginning when the worms are very young, to use rice flour. It is sprinkled lightly over the frame immediately after the worms have been fed. When this is done, the leaves require to be dampened.

Dried mulberry leaves, finely powdered, are sometimes used in the same way. It is thought to strengthen the worm, and cause it to make a more perfect cocoon. One of the most accurate works, treating of this subject, says :

'The leaves which are given them ought to be neither wet with dew nor dried in the wind or sun, nor impregnated with disagreeable smells ; for as soon as they have fed upon such leaves, they will contract diseases. If care be taken to preserve, in advance, a sufficiency of leaves for three days, there will be nothing to fear from long rains nor a want of food.

The space of one day and night is, to the silk worm, like the four seasons of the year.

The morning and evening answer to spring and autumn, and the middle of the day and night to summer and winter. In these four periods of the day, the weather is never the same. When a good fire is preserved in the silk room, great attention should be paid to keep it of a uniform temperature during all parts of the day and night. The matron should wear only a single garment, and regulate the temperature according to the sensation of heat or cold she experiences. If she feels chilly, she will judge that the silk worms are cold also; and so when she experiences oppression from heat, will the worms be affected. An increase of heat immediately after feeding encourages the appetites of the worms, and causes them to eat with great avidity.

To effect this, a long stove, placed on a hand barrow, is used. When the worms have been fed, and had time to ascend the leaves, this stove is carried by two men through the aisles, until a gentle heat has diffused itself among all the hurdles. The fire in this stove should consist of burning charcoal, so as to prevent smoke, and covered with ashes, to prevent too brilliant a flame. When the worms have finished their eating, the stove must be carried back. This is repeated at each feeding, if the air of the room is in the least chilled.

The various moultings are attentively observed, and every preparation made for the necessities of the worms. They are not suffered to remain upon their moulting beds for any length of time after their awakening; but are removed\* promptly to fresh frames, covered with rice straw, crushed in a mill.

The rapid growth of the worms renders it necessary to remove and separate them, constantly, which is done with the greatest care and affection. Any neglect or carelessness may be followed by diseases and losses. The weakness and delicacy of the worms should never be lost sight of.

#### *Entrance of the silk worms into the Cocooneries.*

When the worms indicate a desire to spin, they are removed to cocoon rooms, which are generally constructed separately from the feeding apartments. These rooms are provided with various descriptions of winding frames. As this has been, and is yet, a subject of much discussion and difference of opinion in this country—it claims at least a passing notice. A country so long engaged in making cocoons—must necessarily have acquired a pretty accurate knowledge of the best methods of spinning—this would be our judgement of any other country, save China, and is doubtless true of them to some extent, notwithstanding their unreasonable adherence to ancient usages.

We have just said that the spinning is done by distinct rooms. In the southern countries these are generally placed in the house, as

\* In the removal of the worms, a frame of net work is used, somewhat similar to those used by many persons in this country.

fewer worms are there fed; and besides the early rains occurring at the spinning season, forbids their being placed in the open air. At the North, the rooms are larger and placed outside of the house, that there may be no obstruction in the circulation of the air. A dry and warm place must be selected, in order that neither cold nor dampness can penetrate into the interior of the cocoon rooms. When the worms approach their maturity, a fire must be lighted on the ground where the room is to be located, until it is perfectly dry; afterwards the remains of the fire and ashes must be swept away. One description of cocoon room is constructed as follows.

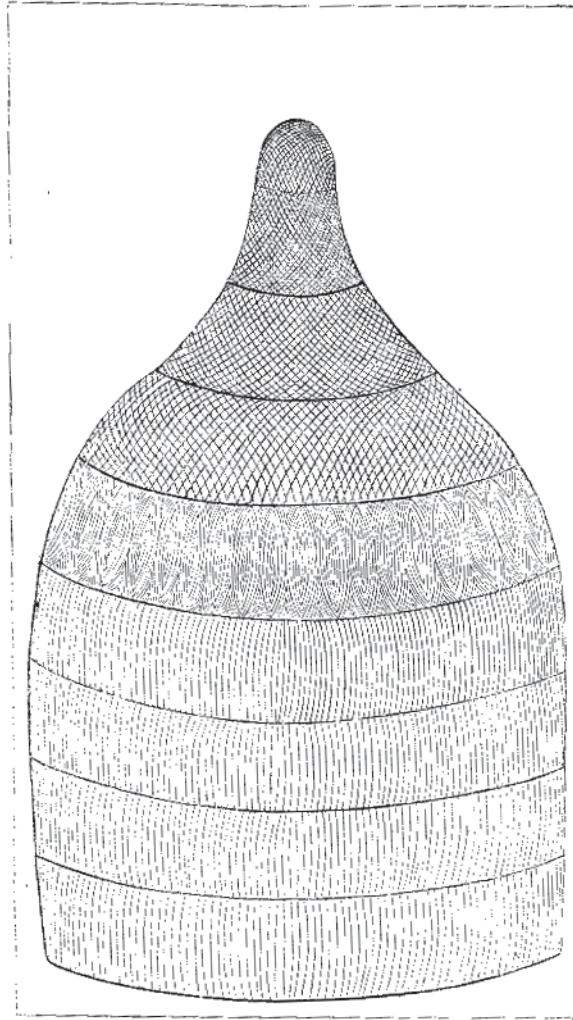
The floor is made of plank of the fir tree, six feet long and three feet wide. A frame, pierced with large holes, must be made of thin bamboo from which arrows are made. In these holes some rods must be inserted; then long and large bamboo branches, stripped of their leaves, must be cropped above. The room must be covered with a frame work of woven reeds. The silk worms will here have a place where they can establish themselves in safety without fears of falling. When the interior is well arranged, where it affords necessary depth and security, the worms may be successively spread over it. At first, the frame must be a little inclined until the worms have voided their excremental matter which always precedes the formation of their cocoons; and afterwards, warmed with a small brazier, or pan of live coals. When they have begun to inclose themselves in their cocoons, the heat must be increased. They *must never stop* in their work. If the temperature be too cold they walk upon their silk and cease to spin.

