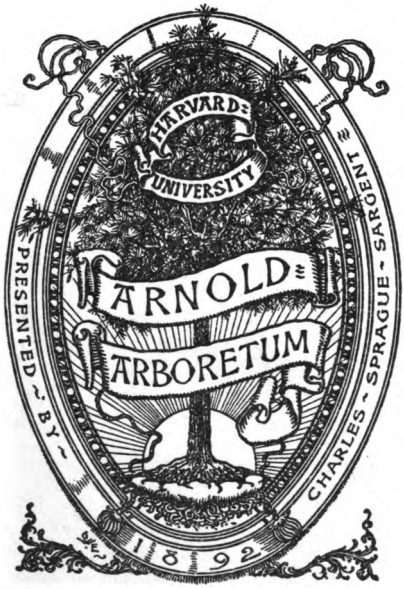


ESSAYS

ON

AMERICAN SILK,

AND THE BEST MEANS OF RENDERING IT A SOURCE OF INDIVIDUAL AND NATIONAL WEALTH.

WITH

Directions to Farmers for Raising Silk Worms.

BY

JOHN D'HOMERGUE,
Silk Manufacturer,

AND

PETER STEPHEN DUPONCEAU,
Member of the American Philosophical Society, held at Philadelphia, for promoting Useful Knowledge.

Knowledge is Power, and Information is Capital.
Report Comm. of Congress on American Silk.

Philadelphia:
JOHN GRIGG, No. 9, N. FOURTH STREET.
1830.

Printed by James Kay, Jun. & Co.
Printers to the American Philosophical Society,
Library Street, Philadelphia.

PREFACE.

The cultivation of the mulberry tree and the raising of silk worms have, for some years past, engaged in a remarkable manner the attention of the people of the United States. In every part of the country this important branch of agriculture is more or less attended to. Societies of various kinds have been established for its promotion. With the same views, acts of incorporation have been granted by the state legislatures*, and the national government themselves have not thought this object unworthy of their special patronage. The works of foreign authors on these interest-

* An act was passed on the 9th of February last by the legislature of the state of Delaware "to enable Everest Maury (an Italian) to introduce the production and manufacture of silk into that state." By that act a company was to have been incorporated with a capital of $50,000. Nothing, however, was done under it, and it appears that the scheme has entirely failed. The same legislature also passed a resolution exempting from taxation all lands employed in the growth of white mulberry trees with a view to the raising of silk, for ten years from the time of planting the trees, and promising a silver medal worth five dollars to every person planting and bringing to perfection within the state two hundred mulberry trees within five years from May 1, 1829.—This was probably intended in aid of the company above mentioned.

The house of representatives of Tennessee, on the 27th of Nov. last, passed several resolutions to encourage the culture of mulberry trees and raising of silk worms. I have heard of other states having taken similar measures, but have no certain information on which I can rely.

ing subjects issue in translations and abridgments from our presses; Manuals, and even periodicals, are published by American authors, all tending to produce the same result—the introduction of silk as a profitable object of culture into this country.

Notwithstanding these simultaneous efforts, we do not find that, except in the increase of mulberry trees and propagation of silk worms, they have yet produced any of the effects that might have been expected from them, and we are not nearer to manufacturing silk than we were before. Sewing silk, indeed, has been made for upwards of seventy years, and still continues to be made in the state of Connecticut and in some other parts of the Union; but this silk is of so inferior a quality, that it not only cannot be exported abroad, but cannot even find a cash price in our markets. It is disposed of in barter among the farmers, and is acknowledged not to be fit to compete with the same article imported from Europe, with which we still continue to be supplied. The reason of this is not in the want of ingenuity of the females, who, it is understood, exclusively attend to this manufacture, (for who ever taxed the Americans, male or female, with want of ingenuity?), but to their ignorance of the art of preparing this precious material, an art which can only be acquired by experience and practice, and which must be taught by a person skilled in it. Such persons are not to be obtained from foreign countries without the greatest difficulty. The sovereigns of Europe themselves have not been able to procure them without great sacrifices and considerable rewards.

It is also to be remarked that even if sewing silk could be made in this country, not only equal, but superior, to that which is imported from Europe, it would still be a losing business, because it is a well known fact, that the refuse of the cocoons, those which are called *imperfect*, and which

cannot be employed to any other purpose, are alone in other countries put to that use, while the silk of the good cocoons, when properly prepared, commands a high price even as a raw material; England and France purchase it in large quantities, particularly from China and Italy. France raises it at home, but by no means sufficiently for the consumption of her manufactures. Her annual importation of that article in the raw state is immense*. Her exportation of manufactured silk, according to a sensible American writer, (Mr Vernon of Rhode Island), is not less than five hundred millions of dollars; besides, says the same author, a much larger saving to the French nation from the quantity that she consumes at home†.

While the nations of Europe are at such pains and expense to procure the raw material, which they manufacture at home with immense profits, we, who are in possession of an extensive country, in every part of which that same material may be produced without stint or measure, and which may be said in that respect to be inexhaustible, are contented to purchase the manufactured articles, with which we might be supplied by only applying our own industry to our own produce, from those nations to whom nature has denied that produce, or bestowed it only upon them in small quantities compared to their wants. In this

* From a late statement of count Lasteyrie to the society of domestic economy at Paris, it appears that the value of *raw silk* used annually in France amounts to one hundred and twelve millions of francs, of which only fifteen or sixteen millions value is of French production, so that France pays nearly one hundred millions of francs (*twenty millions of dollars*) annually for foreign silk.—See National Gazette, Dec. 7, 1829.

† A Methodical Treatise on the Cultivation of the Mulberry Tree and Raising of Silk Worms, &c. abridged from the French of M. De la Brousse, with notes &c. By William H. Vernon. Boston. Hilliard Gray & Co. 1828. Page 11.

manner we expend annually the millions that we might make. Let me be permitted to enter here into some details.

The records of the treasury department inform us that in the year 1821 manufactured silks were imported into this country to the amount of $4,486,924, and in 1825, by a gradual increase, to that of $10,271,527, making in the course of five years more than *thirty-five millions of dollars*, of which about eight millions only were exported, leaving twenty-seven millions to be consumed at home and to be *paid for*. It appears, however, from the same documents, that, owing probably to the general stagnation of commerce, the importation of silks has lately suffered diminution, since during the year which ended on the 30th of September 1828 their importation amounted only to $8,433,563, of which $1,274,461 were exported; but in the same year the exportation of bread stuffs from this country amounted only to $5,414,665, leaving a balance against us of about two millions: among these last importations there is an item of $608,709 in one year of *raw-silk*. This remarkable fact, extracted from the treasury report, is recorded in Hazard's Register of Pennsylvania, October 10, 1829*.

It was, no doubt, the consideration of this state of things which induced the national government, in the year 1826, to give that strong impulse to the culture of silk in this country, of which we see the effects in the attention which is paid to it throughout the Union. But the efforts which are now making will soon spend themselves, unless they are directed to some profitable end. The people

* It is not probable that all this raw silk is consumed at home; it is rather to be supposed that part of it is exported. We know of some having been sent to Vera Cruz; a considerable quantity, however, is employed in this country by fring- makers and others, who import or purchase it at high prices.

will at last get tired of planting mulberry trees and raising silk worms, if they can find in it no advantageous result. The late administration has raised a spirit which must be profitably employed, otherwise it will quickly vanish, and when called may not appear again. The government has encouraged the people of the United States to plant mulberry trees and raise silk worms, and the people have done it. They have now a right to ask, what shall we do with these things?

It may not be improper to review here the course which was taken by the national legislature in the session of 1825-6. On the 29th December 1825, Mr Miner, of Pennsylvania, moved that the general subject of the culture of silk should be referred to the committee on agriculture, and that they should inquire "whether any legislative provisions were necessary or proper to promote its production."*

The committee, on the 2d of May following, made a report which is replete with interesting facts. They did not fail to bring into view the large quantity of manufactured silks imported into this country, compared with the small amount of the exportation of bread stuffs. They stated what is very true, that silk might be raised with facility in every part of the United States, and showed by facts that in several parts it was already raised of a superior quality in considerable quantities. The question now presented itself—what was to be done further to encourage the raising of that article? It seems the answer was obvious: make it the interest of the cultivators to pursue that branch of industry, and let them alone. They had already produced silk of a fine quality. The committee had seen *beautiful* specimens of sewing silk made out of it in Connecticut. It

* See Appendix A.

was not instruction, therefore, that they stood most in need of, so far as it respected the raising of that article; what they chiefly wanted to know was how to make it profitable to themselves; for if the whole territory of the United States were covered with the most beautiful cocoons, they could be of no kind of use without the means of employing them. The first question therefore to have been examined was, what should be done with the cocoons after they were raised?

The committee seem to have thought that nothing was so easy as to manufacture silk, if a sufficient quantity could only be obtained, and that the art could be learned by books, if their contents should be properly condensed into a small volume. On this supposition they recommended that the secretary of the treasury should be directed to prepare a *Manual*, containing the best *practical* information that could be collected on the growth and *manufacture* of silk, and to lay it before congress at their next session.

The Manual was prepared and laid before congress on the 11th February 1828, and six thousand copies of it were ordered to be printed. Nothing, however, has resulted from that publication. Sewing silk continues to be made in Connecticut, as it has been for seventy years before; but no improvement appears even in the manufacture of that article, which is still disposed of in the way of barter, as it was before, but cannot command a cash price in the markets. This is not extraordinary, as sewing silk, such as is imported from Europe, cannot be made without the use of complicated machinery, which is here entirely unknown; nor can it be made even with the use of those machines, unless it is first properly reeled from the cocoons, and made into what is called raw silk, which is also an art to be learned from those who have long practised it. A few reeling machines have been imported from Europe; but there being no persons who knew how to

make a skilful use of them, the art has not been improved, but remains stationary, for want of *practical* knowledge, which no genius can divine and no ingenuity supply.

In the meanwhile, encouraged by the interest which the national government appeared to take in the culture of silk, and no doubt in hopes of some proximate advantage, the farmers and planters of the United States have been employing their industry in the production of that article; but (excepting the sewing silk above mentioned) there is no use for their cocoons, which lie rotting in their hands, and the consequence must be that so unprofitable a branch of industry will soon be abandoned.

It is evident, therefore, that in order to keep alive the disposition which is now manifested throughout the United States towards the culture of silk, some means must be found to render it profitable. M. D'Homergue has proved in the following essays, that this can only be done at the present moment by the preparation of raw silk, in the form of a merchantable article, which will find a ready and an advantageous sale in Europe, where it is much wanted, and in time will be employed by our own manufacturers, in the fabrication of silk stuffs, which will prove an immense source of riches and prosperity to our country. If the cocoons could be exported in their natural state, and could be compressed like cotton, there would be nothing to be done at present but to plant mulberry trees and raise silk worms, and we should find ourselves at once in possession of a rich article of commerce; but it is well known that cocoons cannot be transported across the ocean, where they are liable to become mouldy, besides that their great bulk would make that trade unprofitable, by reason of the cost of transportation.

I have heard it objected, that it is too soon for us to begin the preparation of raw silk, or the manufacturing of it

into any form. The reason that is alleged is that the quantity of silk worms raised in this country is yet too small; that this measure should be postponed until the time when there will be a sufficient supply of cocoons to carry on the business to some considerable extent. But those who speak thus do not consider that the raising of silk worms cannot be effectually encouraged unless it is shown that some profit can be made by it. Fifty pounds of raw silk, sold at a reasonable price in one of our great sea ports, and quoted in the prices current of the day, and a regular market established for the purchase of cocoons, would produce more mulberry trees and more silk worms throughout the country than all the recommendations of legislative bodies, and all the medals and premiums awarded by patriotic societies. I can, indeed, see no other way to prevent the planting of mulberry trees and the culture of silk from being entirely abandoned, as has been repeatedly the case in this country, as well as in Europe*. I think there are mulberry trees and silk worms enough in this country, at least for a beginning, and I have reason to believe that there are more than is generally supposed. Let us only begin with what we have, and I have no doubt

* Count de Hazzi, of Munich, in his Treatise on the Culture of Silk in Germany, a translation of which was presented by that zealous patriot, Dr James Mease, of this city, to the house of representatives of the United States in 1828, and published by their order, informs us that the white mulberry was formerly cultivated in that country, and particularly in Prussia, to a very great extent; but that its culture was abandoned for want of encouragement, and it was found extremely difficult to resume it. It is well known, also, that it took a considerable start in this country, when filatures were established in Georgia and Pennsylvania, and also at the beginning of the settlement of the colony of Virginia, and it is only within the last four or five years that it has drawn again the attention of our citizens. Similar causes will always produce similar effects.

that in a few years the United States will abound in silk worms and cocoons, which may be easily transported to any points of this vast continent where filatures may be established. At the same time the art of reeling will diffuse itself through the country. The beginnings, I admit, will be difficult, and require encouragement; but the prize is such as will justify any efforts, and I might even say any sacrifice, which will be richly rewarded in the end.

The art of reeling silk from the cocoons, so as to convert it into a saleable article, is only known in China, in Bengal, in the Turkish dominions, in Italy, and in the south of France, where silk worms are raised in considerable quantities. It is not known in Great Britain, where the climate is not suited for that culture, and their manufacturers are obliged to purchase their raw silk of the nations who produce it. Hence their silk manufactures can never compete with those of the countries where the material is raised. Of this they were so sensible that they made various attempts before the revolution to introduce into their continental colonies, not only the culture of the mulberry tree and the raising of the silk worm, but also the *filature* or *reeling* of raw silk, without which the other branches would have been of no use to them. They succeeded to some extent in the state of Georgia* by means of an Italian artist whom they found the means to engage. In the year 1736, a quantity of raw silk reeled in that colony was organzined at Derby by sir Thomas Lombe, mentioned in the 15th number of the following essays, manufactured into a piece of stuff and presented to the queen. During about thirty years, owing probably to the want of capital, the undertaking languished; a few years, however, before the revolution, considerable quantities of raw silk began to be ex-

* Manual published by order of the house of representatives of the United States, p. 14.

ported to England, which was found equal to the best silk of Piedmont, and to be worked with less waste than the China silk*. In 1766 more than twenty thousand pounds of raw silk were imported into England from Georgia†.

In the year 1769, on the recommendation of Dr Franklin, through the American Philosophical Society, a filature of raw silk was established at Philadelphia, by private subscriptions, and, I have been told, under the direction of a Frenchman who was said to be skilled in the art; but no result of any consequence appears to have followed from that undertaking. The revolution came and put an end to these promising exertions. There is little doubt to be entertained that if the United States had continued to remain British colonies, the culture of silk would have made an immense progress in this country, because its promotion was a matter of vital interest to the mother country, whose manufactures would have been furnished from hence with the raw material, which they are obliged to purchase at a great expense, drawing very little from their dominions in Bengal, where it seems it is imperfectly prepared‡.

The conclusion seems unavoidable, that the only means by which the culture of silk can be not only encouraged, but rendered profitable in this country, is to establish filatures for the reeling and preparation of the raw article, so as to make it saleable abroad, when it will find a ready market in all the countries of Europe where that article is manufactured, and will be the means, by gradual steps, to introduce among us the manufacturing of silk stuffs, and prove in the end an inexhaustible source of riches to our country.

The object of the following essays is to develope these views, and to lay before the American public a mass of de-

* Ibid, p. 15. † Ibid, Report, p. 3. ‡ Ibid, p. 172.

tails, which it is hoped will be found not less useful than interesting. The author, M. D'Homergue, is a young Frenchman, the son of an eminent silk manufacturer at Nimes, in Languedoc. Although he has since chosen another profession, he was originally brought up to his father's business, and has been initiated in all its mysteries. It will not be easy to perceive, by reading his essays, that he unites to experience in his art a strong and solid judgment, with a clear view of the interest of this country, and of the best means of pursuing it.

M. D'Homergue came to this city from France, in the month of May last, at the instance of an association whose object is the promotion of the culture of silk and the raising of silk worms. From causes, which it is unnecessary to mention, differences arose between them, and a law suit followed, which is now pending, and of the merits of which it would be improper for me or for him to speak. I became acquainted with him shortly after his arrival. We had not long conversed together before I became convinced of his profound knowledge in the art he professes, which I could easily judge of by the clearness and consistency of the answers that he gave to the questions I put to him. I conceived that he would be a real acquisition to this country, if he could be induced to remain in it; but at any rate, whether he did or not, I was unwilling that the benefit of the information which I received from him, on a subject of which I had before but a superficial knowledge, should be lost to the American public. He communicated to me some experiments he had made on American silk, by which it was proved to be greatly superior to that of other countries; and I proposed to him to make their results known through the medium of the National Gazette. As he does not know the English language, I offered to be his amanuensis, and thus the first number of these

essays was published in his name, and under his signature. In the same manner were produced the subsequent numbers, in which I condensed, as well as I was able, the information that I received from him from time to time, with some accessory matters, gathered from various sources, and which the reader will easily discern. As to the general views pointed out in the essays, they arose in conversation between us, and whatever merit or demerit they may possess, we are both willing to share. The public will judge of the soundness of the principles upon which they have been based.

These essays have attracted considerable notice, and have been reprinted in the newspapers of almost every state in the Union. The subject is, indeed, one of the most important and interesting to this country, as it points out the means by which this nation can avail itself of a rich and abundant source of individual and national wealth. It has been thought, therefore, that a republication of them in a more convenient form, with suitable additions and amendments, would not be unacceptable to the public. Indeed, the expectation that they would so appear has been manifested from several quarters, and there is little doubt, from the interest which the subject has already excited, that the publication will be favourably received.

Whether M. D'Homergue will remain in this country or return home to France, where he has left a profession and an establishment*, is a matter not yet ascertained; I earnestly wish that he may, and that such an opportunity of benefiting our country may not be suffered to be lost.

* M. D'Homergue, when he left France for this country, was an advocate, and also the editor of *Les Petites Affiches Marseillaises*, an advertising paper published at Marseilles, three times a week, and the only one, I am told, of that description in that city. His inclination for what he considered more liberal pursuits had made him abandon the business to which his father had at first brought him up.

If, however, after the decision of the suit that detains him here, he should determine on going back to his native land, he will leave behind him what will entitle him at least to be kindly remembered.

M. D'Homergue, in fact, has been the first to discover the great superiority of American silk over that of any other country, and ascertained the fact, that while in France it requires twelve pounds of cocoons to produce one pound of raw silk, eight pounds will in this country be amply sufficient to produce the same quantity. Experiments made long since in Georgia, it is true, had given the same result, but they were insulated, and had excited no particular attention. In the Manual published in 1828, under the authority of the house of representatives of the United States, as has been above mentioned, the author (pp. 105, 106) has inserted those experiments in detail, as extracted from the manuscript of the late Col. Habersham, and has subjoined similar ones made in France and Italy, with their results, extracted from various foreign writers, and those results in general correspond with the statements of M. D'Homergue*; but neither that author, nor any body else, appears to have perceived the great advantages of American silk over others, although the facts were before their eyes. The reason is that it required a practical man to make this important discovery; one well acquainted with the properties of foreign silks, and enabled, by his own experience, to take a clear comparative view of them with our own, and decide on both.

M. D'Homergue has moreover pointed out to us the

* If the reader should wish to be convinced of this fact by referring to the Manual, he will be pleased to correct an error in page 106, where the French pound is said to be of 12 ounces, whereas it is invariably of 16. The Italian pound, like that of the ancient Romans, is of 12.

best means of employing the American silk to advantage. For more than half a century a few of our states had been employed in the unprofitable work of manufacturing an inferior kind of sewing silk. M. D'Homergue has clearly shown the disadvantages of this course, and demonstrated the great profits to be made by confining ourselves for a while to the preparation of raw silk, which might afterwards be extended to every kind of manufacture. This was the course which the English, who well knew their own interests, pursued before the revolution, by establishing filatures in Georgia and Pennsylvania; since that time that policy has been abandoned, perhaps for want of the proper means, for I cannot believe that it has been entirely forgotten. It is certain that filatures cannot be established in this country without foreigners to direct them and to instruct our women in the art, and that it is at present, and has been at all times, very difficult to obtain such aid. But it is no less true that there is no other way to introduce the manufacture of silk into the United States, or to make that article at all profitable. This difficulty must be, and it is to be hoped will be, overcome in some manner or other. If M. D'Homergue should be induced to stay among us, he will be an acquisition to this country, the value of which is incalculable. He is young*, active, industrious and is well acquainted with all the branches of the silk business. Such another person is not easily to be found, even in Europe; and if found, cannot be easily persuaded to abandon his country.

However this may be, M. D'Homergue has laid open in these essays the great outlines of the silk business, from the preparation of raw silk to the fabrication of fine stuffs, and by the light which he has thrown upon these compli-

* M. D'Homergue is only 25 years of age.

cated subjects, he has guarded us against the impositions of pretenders to a knowledge which they do not possess. It is now impossible for quacks to deceive this country on the subject of silk. Every one who reads these essays will be able to detect them.

By the directions to farmers for the raising of silk worms which M. D'Homergue has subjoined, he has communicated in a few pages, and in a clear and perspicuous manner, all that seems essential to be known on that subject to the American farmer, at least at the present moment. This he has given in plain and intelligible language, such as should be addressed to those for whom his advice is chiefly intended. Having observed that excellent cocoons are raised in this country, without any of the expensive and troublesome apparatus recommended by foreign and even by American writers, he has concluded that they might well be dispensed with, and therefore he has laid aside thermometers, hygrometers, graduated heats, fumigations, and many other things, and aimed at attaining his object with the least possible trouble and expense. His rules are all plain and simple, easy to be understood, and presenting no difficulty in the practice. They are suited to the climate and temperature of our country and to the habits of the American people. They may be improved hereafter, if experience should show the necessity of it. For the present they appear to be sufficient.

These are real services rendered by M. D'Homergue, and for which I am persuaded that he will be gratefully remembered. It is worthy of remark, that since the essays have been published, and they have been reprinted in almost every state in the Union, no one has ventured openly to contradict any of the facts, statements, or even opinions that they contain. It is proper also to mention that M. D'Homergue has no pecuniary interest in the pub-

lication of this work, having only reserved to himself a certain number of copies for gratuitous distribution.