Some persons, particularly at the South, where silk worms are fed more for amusement than profit, remove the worms, when they are ready to spin, to their own houses. They spread short stalks of dry plants upon the frames on which the worms were fed, and in these beds of branches they deposit their cocoons.

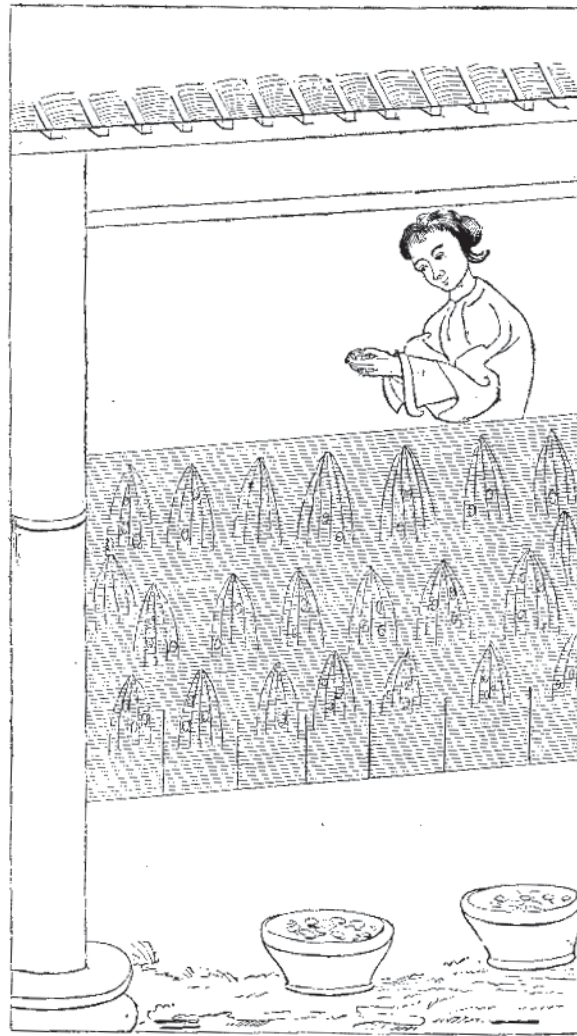
Another plan is to construct long sheds of light frame work, covered with straw mats, and in these place their cocooneries when the worms are ready to enter them. They are set in rows on each side with a passage in the centre large enough for a man to pass through. As fast as they are needed the rooms are provided with shelves covered with dry branches, on which the worms are placed. When the necessary number have been installed here, they are covered with double mats. These mats are not so closely formed as to prevent the admission of air. Artificial heat is recommended here also.

*Touran-Tso, or Round Cocoon Rooms.*

The cocoonery represented on p. 342, is highly valued by some. The center is first established and the circumference divided into five parts by pine boards. Five poles are then planted and tied together at the top, and then surrounded with rush mats. Dry branches are laid all around against the sides, against the mats where the silk-worms are to ascend. When the worms have been placed in, the lower part is surrounded with rush mats, and covered high up with straw in the form of a cove.



TOUAN-TSO, OR ROUND COCOON ROOM.



CHIAN-PO.



*Chan-Po.*

This cut represents the cocooneries of the districts of *Kia* and *How*, where the best silks of China are said to be produced. This term signifies a frame covered with small protuberances or hillocks. The frames are woven of split bamboo reeds, and placed upon a stage or table, supported on each side by wooden pillars about six feet high. The small elevations are made of rice or wheat straw, cut of equal length and twisted together at the top; and then placed upright on the frames.

It is necessary to cover the frames with a slight bed of short straw to prevent the worms falling through between the reeds.