For my part, I claim no other merit than that of having lent my feeble aid to the communication of knowledge not my own, which I consider of the greatest importance to be disseminated through this country, and which I am satisfied will in time produce rich and abundant fruits. If by this means it should be my good fortune to have connected my name with the introduction of silk and its various preparatious and manufactures into the United States, and with the immense benefits that they will ultimately produce, I shall have attained an object of honourable ambition, which kings might envy and patriots only can appreciate.

PETER S. DUPONCEAU.

Philadelphia, December 31, 1829.

CONTENTS.

GENERAL DIRECTIONS TO AMERICAN PLANTERS AND FARMERS FOR THE RAISING OF SILK WORMS.

APPENDIX.

A.

B.

AMERICAN SILK.

No. I.

Experiments on American silk.—Its beauty and fineness.—Its superiority over other silks in quantity as well as quality.

The subscriber having received a part of his early education in an extensive manufactory of silks, at Nimes, in France, and by that means having become familiar with all the processes of that kind of manufacture, from the raising of the silk worm, and reeling off the silk from the cocoons, to the fabrication of the most delicate stuffs, has thought that it would not be unacceptable to the American public to lay before them the results of some experiments that he has made upon the produce of the American silk worm, in the short space of less than two months that he has been in this country. These results are truly surprising, as they show a superiority in the silk produced by the American worm, (at least in Pennsylvania), over that of any other country that he has ever seen, which he was far from expecting when he began his experiments, and which, he believes, no one had yet suspected or imagined. They promise an immense source of riches to the United States.

Those experiments were made at the farm or place of Messrs Ter Hoeven, a Dutch family, who have a small but thriving nursery of silk worms in the vicinity of Philadelphia.

The first thing that struck the subscriber was the extreme fineness of the silk which he extracted from the cocoons. They were of the white species, and of a dazzling lustre. The white cocoons appear to be numerous in this country, and their silk is truly beautiful*. But it is not in quality only, but also in the quantity of the material that they produce, that they surpass those of other countries. The following experiments will show what a mine of wealth is opened to American industry.

EXPERIMENT I.

Weight of the cocoons.—One cocoon without chrysalis was found to weigh six grains. Three cocoons, also without chrysalis, weighed together eighteen grains. The cocoons were not selected, and were taken at hazard. This weight is superior by near one half to that of the cocoons of Europe, and this experiment shows that the American cocoons are nearly equal in weight; whereas in Europe, there is a pretty considerable inequality between them.

EXPERIMENT II.

Produce of the cocoons.—Eight ounces of cocoons with their chrysalides, not selected or picked, produced two ounces of raw silk of the first quality. It would require more than one pound of European cocoons to produce the same result.

* I would advise the cultivators of silk to dispose of their yellow and green cocoons, whenever they can, and keep only the white for reproduction. This cannot well be done in Europe, where the quantity of coloured cocoons is too considerable; but in this country it might, I think, easily be effected, and great advantages would result from it.

EXPERIMENT III.

Proof of Experiment I.—Seventy-five cocoons, without chrysalis, weighed together 450 grains, which gives exactly six grains for each cocoon. These, however, were in some degree selected, though not with any great care. These 75 cocoons produced 419 grains of raw silk, superior to those of France and Italy. This may appear extraordinary, but it may be attested by several persons of respectability who were present.

EXPERIMENT IV.

Produce of bad cocoons.—Thirteen bad cocoons, with their chrysalides,—(by bad cocoons is meant those of which the worms have suffered from want of care or proper feeding),—have produced 47 grains of superb silk.

The weights used in these experiments were French weights of sixteen ounces to the pound.

The subscriber will content himself at this time with laying the foregoing experiments before the public. He may, perhaps, at a future day, present them with some of the results of his experience in this branch of business, which he thinks may not be useless if it should be thought advisable to introduce it effectually in this country.

J. D'HOMERGUE.

Philadelphia, July 13, 1829.

P.S. Since the above was first published, the subscriber has seen cocoons raised in the vicinity of Norfolk, in Virginia, and of Camden, South Carolina, of a very large size, and the silk of which is extremely beautiful. This has convinced him that the country south of the Potomac is admirably calculated for

the production of silk, while the north possesses all the advantages for the establishment of manufactories.

No. II.

Further experiment with similar results.—Object of these essays.

The liberal manner in which my former observations have been received by the patriotic editor of this journal*, and the interest which they appear to have excited among the enlightened friends of the prosperity of this country, have encouraged me to proceed in laying before the public some further views, which, I flatter myself, will not be found without some degree of utility.

I am a foreigner and a stranger in this country, and my residence in it has been but short; I shall nevertheless have to speak of what has been hitherto done by the citizens of America to introduce the silk worm, and, to some small extent, the manufacture of silk into the United States. In so doing, I shall speak with the caution and modesty which becomes me, from the lights (no doubt very imperfect) which I have been able to obtain; and if

* The National Gazette, in which these essays were first published: I owe a tribute of thanks to its distinguished editor, for the truly patriotic zeal with which he entered into the spirit which dictated them, and the flattering manner in which he repeatedly recommended them to the attention of his readers.

I shall commit unavoidable errors, I hope they will be forgiven, in consideration of the motives by which I am induced to communicate the results of my practical knowledge, for I pretend to no more.

Since my last communication I have made an additional experiment, at the same place where the former was made, in the presence of a gentleman, who has permitted me to mention his name—Mr Duponceau, of this city, and his family. The result has confirmed the former ones. I put seventeen bad cocoons into the tub, in order to reel the silk from them. Five of these cocoons immediately filled with water and were useless. The remaining twelve produced fifty grains of beautiful silk, which I have left in the possession of the gentleman above mentioned.

From the best information which I have been able to obtain, I believe that the same quantity of silk has never yet been drawn from the American cocoons, any more than silk of the same fine quality, and that for reasons which I shall have occasion to mention*. Nor is this to be wondered at. American genius and industry (to which the world is already indebted for so many useful inventions and discoveries), have been exerted to the utmost; but *practical knowledge* was wanting, and what has cost Europe the experience of ages to acquire, no genius or talent could supply in the short space of time that has elapsed since this happy country has had the control over her destinies.

The knowledge that I am speaking of, it is out of the power of books to communicate. Practice, long practice, is indispensably required. The mode

* Since the above was first published, I have learned that experiments were made in Georgia before the Revolution, which produced similar results; but they do not appear to have excited any particular attention.

of raising the silk worm, indeed, may perhaps be acquired by theory aided by diligent observation. But beyond that all is art,—complicated, difficult, and requiring experience and practice. The knowledge of it, in its extent, is in Europe confined to a few whose business it is to direct the works. Those who execute the details, in their various branches, can only instruct in the parts which the minute subdivision of labour has assigned to them.

It will not be, therefore, the art of extracting silk from the cocoons in its various qualities, or that of manufacturing the silks into threads or stuffs, that I shall undertake to teach in these successive communications. That would be attempting what is admitted to be impossible. But I think I can present views respecting the use to be made of the immense riches that Heaven has bestowed upon this country, which I hope will not be thought uninteresting, and I can flatter myself that they will be found conducive to the national prosperity.

What astonished me most, when admiring the beauty of the silk produced by the American cocoons, and its great superiority, both in quantity and quality, over those of Europe, was that these results should have been obtained in a country which more, perhaps, than any other, is liable to those sudden changes of temperature which theoretical writers as well as practical men, agree to be of all things the most injurious to the health of the silk worm. I am as yet at a loss to conceive how the American farmers do to prevent the worms from feeling the effects of those changes. This requires more care, attention and sagacity than might be believed by those who are not acquainted with the constitution of that delicate insect. I doubt much whether it will be credited at first in Europe, when the fact shall be made known there. All I can say is, that it has excited the astonishment of gentlemen from France, well ac-

quainted with the silk business, who would not have believed it if they had not been present at my experiments.

From what I have said of my not having yet been two months in this country, it may be asked, perhaps, how I came to write in the English language, with which I confess I am unacquainted. I shall only say in answer to this question, that the language of these communications is not my own, and that a gentleman of this city, to whom I impart my ideas from time to time, has the kindness to clothe them in his own words, which he afterwards translates to me, as literally as possible, and to which, when possessed of the full meaning of every sentence, I affix my signature.

J. D'HOMERGUE.

July 18, 1829.

No. III.

Importance of the subject.—Encouragement and rewards given to foreigners by the sovereigns of Europe for introducing the culture and manufacture of silk.—France.—Prussia.—The Netherlands.—Mexico.—England.—Filature established at Philadelphia in 1770.

It is the privilege of every writer to endeavour, by preliminary observations, to convince his reader of the importance of his subject. In the present case, there is perhaps less need of this than in any other that may be submitted to the American pub-

lic. The immense riches which some nations of Europe, particularly France and England, have derived and are deriving from the silk trade, are within the knowledge of all who have attended to the general affairs of the world. Nevertheless, as I have been informed that it was not without considerable pains that the inhabitants of the United States were convinced, some 30 years ago, of the importance of the article of cotton, to which they owe in a great degree their unexampled prosperity, I shall not forego the good old custom, and shall show, by some examples, what exertions have been made and what expense incurred by other nations to introduce the silk worm and the manufacture of silk into their respective countries.

It is well known that for several centuries, Greece at first, and afterwards Italy, were the only European countries that produced the article of silk and silk stuffs. France followed by slow degrees. Henry IV. was the first of her sovereigns who encouraged that branch of industry with a liberality worthy of that great monarch. He invited one *Michaeli* from Italy into his dominions, and gave him, for the purpose of forming an extensive plantation of mulberry trees and raising the article of silk, the castle of the old Marquis de Fournes, situate on the river Gardon, in the vicinity of Nimes; and the place, which has passed into other hands, still bears the name of *Michaeli's castle*. This ingenious foreigner was the first who began the manufactories of silk stuffs that now enrich that city; and tradition informs us that the king expended on those establishments the immense sum of near one million and a half of French livres, which are equal to about three hundred thousand dollars, an enormous sum in those days. Of the manner in which the great silk manufactories of Lyons were first established I am not so well informed.

Those of Great Britain began at a later period.

They have been of slow growth, and were more promoted by individual exertions than by the aid of the government. Encouragements, indeed, by bounties, high duties, prohibitions, and the like, were freely given; but the rest was abandoned to the spirit of enterprise for which that nation is so conspicuous, which at last produced the brilliant success that we now witness.

In later times, and since the termination of the wars which grew out of the French revolution, the sovereigns of Europe, even of those countries whose climate would rather seem to forbid such undertakings, have turned their thoughts to that branch of trade from which their neighbours have derived so much riches. The King of Prussia has made considerable sacrifices to introduce into his states the culture of the mulberry tree, and the manufacture of silk stuffs. He has, at a great expense, procured skilful Italians to migrate into his dominions; he has patronized and encouraged them; and I am informed that by means of those exertions, that branch of business in the Prussian provinces already begins to excite the jealousy of other nations.

The King of the Netherlands, for the same purpose, invited from Spain the chevalier *Barramendy*, and assigned to him the castle of *Manoge* in the vicinity of the town of *Ath*, at the distance of ten leagues from Brussels, with a number of acres of ground belonging to it, which he has planted with the white mulberry tree. The king supplied him with considerable sums of money, as well from his privy purse as from the public treasury. The silk which was made from the cocoons produced upon this establishment proved, however, as I have been assured, of a very inferior quality. Nevertheless, the minister of the interior, *Van Gobhelschroy*, and the inspector of the national manufactories, Mr *Nettscher*, continue to encourage this undertaking. The

Prince of Orange himself, the presumptive heir to the crown, went in person to *Manoge* to inspect the establishment, and give it the sanction of his patronage.

In the new republics of America the same spirit appears to prevail. Messrs *Chabaut* and *Latour*, of Nimes, my native town, were called to Mexico some years ago to introduce the culture of silk. What success they had I do not know*. They died in that country, and it is generally understood at Nimes that they both died rich.

But I have to relate a more striking fact, of which, by a circumstance which could hardly have been expected, the proof is here at hand. I have said that in Great Britain the high degree of prosperity to which the manufacture of silks has risen had been obtained chiefly by individual exertion. Here is a remarkable instance of it. In or about the year 1823, a Mr *Despoulies*, a silk manufacturer of Lyons, went over to England, at the instance of individuals, for the purpose of introducing there some particular branches of his art. At the end of a twelvemonth he returned home, with the sum of *thirty thousand pounds sterling*. He was prosecuted by the government for having introduced into a foreign country the arts and industry of his own. The trial took place at *Boulogne sur Mer;* but, by the skill of his advocate, the defendant and some of his companions who were joined with him in the accusation,

* I have been since informed that they make beautiful sewing silk at Mexico, which has been acknowledged in France to be superior to that of that country. The French manufacturers said they could easily make such silk; but it would cost them too much. I presume the Mexicans employ their best material in that manufacture, perhaps because they have not yet learned to put it to a better use. I am informed also that raw silk from China has been exported from this country to Mexico, and sold there at a great profit, although it be very inferior to that of this country. I have heard that it was sold at eighteen dollars a pound.

were fortunately acquitted. One of those gentlemen, who was a defendant in the suit with Mr Despoulies, is now respectably established in this city, and by him I have been informed of the facts which I have stated.

The importance of the silk business was felt in Pennsylvania before it became an independent state. In the year 1770, the American Philosophical Society took up the subject, and petitioned the Legislature to provide, during five years, the annual sum of £500 for the encouragement of the filature of silk from American cocoons. This, however, was not carried into effect. By the exertions of individuals, the sum of about £900 ($2400) was raised by private subscription, and a filature was established at Philadelphia; but the undertaking was shortly afterwards abandoned*, most probably for want of persons skilled in the art, and able to extract such silk from the cocoons as, had it been produced, would infallibly have been greedily purchased by the British manufacturers, and its further production immediately and effectually encouraged by the government of Great Britain.

J. D'HOMERGUE.

July 21, 1829.

* I have been told that a Frenchman skilled in the art of reeling silk from the cocoons, was employed in that establishment. Who he was, or what became of him afterwards, I have not been able to learn. I have not heard of any raw silk having been prepared at this filature, or sold out of it; yet I have been told that a lady of this city had a *negligee* dress manufactured in England out of silk of her own raising. The lady's name was Roberdeau.

No. IV.

Subject introduced.—Raw silk.—Its various kinds for the manufacture of fine silks.—Singles, organzine and tram.—Raw silk a profitable article of commerce.—Error of an English silk broker.—Organzining of silk.—Throwsting mill.

I now proceed to the main subject which I have undertaken to elucidate. I shall endeavour so to arrange the explanations that I shall give, that each number may facilitate the intelligence of those that are to follow. This is indispensable, when speaking of an art complicated in its nature and in its details, and the language and phraseology of which are only understood by those who are skilled in it.

The art of the silk manufacturer, taken in its most general point of view, consists of three principal branches.

1. The first is the art of extracting from the cocoons, by the process of reeling, or filature, as it is called, the greatest possible quantity of silk of the different qualities used in the manufacture of silken stuffs, and so to extract it that it may, after undergoing other processes hereinafter to be mentioned, be safely and advantageously employed in those manufactures. The article thus produced, and wound into skeins, is called *raw silk*. It is the raw material of which silk stuffs are made, from the velvet down to the levantine.

There are three qualities of raw silk, graduated according to their different degrees of fineness. While in that shape, and until they have undergone the operations that are to fit them for the loom,

they are called first, second and third, beginning with the finest. They assume other names as soon as they have been prepared and made fit to be used by the manufacturer. Then they have ceased to be *raw silk*, and they are called *singles*, *organzine* and *tram silk*, according to their different degrees of fineness and the manner in which they have been passed through a certain machine called a *mill*.

Singles, called in French *le poil*, that is to say *hair silk*, are made of the first quality of raw silk, consequently the finest, as the name sufficiently implies. They are made of a single thread. This silk is used for the *woof* of the lighter stuffs, the *warp* of which is made of cotton thread.

Organzine, in French *organsin*, is the next in fineness. It is employed in weaving to make the *warp* of those stuffs that are made entirely of silk*.

Tram silk, called in French *la trame*, or *soie de trame*, which means *woof silk*, is the thickest of the three, and is the thread of which is made the *woof* of silk stuffs. It seems the English have preferred retaining the French name to translating it.

Of the three qualities of raw silk of which those different threads are made, the second, that which makes *organzine*, is the most in demand in foreign markets. The silk which I have extracted from American cocoons, as mentioned in former numbers, is of that quality. In performing those operations, I have for the first time discovered the superior fineness of the American silk, by finding, to my great astonishment, that it required a much greater quantity of threads to produce the different qualities of

* I am informed that those samples have been much admired by the merchants at Lyons, who have sent them to Nimes to be organzined. No answer from Nimes has been yet received. Other samples of American raw silk were also sent to Lyons by the late President Mr Adams, through a gentleman residing in this city. The silk was found beautiful, but not properly reeled, and not fit to be organzined.

raw silk above mentioned, than with the cocoons of Europe. Singles, or hair silk, made of the same number of threads as in Italy or France, would be almost impalpable and entirely unfit for use. This superiority will give to the American raw silk a great advantage over all others.

Raw silk is an article of commerce of great value to the countries that produce it. Great Britain imports it for the the use of her manufactures from Bengal, China, Turkey, and Italy, to the amount of one million eight hundred thousand pounds sterling annually. France imports it to the amount of one hundred millions of francs, and makes it herself to the amount, it is said, of sixteen or eighteen millions more. A Mr *Enoch Durant*, a silk broker in London, on his examination before a committee of the House of Commons, in 1821, ventured to say that no *organzine silk* is made in France. Whether by that expression he meant the raw material from which organzine is made, that is to say, raw silk of the second quality, or that that silk was not prepared there for the loom in the form called *organzine*, he was equally mistaken. The mulberry tree and the silk worm are extensively cultivated in France, and with great success, and the raw silk is manufactured there in all its possible shapes. I could not help noticing such a strange assertion thus made in the face of a British parliament and of an enlightened world.

Be that as it may, if France does not make the kind of silk which Mr Durant calls *organzine*, she will have the more to purchase from this country. The beauty of the silk which I have extracted from American cocoons, has already attracted the notice and excited the admiration of some of the most eminent French silk merchants who reside here and in New York; and they have applied to me for samples which they have transmitted to their correspondents

at Lyons and Nimes, who no doubt will be equally astonished at the singular beauty of this American production*.

2. The next branch of the silk manufacturing business is the *organzining* or preparation of the raw silk for the weaver's loom. This is done by a number of distinct and successive operations, performed by different machines, the principal of which, the *mill*, or *throwsting mill*, as it is called, has never, that I have heard†, been introduced into this country, and yet cannot be dispensed with. The silk, when thus prepared, is said in French to be *moulinée* or milled; in English it is called *organzined* or *thrown silk*. These operations are nice, difficult and complicated; their methods vary according to the kind of silk that is to be produced, whether organzine or tram silk. Singles do not require to be organzined. The success of these operations depends much on the manner in which the raw silk has been prepared before it is brought to the mill. After going through these various processes, the silk is wound into short skeins, for the greater facility of the weaver, and, after being dyed, is fit to be immediately employed in the manufacture of silk stuffs. I shall not undertake here to describe those processes, as it is entirely foreign to my object; and no descriptions that I can make could supply the place of skill, experience and practice.

3. The last branch is the weaving and manufacture of silk stuffs in all their varieties. It is sufficient for my purpose to indicate it.

Having thus shown, as briefly as I have been able, the use that is made of the fine silk extracted from the cocoons, I shall proceed in my next number to speak of those articles that are manufactured from what is called the *floss*, and from waste and refuse silk.

J. D'HOMERGUE.

July 23, 1829.

* See note above, p. 13. † But see below, No. XVII.

No. V.

Nothing lost in the silk business.—Perfect and imperfect cocoons.—All find employment.—Sewing silk made out of imperfect cocoons.—Its different kinds and uses.—Cannot be made perfect without the throwsting mill.—Its introduction into France by Benay.—How rewarded by Louis XIV.—Connecticut silk.—Refuse and waste silk or *floss*.—Its preparation and use.—Recapitulation.—Six different kinds of raw silk.—How this business is managed in France.—Difficulty of obtaining workmen from the countries which possess them.

All cocoons are not fit to make the three qualities of fine silk mentioned in the next preceding number, and which are the principal, the great staple of the silk trade; but it is the peculiar advantage of the material produced by the labour of the silk worm, that there is no part of it, however apparently worthless, that is not put to some profitable use. In no branch of human industry is the excellent precept of the Gospel more religiously followed than in the silk business: "Gather up the fragments, that nothing be lost." This number will be devoted to exemplifying this assertion.

There is a great variety of what are called *imperfect cocoons*, whose threads are not susceptible of being prepared for the manufacture of silk stuffs. They are called in French by the generic name of *choquets* or *chiques*. The limits of these essays do not permit me to enumerate or describe them; nor is it necessary for the object I have in view. The material extracted from those cocoons is employed in the manufacture of *sewing silk*.

This silk is of two kinds, each of which has its first and its second qualities. The name of *sewing silk* is exclusively appropriated, in France, to the finest of these two species; the other is called *cordonnet* or *twist*. The sewing silk, so called, is employed in the sewing of silken stuffs; the *cordonnet* is used for working button-holes and sewing woollen and cotton stuffs. The one is for the use of *tailors*, the other for that of *milliners* and *mantua makers*. Tailors employ it only in their more delicate works.

The raw silk for these purposes is extracted from the bad cocoons, reeled and wound into skeins, according to its different degrees of fineness, in the same manner and by the same process (varying only in the details) as that intended to be used for the manufacturing of fine stuffs. It is sold in market under the name of raw silk, but does not bear so high a price as the other.

To manufacture this raw silk into *cordonnet* and sewing silk, properly so called, is a nice, delicate and very complicated work, particularly to make the finest kind, and give it the evenness of threads, the elegant twist, and the beautiful gloss that the French sewing silks possess. Like the threads which are worked into organzine and tram silk, these are passed through the *throwsting mill*.

This admirable machine, to which the French silks owe so much of their beauty, was introduced into France from Bologna, in the Papal States, under the ministry of the great Colbert, by an Italian named Benay*. The enlightened minister was soon sensible of the value of this acquisition. Benay was loaded with riches and honours. "*Il fut* (says the Dictionaire Universel du Commerce, *verbo* ORGANSIN,) *gratifié, pensionné et ennobli.*" He received

* For its introduction into England see below, No XV.

largesses in money, a pension and a title of nobility. In those days nobility was not so cheap in France as it became since. Every one knows the answer of Louis XIV. to an officer, who, being offered a pension, said he would prefer the cross of St Louis —"You are not a man of bad taste," replied the monarch, and the cross was not given.