At the bottom of this frame chafing-dishes filled with charcoal, are placed four or five feet apart. When the worms are put on the frame only a little fire is necessary to induce them to work, and they will not be seen to climb and move about wasting their silk. As they enter their cocoons the heat must be increased by the addition of burning coal to the chafing-dishes. As the silk is thrown out by the worms, it dries, and immediately hardens; which is the reason why the silk from these districts, so long retains its strength and receives such brilliant dyes, which is never the case, where the worms spin in a damp and chilly atmosphere, as is generally true of most other constructions for spinning. Another spinning frame recognising the same principle, and which is highly spoken of, is shown by the following cut.\*

It is taken from a silk painting before referred to, as belonging to Dr. Stebbins. These frames are of bamboo net work, with interstices large enough for the formation of the cocoons.

They are intended to be placed within enclosed cocooneries similar to those described, and present peculiar advantages, as the worms are not suffocated by masses of branches; while the heat and air have free circulation.

The French provide for the spinning of their cocoons a "cabin" of the following description:

Take a round willow basket, which dress with brush wood, putting the wood round two-thirds of the basket, and leaving the other third open for putting in the worms, and to give an opportunity to clear away their litter. Then pull the ends of the wood together at the top, so as not to press too close upon each other, and so tie them with a little twine or pack-thread, to keep them in their place; after which you put a paper cap, pretty large, upon the top of the wood, it having been found that the worms are fond of making their cocoons under a cover of this kind; as it affords an opportunity of attaching some threads of silk to the paper, which enables them to fix their cocoons the more firmly in their place. In putting up the cabins, on the stage erected for this purpose, the two rows of brush-wood at the extremities of the stage are made much thicker than the others, especially for 6 or 8 inches above the stage or shelf, to prevent the

\* The cut referred to here will be inserted with the next communication.—Ed.

worms from getting out at the ends and falling over the stage. In putting up the other two rows, you lay a piece of wood or reed across the stage for each row; and in putting up the brush-wood you make the first turn to the right and the second to the left; and so alternately, keeping the reed in the middle, which binds all fast. In dressing the stage with the brush-wood it is advisable to cover the pillars which support it, and to cover also the top of the stage with the same, that the worms may find a convenient hiding place wherever they wander. In constructing the cabins great care must be taken to put up the brush-wood in such a manner as to allow a passage for the worms between the different branches, which however, should not be too wide; and it is well to make a great number of the points or buts touch the shelf, because it affords the greater opportunity to the worms to mount.

Many people at Montauban put roses or sweet smelling flowers upon the pillars which support the stage, and in other parts of the room, with a view to sweeten the air.

In forming the arches of the cabins, there is always a little opening at the top of each pillar, occasioned by the curve or top of the circle. Care should be taken to make this opening pretty wide, because it has been observed that the worms make choice of this opening to fix themselves in forming their cocoons. The cabins may, in this way, also be made to accommodate a greater number of worms. The most irregular and crooked brush wood will make the best cabins. (The scrub oaks growing in many parts of this county would make fine cabins.) The tops should be intertwined, thus forming as many interstices as possible. (The materials for the cabins should be ever ready, that whenever the worms show an inclination to mount, you may always have a house to place them in.)

When the worms have commenced their spinning, care must be taken not to suffer the cabins to be touched; because, when they begin to work, the first operation is to fix many threads of silk to different branches to support the cocoon, and keep it in a proper poise. If, by any means, any of these supports are broken, the worm finds his arrangements deranged, and, becoming at once discouraged, abandons his cocoon, and throws out his silk at random, wherever he goes. Such accidents sometimes occur, by worms working in the same neighborhood crossing each other, though this is not often the case.

It sometimes occurs that worms, apparently as good as any, linger on the shelves and refuse to mount, the reason of which seems not understood. Such worms, however, will generally go to work and spin vigorously, if placed in a good position, and become quite lively when exposed to a moderate increase of heat, which it is always advisable to have the means of producing.

The spinning worms should be visited with great care and frequency, that no diseased worm be allowed to remain among the healthy ones, to become putrid, and vitiate the atmosphere, which should, above all things, be pure and well supplied with a free circulation of air.

Much care is required that no worms be placed in the cabins un-

till they are thoroughly ripe, which is easily determined by those accustomed to them, as they will refuse eating, commence crawling, and assume a transparent appearance, resembling a newly laid egg. This is peculiarly the appearance of the head and neck.

We must here terminate our views of Chinese silk culture. What has been said has been culled from much matter on the various topics introduced. To include the translation wholly, would have been impracticable; and to extract the sense of such a mass of confused indefinite scrapings has been intolerably tedious.

The *management of the mulberry tree* by the Chinese; their application of *artificial heat*; and the use of *heat* at the time of *spinning*, are subjects deserving our particular consideration.

Further than this, we have no remark to offer, either in commendation or otherwise, of Chinese practices in making silk. Our readers must judge of their value. What may be entirely practicable under their system of labor, may be wholly incompatible with ours. There will be found suggestions, without doubt, which may be turned to good account by American silk producers. We commend the whole to an attentive reading.

[To be continued in the next No.]

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