It might be expected that I should speak here of the sewing silk which is manufactured by the wives and the daughters of the Connecticut farmers, and I am told, also, by those of the state of Ohio, much to the honour of the skill, enterprize and ingenuity of this country. This subject is too interesting to be passed over, and I shall speak of it in its proper place. I am now on that of French manufactures.

Having thus shown the use which is made of the imperfect cocoons, I shall proceed to that of the waste and refuse silk.

In winding off the silk from the cocoons, whether perfect or imperfect, the finest and best threads are not those which are first spun out; on the contrary, the first threads which come off the cocoon are coarse, uneven, and unfit for use in the silk manufactories, either for the stuffs, twist or sewing silk. This loose, furzy substance, which is about one-tenth part of the whole silk on the cocoon, is called in French *fleuret*, and in English *floss*, from the Latin *flos*, flower; a name which reminds us of *lucus à non lucendo*. As soon as the threads of silk in the process of reeling come out fine and regular, this floss is separated from them and put aside for use, as will be presently mentioned. To it are added all the threads which, either from some defect in the cocoons, or from the awkwardness of the women employed in the different operations of reeling, winding and doubling, either break off so as not to be easily united to the other threads, or come out uneven or otherwise unfit for use; these are called

the *waste silk*, and added to the *floss*, assume with it the same name. This mass, boiled in soap and water, afterwards carded and spun in the spinning wheel, takes the name in French of *bourre de soie* or *filoselle*. Boyer, in his dictionary, translates the word *filoselle* into English by *ferret-silk* or *flurt silk*. This last name is evidently a corruption, or an English pronunciation of the French word *fleuret, floss silk*.

This floss, ferret or flurt-silk, by whatever name it may be called, is employed in making silk stockings, mittens, gloves, suspenders, night caps, and, in general, all kinds of silk hosiery. I have heard that the women of Connecticut knit silk stockings and mittens out of the silk which they extract from the cocoons. I shall speak of these also in their proper place.

Thus nothing is lost or wasted of the precious material produced by the silk worm. I mean by those who understand the art of employing it. Otherwise, all experiments by those who are unskilled in the business cannot but be attended with considerable loss.

There are, then, six different kinds of silk extracted from the cocoons by processes of various kinds, or which vary more or less from each other in the manner of using them, and all of which require not only skill and dexterity, but knowledge acquired by long practice. I shall recapitulate them in their order, according to their different degrees of fineness.

1. Silk of the first quality, or singles.
2. Silk of the second quality, or organzine.
3. Silk of the third quality, or tram silk.
4. Sewing silk of the first and second quality.
5. Cordonnet, or twist of ditto.
6. Filoselle, or floss silk.

The whole of the labour of extracting these different silks from the cocoons, and all the prepara-

tory work until it is put to the mill, is done by women, who have separate tasks assigned to them in each of the various and complicated branches of this business. The workshops are superintended by an overseer, who must be master of the whole art. These are well compensated, and have no inducement to leave their country. Hence the difficulty which the nations of Europe have found in obtaining the knowledge that is indispensable for introducing the manufacture of silk among themselves. It is doubtful whether Great Britain would have possessed it, if the revocation of the edict of Nantz had not brought among them the protestant refugees from France, whose descendants even at this day are the support of the silk manufactures of *Spitalfields.*

J. D'HOMERGUE.

July 27, 1829.

No. VI.

Cocoons produced in Virginia from worms fed on the wild mulberry tree.—Difference from other cocoons.—Strength of their threads.—Sewing silk made in the United States.—Imperfect for want of the proper machinery.—Made of the silk of the best cocoons, while in Europe it is made only of that of the imperfect ones—Immense loss resulting therefrom.

Since the publication of the fifth number of these essays, I have been shown two parcels of fine cocoons, raised on the estate of general Hartwell

Cocke, at Bromo, in the county of Fluvanna, in Virginia, by the son of that gentleman. One of the parcels was the produce of worms fed on the leaves of the white Italian, and the other of worms raised on those of the wild American black mulberry tree. From the colour of the silk, it appears that all those worms proceeded from eggs of the China breed. The dead chrysalides were within the cocoons, so that it is probable that they were killed by the usual process of baking.

On the first inspection of these cocoons, the silk of those made by worms fed on the wild mulberry leaves appeared to me richer, and if I may use the expression, more *silky* than that of the others. On lifting them they hung by each other by their silken threads, while those of the other parcel did not stick together, and were entirely separated. But on a closer examination, I satisfied myself that this appearance proceeded from the greater quantity of *floss* that they contained, which is so considerable that they could not be reeled off without very great loss, and consequently they would never be a good merchantable commodity. Dr Dudley, professor of surgery in the Transylvania University, who was present when these cocoons were exhibited at the hall of the American Philosophical Society, said that he had used sewing silk made from those last mentioned in tying up the larger blood vessels, and found it stronger and fitter for that use than any other. This is easy to believe as this strength is produced by the greater coarseness of the threads, which, by a parity of reasoning, makes that silk unfit to be used in the sewing of fine stuffs, which it would be apt to tear.

I therefore cannot recommend making use of the silk produced by worms fed on the leaves of the wild mulberry; but I am of opinion, at the same time, that that tree, engrafted with the Italian mulberry, would

be of a hardier growth, and not so liable to perish by cold and other vicissitudes of the atmosphere, as the plants of the latter, and the leaves would be obtained in a shorter space of time.

These incidental observations on the indigenous mulberry tree of America, and the silk produced by the worms fed on its leaves, naturally lead me to speak of the domestic manufactures of the ladies of Connecticut, and, if I have been rightly informed, also of some other parts of this Union. I have been shown some of the best sewing silk and twist made in that state, and I have been astonished that so much should have been accomplished without the knowledge of the art, and without the use of the necessary machinery, and particularly of the *mill*, which I have already said to be indispensable to making that article in its perfection. If I have found a considerable difference between that sewing silk and those made in Europe*, it is not to be wondered at, since I have been informed that it is spun on that coarse machine called the *wool wheel* or the *big wheel*. I cannot say, therefore, that it is fit to supersede the same article of European manufacture, and this is sufficiently proved by the great quantity of the latter which is annually imported

* The principal defects that I have observed in the Connecticut sewing silk are these. 1. The threads are not even, which arises from a defect in the reeling, by means of which they are not of an equal thickness in all their length. 2. The threads are either too much or too little twisted, and seldom equally so throughout, the throwsting mill alone can give to silk the exact degree of twisting that it requires, and the same degree through the whole length of the thread. 3. It is not free from burrs, for want of the proper method of cleaning. 4. It is rough and hard, and cannot be employed in sewing fine stuffs. It may be used, however, for sewing thick stuffs; but I presume that a good deal of it must be wasted, in consequence of the imperfect twisting; and at the same time I must say that I am astonished that so much has been done without the aid of the proper machinery.

into this country and sold at a much higher price. At the same time, I am free to say, every thing is to be expected from a country which, unaided by any thing but its own native powers, displays so much genius, skill and talent, with the most active and enterprizing industry.

I have not seen any of the silk stocking, gloves and mittens which I am told are manufactured by the American ladies, and which I have been assured are excellent of their kind. But the question is not here about the beauty or excellence of these samples of American ingenuity. Admitting them to be as perfect as possible, and equal in beauty or fineness to any manufactured elsewhere, I still must regret the enormous waste of the bounties of which nature has been so prodigal to this country, and the immense loss which it experiences by their not being otherwise employed. I have said in my fifth number that sewing silk and twist are only made in Europe out of the *imperfect* cocoons, and hosiery out of the coarse and refuse silk called *floss*, while all the rest is prepared in the form of raw silk, to be employed in the manufacture of fine stuffs. Here, on the contrary, the whole of this precious material is wasted, is lost, I may say, in the fabrication of an inferior kind of sewing silk and twist, and of stockings and mittens. Is it not as if the pure gold of the mines lately discovered in North Carolina, instead of being applied to its proper uses, were employed in making kettles and sauce-pans? Let not this comparison be thought too strong; if the floss of the cocoons is, as I have said, only one-tenth of the silk that they produce, nine-tenths of that silk is miserably wasted, and lost to the country which it might enrich. The proportion of perfect to imperfect cocoons depends on the attention paid to the culture of the silk worms, and on the skill and experience of those who raise them; but this I can assert, that when the insect is reared

with care, this proportion of imperfect cocoons is very small indeed. I once bought for my father, who was a silk manufacturer at Nimes, and under whose instruction I have learned the art, twenty quintals of cocoons, all of the same crop, and only five pounds of imperfect ones were found among them.

Such is the lamentable waste which is annually made in the United States of the richest material that the earth produces, and which, if properly used, may raise this country to the highest degree of wealth and prosperity. To show how this can be effected will be the object of future numbers. I do not expect that they will be many; I shall say no more than what I shall think absolutely necessary to point out to the people of the United States what I conceive to be their real interest, and the precise mode in which I think it ought to be pursued. Their intelligence, and above all, their patriotism, will do the rest.

J. D'HOMERGUE.

August 3, 1829.

No. VII.

America destined to be a great silk growing and silk manufacturing country; but the proper means must be pursued to obtain that end.—What those means are.—Raw silk to be attended to in the first instance.—Great profit to be made by it.—Manufactures will follow.—The same course was pursued with the article of cotton, and

with success.—Mulberry trees will be planted and silk worms raised as soon as a market shall be established for the purchase of cocoons.—That branch of agriculture will improve of itself, by observation and experience.—Hot-bed schemes to be avoided.

America is destined to be a rich silk growing and silk manufacturing country. But her advances towards that desirable state of things must be gradual and systematic. Every attempt to do that at once which can only be effected in a course of years, must ultimately fail; while patriotism and enterprise will be discouraged by the enormous expense and fruitless labour that will be incurred.

It is an old and a trite adage, that in every thing the *end* is to be considered; but it is no less true that the *beginning* also requires the most serious attention. How a thing is to *end* almost always depends on the manner in which it is *begun*. Hence, when we take a view of the numerous and various branches of science and art of which the silk business consists, from the planting of the mulberry tree to the producing of those elegant and delicate stuffs which daily issue from the European looms, it is natural to ask ourselves by which of these branches is a nation to begin?

As far as I am able to understand what has been said and written in this country upon this interesting subject, it seems to me that it is an opinion pretty generally diffused, that all these things may be done at the same time. I have heard of projected establishments for planting mulberry trees, raising silk worms, and manufacturing silk stuffs of every description. Such an establishment can never succeed. The two great divisions of human labour, agriculture and manufactures, require to be carried on separately and by different hands. A nursery of mulberry trees and silk worms can never be profitably attached to a manufacturing establishment.—

To say nothing of the immense expense which this complex system would occasion, it must be evident that the profits of the manufacturer should not be dependent on the success of the agriculturist; the risk would be too great; one hard winter, one bad crop of cocoons, would reduce to nothing the earnings of the artist, and he could not with safety carry on his business in such a perilous situation. The raising of silk worms, therefore, must be left entirely to the farmer, and the mechanic must apply himself solely to those branches which are within the proper line of his business.

But I have shown in my former numbers that these branches are various, and that the mechanical part of the silk business is susceptible of divisions and subdivisions. I have mentioned the three principal branches: 1. The reeling of raw silk. 2. Its preparation for the weaver's loom, called *thrown silk.* 3. The manufacturing of silk stuffs. This last branch alone is completely entitled to the name of manufacture. To attempt all three at once, and still more to add to it the planting of mulberry trees and raising of silk worms, would require enormous capitals, and such an immense undertaking could hardly end otherwise than by a failure, which would indefinitely postpone the success of the silk business in the United States. Manufactures are of slow growth, and, in their beginnings particularly, require great means and powerful support. Recent experience in the case of cotton and woollen stuffs, has sufficiently proved the truth of this position.

I am therefore of opinion that the produce of the American silk worm should be employed as an article of foreign commerce, before it is attempted to manufacture it into stuffs either for home consumption or exportation. Great profits are to be derived from this branch of industry, and when it shall have arisen to a certain degree of strength and prosperity,

manufactures will gradually and successively follow in its train. Every attempt to force them into existence before the proper time shall have arrived, will prove ruinous and unsuccessful.

It is by this slow and gradual course of proceeding that the cotton business has risen in the United States to the degree of prosperity that it has attained. For more than twenty years cotton was prepared and sold as a raw material, without any attempt to convert it into manufactured stuffs. All the labour that was bestowed upon it was that of drying, ginning, picking, cleaning, packing, compressing; in short, of preparing it for exportation, under the name of *raw cotton*. While the country was following that course, American genius displayed itself by the invention of the invaluable machine called *Whitney's saw-gin*, of which an American writer has said "that the difference between its operation and the ordinary manual operation, is as one thousand to one."* During that period of twenty years the exportation of *raw cotton* produced immense profits to this country. The business at last was overdone, the profits diminished, and manufactures were recurred to. This was the natural order of things, yet those manufactures have had, and still have to encounter, many hard struggles. Their trials are not yet at an end.

Thus instructed by experience, as well as convinced by the reason of the thing, I would recommend the same course to be pursued with regard to silk. Nothing should be attempted at first beyond preparing it in the form of a raw material for exportation or domestic use†. I shall by and by endeavour to show the profits that will arise, and the results that will follow this mode of proceeding.

* Tench Coxe on the Manufactures of the United States, p. 9.

† In some inferior kinds of manufactures, as fringe, tassels, &c. for which silk is annually imported.

I have said nothing as yet (except a few words, incidentally,) respecting the planting of the mulberry tree or the raising of the silk worm for the production of cocoons; neither is it my intention to expatiate upon the subject. Although, undoubtedly, nothing can be done, in the way of silk, without a sufficient quantity of cocoons, I do not see any necessity, at present, for bestowing so much attention upon this agricultural topic. I have observed with astonishment, during my short residence in this country, that although there is not the least encouragement for the farmers and planters to attend to this production, nevertheless the mulberry tree is cultivated and silk worms are raised in all parts of this country, from the north to the south and from the east to the west; I have examined the cocoons produced in this state, and have extracted silk from them, which I have found superior in quantity and quality to any that I have ever seen; I think, therefore, that this part of the business may be in a great measure left to itself. The main object is to find employment for the silk produced by the American citizens, and to establish, in some central place, a regular market for their cocoons. Their industry, stimulated by their interest, will do the rest. The planting of the mulberry tree and raising of the silk worm are not mechanical arts, like the other branches of the silk business. Many excellent books have been published, and I find are disseminated in translations and abridgements through this country, containing directions which need only be attended to to be successful. Experience and observation will soon make the American farmers perfect in that business. When they find that their bad or imperfect cocoons do not sell for so high a price as the good ones, they will naturally inquire into the causes of the deficiency; it will be the interest of the purchaser to give them the necessary information, and in the course of a few years the best cocoons will be

every where produced in the United States, without the necessity of erecting *dandolieres*, as they are called in Europe, or *pattern nurseries*: these are the playthings of theoretical men—the practical man takes a shorter road; he knows how long a time it would take to convey instruction in that slow manner from Maine to Florida, and from Philadelphia to Cincinnati or St Louis; he trusts to the intelligence, the industry, the observation, and above all, to the interest of those who are to supply him with the material that he is in need of, and in such a country as the United States none of these grounds of reliance will ever prove vain.

The plan, therefore, that I propose is, that the silk produced in the United States be, in the first instance, and for some years at least, employed exclusively in the form of *raw silk*, properly prepared, as an article of foreign commerce, until out of the profits which must necessarily arise from that trade, the means be provided to proceed to the application of that material to other and still more profitable branches of industry, which, I am free to say, will take place gradually, and, as it were, of itself, provided no forcing or hot-bed schemes are allowed to interfere and nip these fair prospects in the bud. I maintain, that a regular market being once established in this country for the purchase of cocoons, the production of that article will soon be brought, without any effort, to its highest degree of perfection, and this country will reach an hitherto unexampled degree of solid and permanent wealth and prosperity.

J. D'HOMERGUE.

August 8, 1829.

NO. VIII.

Necessity for making raw silk an article of commerce.—Immense amount of manufactured silks imported into this country, and to be paid for.—Report made to Congress on that subject.—Rich markets in Europe for the sale of American raw silks.—Amount of that article purchased annually by England and France.

Although I have been but a very short time in this country, I could not help observing that there is a very great division of opinion on the subject of *free trade* on the one side, and *prohibition and protection* on the other. I cannot open an American newspaper without seeing the words *tariff*, *anti-tariff*, in capitals, italics, and in every variety of types, set in formidable array against each other. I am told that the country is very much agitated by these divisions, and from all appearances this agitation is not soon likely to subside. I have not a right, neither is it my business to interfere in this *national* controversy:

Non nostrum inter vos tantas componere lites.

But I may, I presume, stepping aside of the question, suggest views which will divest it of a great part of its importance, by offering a remedy to the evil which is felt and acknowledged on all hands; for nations are seldom agitated by theoretical controversies, unless under the pressure of some real and serious evil.

The evil that I allude to is the very great excess of importations from foreign countries over exporta-

tions; an excess which must at all events be paid for, either in articles of value or in ***bankruptcies.*** The latter mode of payment never takes place but where the former is impossible, and it cannot be denied that it is as ruinous to nations as to individuals. It destroys credit, which of all articles of commerce is perhaps the most valuable.

If, therefore, a rich and growing article of exportation may be pointed out as an annual set-off to the excess of importations that I have mentioned, a real service will be rendered to the United States, without at all interfering with the important questions that occupy the minds of their statesmen and their citizens. I take the liberty of suggesting that that article is at hand, and it is AMERICAN SILK.

Cottons and woollens may justly be considered in a great measure as articles of ***necessity***, and hence it is not to be wondered at, that many should be of opinion that the United States should not be dependent for them on their commerce with foreign nations, liable to be interrupted by wars and by various other circumstances, and at all events in itself always of a fluctuating character, and subject to various perils. But silk can never be considered in that point of view; it is an article of mere ***luxury***, which governments have sometimes found it wise to prohibit altogether, at least to all whose rank and riches did not permit them to indulge in the use of it. I need not cite history for facts which are too well known to be called in question.

It is certain that the American ladies would be as handsome and as lovely in their muslins and chintzes, as they were some years ago, as if clad in the lutestrings, florentines and *gros de Naples* of Italy and France. The men use but little silk in their vestments, and for articles of furniture silk might be easily superseded by other stuffs not less elegant. It is therefore greatly to be lamented that America

should annually incur an enormous debt for an article of merchandize that might be so easily dispensed with. But as that cannot be avoided, there is no other remedy than to find the means of discharging it.

It appears from the report made to congress by their committee on agriculture, on the 2d of May 1826, that in the year 1821 the importation of manufactured silks into the United States amounted to $4,486,924, of which 1,057,233 were exported, and by a gradual increase in the course of four years that importation had so risen that it amounted in 1825 to $10,271,527, of which only $2,565,742 were exported, leaving a balance of $7,705,785 to be paid for. By the best information I have been able to obtain, it appears that the importation of silks, chiefly from France, has since that time gradually increased, so that the cost of that article for the present year may be estimated at no less than *thirteen or fourteen millions of dollars;* how much of it is exported I cannot tell*.

Fortunately for the United States, the nations that supply this country with manufactured silk goods, are as much in want of the raw article as their customers are of their fabrics. I have said in a former number that France imports annually, chiefly from Italy, to the amount of thirty millions of francs† of raw silks, while Great Britain purchases to that of one million eight hundred thousand pounds sterling. These two sums together exceed fourteen mil-

* It would appear from a recent treasury report that there has been a diminution in the importation of silks into the United States.—In the year which ended on the 30th Sept. 1828, it amounted only to about eight millions and a half. (See the Preface.) That is still a very large sum, and will probably again increase.

† This amount was taken from a British publication; but it appears from a recent statement of M. Lasteyrie, that France imports raw silk annually for more than twenty millions of dollars. (See the Preface.)

lions of American dollars, the presumed amount of the annual importation of silk goods into the United States.

This demand of Great Britain and France for raw silk is not stationary, but increasing. This appears from the measures these powers have taken to encourage the farther importation of that article, and the success that has attended them. France has lately reduced the duty on it to five centimes (about one cent of American money) per pound. England has reduced it to three pence*. The duty on *thrown silk* she has reduced to seven shillings a pound; but of that she imports little, because it is a branch of her own manufactures.

The effect of these reductions in Great Britain has been, as stated by Mr C. Grant, in his speech in the house of commons, on the 14th of April last, (see the Free Trade Advocate, Vol 2, No. 6, August 8th, 1829,) that in the year 1823, before that measure took place, the total importation of raw and thrown silks amounted only to 2,432,286 lbs. That in the first quarter of 1824, the old system still subsisting, the quantity amounted to 532,000 pounds weight; and in the next quarter, after the new system came into operation, that quantity rose to 949,312 pounds of raw silk, and 135,312 lbs. of thrown silk, making together a total of 1,085,000. Mr Grant added, that in the whole year of 1824, the quantity of raw silk imported was 3,540,906 lbs. and of thrown silk 452,469 lbs. making a total of 3,993,379 lbs; which compared to the 2,432,286 lbs. imported in the preceding year, showed a balance of 1,561,089 lbs. in

* It is so stated in a speech of Mr Grant, in the house of commons, which will be presently mentioned. In an English price current, however, of the month of June last, I find the duty on raw silks from Italy quoted at 1*d.* per pound. It would seem as if there had been a farther reduction.

favour of the new system of moderate, or rather it might be said of *non-taxation.*

Here, then, are two rich and increasing markets offered to the industry of the American people for the sale of their raw silks. I admit that they will be there in competition with other nations; but the superiority of their silk, which I have had the good fortune to be the first to discover, or at least to point out, must in the end ensure them a preference over all but, perhaps, those of Italy. England, as I have said, imports annually, or rather I should have said imported in the year 1821, (for I am indebted for this fact to the deposition of Mr Durant, on which I have before animadverted, but which I believe to be correct in this particular) raw silk to the amount of £1,800,000 sterling, which must have considerably increased since that time. Of that amount eight hundred thousand pounds were employed in the purchase of Bengal, and the same sum in that of Italian silks; the remaining two hundred thousand pounds were laid out in silks of China and Turkey, in equal proportions.

The Bengal silk, says Mr Wilson, a witness examined before the house of commons, (Report of Committee of Congress, p. 172) is defective in its preparation. But for that defect, it is highly probable that England would supply herself entirely from that quarter, as Bengal is a part of her dominions. She therefore buys no more from that country than she can help, as every manufacturer knows that defects in the preparation of raw silk can never afterwards be cured. Of course her Bengal silk can only be employed in the coarser manufactures, while those of Italy are used for her finer and more delicate stuffs. The raw silks of Turkey and China are also known to be inferior to those of Italy. Those of China come nearest to them; but England and France import very little from that country.

England imported from thence, in 1821, but one hundred thousand pounds out of an amount of near two millions.

I conclude from these premises that the United States have a fair prospect of enriching themselves by the sale of raw silk, if they will but raise it in sufficient quantities, and prepare it in the manner that is required by the European manufacturers.

J. D'HOMERGUE.

August 13, 1829.

No. IX.

General attention paid for some time past in the United States to the culture of silks.—Abundance of publications on the subject; but no fixed plan for the employment of that article.—Mistaken ideas that prevail.—The author's journey to Baltimore.—Its results.—Character of foreign works on the culture of silk.—The author proposes to write "*The Silk Culturist's Almanac.*"—Apology for these digressions.

Having made it my business, since my arrival in this country, to obtain all the information I could, in an historical as well as statistical point of view, respecting the subject of which I am now treating, I have found that at various times since the first settlement of the American colonies, and antecedent to the revolutionary war, several successive but fruitless endeavours had been made by the colonists, as well as by the mother country, to introduce the cultivation and the filature of silk in dif-

ferent parts of this continent. Since the revolution, however, the minds of men appear to have been turned to other objects, until within the last five years, when suddenly, and by a simultaneous and spontaneous impulse, without any apparent external excitement, the people of the United States have directed their attention to this source of national riches. Every where, from north to south, mulberry trees have been planted, and silk worms raised, either for amusement, or under a vague impression that it might be turned to profit. I do not speak of Connecticut, where the raising of silk worms, for the purposes of making sewing silk, has been for a long time a settled branch of industry, in my opinion very unprofitable, compared to what might be done with the same materials: I allude to the other states of this Union, where the phenomenon I have mentioned has really taken place. Within the above mentioned period, several foreign works have been translated or abridged on the subject of the culture and manufacture of silk, and it is but lately that the first number of a periodical on that subject, edited by Dr Pascalis*, has been announced at New-York, which shows how much the people at large is desirous of information upon these topics. The rulers of the nation, yielding to this national impulse, have been taking measures to satisfy the general wishes. In May 1826, the house

* The Silk Culturist, to be published quarterly; the second number to appear in October next. Also, by the same author, "Practical Instructions for the Culture of Silk and the Mulberry Tree." Vol. I. New York. Sold by William B. Gilley, No. 94, Broadway, and by the editor, No. 71, Liberty Street.

I find also advertised in the New York newspapers, "A Methodical Treatise on the Cultivation of the Mulberry Tree, and the Raising of Silk Worms, and on Winding the Silk from the Cocoons. By William H. Vernon, of Rhode Island." Being an abridgement of a large French work, by M. De la Brousse.

of representatives of the United States passed a resolution directing "that the secretary of the treasury cause to be prepared a well digested Manual, containing the best practical information that can be collected on the growth and manufacture of silk, adapted to the different parts of the Union, and containing such facts and observations, in relation to the growth and manufacture of silk in other countries, as might be useful." The Manual was accordingly compiled and published last year, under the authority of the government, in a pamphlet containing 220 pages. The legislatures of some of the states have, as I am informed, passed resolutions for the encouragement of the culture of silk; I am not, however, in possession of the particulars. Societies have been established for the promotion of the culture of silk, and the newspapers abound with paragraphs showing how much this branch of industry has attracted the attention of the people of this country. It is evident that the moment has arrived when it is to be taken up and prosecuted with effect.

As far as I have been able to judge, the manufacture of sewing silk, after the example of Connecticut, appears to have been the first object in view. I have seen samples of it from various parts of the Union. Otherwise, I have not seen any where any fixed design for the employment of the silk to be raised by the citizens of the United States. It is not extraordinary that a subject so complicated should be little understood in a country that has never had the opportunity of acquiring practical experience. Having undertaken, at the request of persons whom I could not refuse, to point out and explain to the people of this country what I conceive to be the best plan to be pursued,—that is to say, that of beginning with the making, not of sewing silk, but of the different qualities of raw silk for exportation,—

I felt desirous of convincing the public of its practicability by actual and immediate experiment. Having heard that mulberry trees and silk worms were raised in great quantities in the vicinity of Baltimore, I procured letters of introduction from my friends here, and made a visit to that city. I had expected to find there a sufficient quantity of *perfect* cocoons to make at least a hundred pounds weight of raw silk, for which I was certain of an immediate sale. It would have given me great pleasure, before returning to my native country, to have seen American raw silks quoted in the Philadelphia newspapers, at fair regular prices, as an article of merchandize. I would thus have benefited at the same time France and the United States, and could have returned home with honour, if not with profit, leaving behind me a pleasing remembrance.

Full of this project, I went to Baltimore, and I here hope I shall be excused if I express my sincere gratitude for the kind treatment that I experienced, during five days that I remained there, from the inhabitants of that patriotic and hospitable city. The memory of it shall never be effaced from my mind. I failed, however, in the main object of my journey. I found a great many cocoons—enough, indeed, to produce, by means of their eggs, at least one hundred quintals for the next season, and all these raised within the circumference of a few miles. But, to my great mortification, there were very few of them that were not perforated, the moths having been suffered to escape, so that they could not be used in the preparation of fine silk. They might, indeed, have been employed in making sewing silk, but that was not the object that I had in view; besides, that article, to compete with that manufactured in Europe, cannot be made without the necessary machinery, particularly the *throwsting mill*, of which I have made mention in some of the preceding numbers.

Upon the whole, however, I have no reason to be dissatisfied with my journey. I found the silk of Maryland not in the least inferior to that of Pennsylvania, and I have seen cocoons sent to a friend of mine from Norfolk, in Virginia, the produce of worms fed on the leaves of the wild native mulberry, the silk of which was equally beautiful, with this difference, that they contained more of the floss or refuse silk, and consequently cannot be so profitable as the others. I witnessed also the extraordinary zeal of the inhabitants for the culture of this article; one lady showed me fifteen hundred pounds weight of cocoons produced on her plantation at the distance of three miles from the city. At the same time, I must own that I did not find that the people possessed sufficient instruction respecting the manner of raising the silk worm; the insect which produced the cocoons appeared to have more or less suffered for want of skilful care; indeed the lady to whom I have just alluded, candidly acknowledged to me that she had had no instruction at all, and that she had only followed her own observation and judgment. I am astonished that she succeeded so well.

It seems to me that the publications that have appeared in this country on the subject of the culture of the mulberry and raising of the silk worm, are by far too voluminous for an extensive circulation, and too full of details, for the most part of minor importance. They are in general compiled from foreign works, written for the direction of the European peasantry, who are by no means so intelligent or so well informed as the farmers and planters of the United States. I have therefore promised, at the instance of my Baltimore friends, to publish in time for the next season, *The Silk Culturists' Almanac, for the year* 1830*; in which

* See below, No. XIV, and postscript to No. XVII.

it is my intention to condense into a small space, in that cheap and popular form, the principal directions necessary to be attended to, omitting the minute details with which the existing books on this subject are generally loaded, and leaving as much as possible to the judgment of the intelligent cultivator. Due attention will be paid to the differences arising from the variety of climates of this country, and nothing shall be inserted but what shall be thought absolutely necessary; and in the preparation of that little book I shall be assisted by the gentleman who now holds the pen for me, and who unites his labour to mine in the composition of these essays. I by no means pretend to produce a perfect or complete work; I shall only endeavour to convey, in plain and perspicuous language, the practical knowledge which I have acquired by experience, so as to enable the American farmers to undertake the raising of silk worms, and the production of good, saleable cocoons, with reasonable hopes of success.

I find that I have wandered somewhat from my main subject, but I have thought that this digression, occasioned by my journey to Baltimore, would not be unacceptable. I am hastening as fast as possible towards the conclusion of these essays, fearing that I have already trespassed too much on the patience of an indulgent public.

J. D'HOMERGUE.

August 24, 1829.

No. X.

The author returns to his subject.—Great profits made in Italy by the preparation and sale of raw silk.—Silk affords more employment to the country producing it than any other raw material.—Prices of raw silk in France and England.—Raw silk unsaleable as at present made in America.—What is to be done to establish a proper filature in this country.—General view of the propable expense.—Some details on that subject.

In the eighth number of these essays I have endeavoured to show how much the manufacturing nations of Europe stand in need of the article of raw silk, which they are glad to procure, even of an inferior quality, from the most remote regions of the globe, while America could supply them with the best and finest, to an unbounded extent. I have pointed out two great markets (England and France) open to American industry, and inviting it to their shores. I am now going to display the advantage to be derived from this branch of trade, when once it shall have been fairly introduced into this country.

The celebrated count Dandolo, by whose labours the culture of silk has been so much improved and extended throughout Europe, does not hesitate to affirm that "the value of silk in Italy, considered as an article of exportation to foreign countries, is twice equal to that of all the other products of that country taken together, and that there is no production of the earth in the markets of Europe (in which of course he includes sugar, coffee, cotton, and all the rich productions of both hemispheres,) which, compared to its natural value or prime cost, offers

to the producer a greater neat profit than the article of silk*.

If, then, in Italy, the land of corn, wine and oil, the profits on exported raw silk (for the author does not hear speak of it in its manufactured state) be equal to double the amount of all the other productions of the Italian soil taken together, it is evident that the same, if not greater advantages must result to this country, particularly to the northern and middle states, whose productions are not so rich as those to the south of Europe. And as to the southern states, their tobacco, cotton and rice are no longer the sources of profit which they once were, nor is there a prospect of their returning to their pristine value.

In another point of view, the article of silk, as an object of exportation, is of the utmost importance to the United States. Nothing will tend so much to prevent pauperism and its attendant mendicity. "The labour in preparing the silk," says Mr Wilson —already mentioned, No. VIII, in his examination before the house of commons—"affords much more employment to the country producing it, than any other raw material†. I need not dilate upon this subject.

But setting aside theories and opinions, however respectable, I shall confine myself to the more convincing logic of facts, on which alone I rest the proof of my assertions. In France, the current price of raw silk, whether made at home or imported from foreign countries, is from 20 to 40 francs a pound, according to its different qualities and degrees of fineness, of which there are a great number.—

* L'art d'élever les vers à soie, &c. par le comte Dandolo; traduit de l'Italien. Par F. Philibert Fontaneilles; 2d. edition. Lyons, 1825. Pp. 458.

† Manual published under the authority of Congress, 1828, p. 358

Singles in general bear the highest price; orgazine the next, and tram silk is of the least value. These three qualities have also their subdivisions in respect to fineness. I do not speak here of the inferior kinds of raw silks, such as filoselle, and the various silks made of imperfect cocoons. In England the price of the three first qualities is from 18*s.* to 35*s.* sterling*. I should suppose that assorted qualities of fine American silk, well prepared, would bring on an average in the European markets, seven dollars a pound, or at least something between six and seven dollars. But admitting that in the beginning, and before their reputation were well established, these silks should produce only six, or even five dollars a pound, there would still be a great profit to be made by the American seller.

I am not sufficiently acquainted with the prices of things in this country to present the readers with a statement in dollars and cents of the cost of raw silk, to the time when it is ready for sale, in order to enable him to deduce from it the clear profits to be made. Nor is it necessary that I should do so; it is enough, I think, for me to offer general data, from which any one may be enabled to draw his inferences and make his calculations as he shall think proper. It is at least the fairest and least objectionable mode of proceeding in this matter.

Every one will easily understand that the profits on raw silks will in a certain degree be proportioned to the extent of the means of those engaged in its preparation, and of their establishment for that purpose. Without speaking of the advantage of ready money purchases, it must be obvious that various expenditures, such as the ground, the buildings, fuel for boiling the water, which must be kept constantly hot, and other incidental expenses, will be

* Manual published under the authority of Congress, 1828. John de Ferre's examination.

nearly the same whether the business is conducted on a small or a large scale. In the latter case, the machinery may even be moved by water-power, or by steam, which will add greatly to the economy of the undertaking. But the time is not arrived for such vast establishments. Before that takes place, a great number of women must have been instructed in an art, which, whatever may be thought of it, is not learned by intuition, nor without a great deal of habit and practice.

It is now three or four years since the Italian reel was imported by a patriotic gentleman into this city. There it still lies, like a fine musical instrument, waiting for the hand of the master. Nobody has yet succeeded in making *merchantable* raw silk, either by its means or by that of similar machines which are scattered through this country. Many attempts have been made, none of which have been successful. I have seen various samples of those fruitless exertions of American ingenuity. A few days ago I was shown, by Mr Hamilton of the Franklin Institute, a specimen of supposed raw silk, made by some enterprising ladies in Kentucky from cocoons, the worms of which had been exclusively fed on the wild native mulberry; the silk, indeed, was beautiful; I never have seen any to surpass it*;

* Not having reeled off the silk from the cocoons mentioned in my sixth number, brought to this city by Gen. Cocke, of Virginia, and spun by worms fed on the leaves of the wild American mulberry, I could not so well judge of its fineness; therefore, from what Dr Dudley said of the superior strength of the sewing silk made out of it, I supposed that it might proceed from the coarseness of the threads; but from this specimen, if it be really what it is represented to be, I find that the silk of such cocoons (exclusive of the floss) is equal in fineness to any other.

Since this note was written, I have been informed that the first judges in France and Italy, at the same time that they have admired the fineness of American silk, have pronounced it to be more *nervous*

but as *merchandize*, it could not procure a single cent. I have seen some made at Washington, on which I have pronounced the same judgment. I do not hesitate to affirm that all similar attempts, without the necessary instruction, and the skill to be acquired by habit and patience, will forever prove vain. I need only say, to give an idea of what it is, that the operations of the female silk-winders are chiefly guided by the sense of feeling, their hands and fingers acquiring by practice a nice sensibility of touch, without which it is impossible to wind silk of the degree of perfection that is required. Add to this the great degree of skill and dexterity that is necessary for the management of the cocoons, and for producing the various qualities of silk, according to their numerous degrees of fineness, which may be compared to the different numbers by which the various qualities of cotton threads used for sewing are designated. All these things must have been learned by a sufficient number of women before the business can be undertaken on an extensive scale*.

The extent of a filature is calculated from the number of reels that are employed, from ten to five hundred or more. To each reel there must be a woman to wind the silk, and a little girl to turn the crank. There must be two men alternately to feed and watch the fire. The cocoons, which I suppose may be purchased of a good quality for twenty-five cents a pound, and eight pounds of which will yield one pound of silk; the fuel, a cauldron, pipes, basins, and necessary apparatus to convey the water to the reelers, and the wages of the people, are the internal expenses of the establishment. A good reeler can turn out three pounds of silk in one day.

than any other.—The only fault that they found was in the filature, which was every where found to be defective, and the silk unfit for use.

* See Appendix, B.

As to the ground and buildings, a piece of land of two or three acres, well supplied with water, that it may be found constantly at hand; a dwelling house for the person at the head of the establishment and his family; a shed proportioned to the number of reels to be employed, with a store house adjoining for the cocoons, are all that will be required, besides a stable, with a good saddle horse, or a one horse carriage, that the director of the works may be enabled to go about the country in search of cocoons, and from time to time to inspect the nurseries of the surrounding farmers, and give them proper advice. By this means the necessary notions for the proper management of silk worms will soon spread through the country.

When the annual amount of these expenses is properly calculated and compared with the European prices which I have mentioned above, it will be found that a great and increasing profit is to be made by the purchase of cocoons, and the preparation of raw silk. Little or no profits are to be expected for the first year. I suppose that during that time, with a great deal of labour, forty women may be instructed in handling silk, so as to become tolerable reelers. The winter might be thus usefully employed. These, afterwards, would instruct others, and their number would rapidly increase. After a few years the profits will be immense; and for a long time the demand in Europe will keep pace with the supply. There is little doubt that the raw silks of China and Bengal will be abandoned, and entirely superseded by those of this country.

J. D'HOMERGUE.

August 28, 1829.

No. XI.

Probable course of the silk business in this country.—Raw silk.—Thrown silk.—Sewing silk.—Connecticut sewing silk, its value and probable cost.—The sale of cocoons will produce at least as much, with less expense and labour.—Probability that the sewing silk business in Connecticut will be abandoned.

Having endeavoured to show, in the preceding numbers, the advantage that will result to the United States from the mere preparation of raw silk for exportation, I shall now proceed to point out the course which the silk business will probably take, and the prospects that it holds out, if the plan that I have suggested be followed—until America shall at last become, what sooner or later it is destined to be, *a rich silk growing and silk manufacturing country.*

The business of raw silk will have to be exclusively followed, until in process of time (how long and how short will depend on the degree of activity and industry that shall be applied to it) there will be enough of that material in the country to warrant the diverting some part of it from the channel of exportation to the establishment of manufactures at home. If it be true, according to my calculation, which I submit however to those who are better informed, that raw silk may be made here at the average cost of three dollars a pound, and immediately sold on the spot to the agents of the foreign manufactures for six or seven, there will be no very great reason to wait with anxiety for better times.

Better times, however, will come, and America will have manufactures of her own, which will, in time, rival those of the old world, and perhaps surpass them. Is it fit to observe here, that those manufactures will have a great advantage over those of cotton and wool, in this, that they will not want to be supported by prohibitory or even by protecting duties. For, as it is a fact that cannot be denied, that the American cocoons produce one-third more of silk, and of a finer quality, than those of Europe, no manufacturers in the world will be able to stand in competition with those of the United States, who will be able to offer at the same time cheaper and finer goods.

This is a prospect which cannot fail of being realized, if a rational and regular plan be but steadily pursued. Let us see how it will work.

Thrown silk, as well as raw silk, is also an article of exportation. The manufacturing nations of Europe, particularly Great Britain, purchase it, as we have seen, though not to the same extent as the raw material, because they make it themselves. The making of *thrown* silk will be the first step of the United States towards manufactures. The American women will by that time be accustomed to *handling silk*, and will be prepared for the new operations which they, chiefly, will have to perform. It will not be improper here to give an idea of what these will be.

Methinks I hear some of my impatient readers exclaim in this place, "when shall we then begin to make *sewing silk*—sewing silk, that we have so long considered as the *alpha* and the *omega* of the silk business, and in the making of which our Connecticut women have been so long and so industriously employed?" To this question I answer, that the time for making sewing silk is not yet arrived; that thrown silk must be made before sewing silk

or even sewing twist are attempted, because sewing silk and twist are nothing else than the *perfection of thrown silk*, as I shall presently demonstrate. As to the Connecticut ladies, I think I can foretell, without pretending to the gift of prophecy, that they will, of their own accord, abandon that domestic manufacture; and for this simple reason, that they will find a more profitable way of employing their cocoons. This assertion, I am sensible, requires proof; and I am going to give it.

I have never been in Connecticut, and I do not know, either of my own knowledge or by hearsay, how many pounds of cocoons are employed there to produce one pound of sewing silk. I believe, however, that it is not less than fifteen or sixteen pounds. If I am mistaken, I shall be glad to be set right; but I think it will be found that I am not far from the mark. Of the price of this silk in the New York market I am well informed by an American merchant of great respectability in that city, and I cannot state it better than by giving an extract of his letter to a friend of mine, dated the 31st of July last:

"The Connecticut silk has been, to a considerable amount, brought to this market. The first sales were at four dollars per pound. It is now dull in this market, but is *exchanged for goods*, at the rate of two dollars and fifty cents a bunch, consisting of 100 skeins, or say about six and a half ounces pure silk."

The result of this information is, that 13 ounces, or one pound and one ounce, of Connecticut sewing silk produce at New York, *in barter for goods*, the sum of five dollars; which, allowing for the profits of the merchant, who is at the same time buyer and seller, does not, I believe, exceed the price of four dollars a pound in ready money. The first sales, says my friend's correspondent, were at four dollars a pound, but the article is now *dull* at the

price for which it is given *in barter*. Four dollars a pound may therefore be considered as the maximum price, in ready cash, of this Connecticut article.

Taking this for granted, I shall proceed to show that the ladies of that state will make a greater profit by selling their cocoons than by manufacturing them into sewing silk. I say nothing of *twist*, which it is well known does not in general sell for so much as sewing silk, and consequently makes a difference in the average price of the two articles. I shall suppose four dollars to be the price of both.

Now I have said before that I believed that cocoons might be purchased for 25 cents a pound, and that is indeed the lowest price for which good cocoons may be expected to be given. That being the case, sixteen pounds of cocoons, which I have supposed and believe to be employed in the manufacture of one pound of Connecticut silk, will produce at that price exactly *four dollars*, so that the cost of dyeing and the labour of manufacturing, which I estimate to employ at least ten days* for each pound of silk, will be a clear gain to the fair manufacturers. I consider, therefore, that they will find it their interest to sell their cocoons, instead of manufacturing them into sewing silk or twist, and that they will act accordingly.

If, however, those ladies, for their amusement or otherwise, should be inclined to continue their innocent and useful occupation, they may be in-

* Since the above was first published I have conversed with two women from Westchester county, in the state of New York, who were employed here in reeling and making sewing silk, after the manner of Connecticut. They told me that it took them fourteen or fifteen days to make a pound of such silk, which is four or five days more than I had calculated. They could not tell me how many pounds of cocoons were employed, probably because they had never sought to ascertain it.

dulged in *wasting* fine silk, which might, as I have shown, be otherwise better employed; but no ill consequence will result from it. As soon as a regular market price shall have been established for American cocoons, enough will be raised to supply the demand, and a scarcity will not be produced by the manufacture of a few hundred pounds of sewing silk.

I find I am treading close upon the limits which I have prescribed to myself for this number; I am, therefore, obliged to postpone what I have to say on the subject of *thrown silk* to the next. I regret that these essays have been drawn out to a greater length than I at first expected; the candid reader, however, will do me the justice to say, that I have kept as close to my subject as has been in my power, and that I have never yet lost sight of the object that I had in view. It is a duty which every writer owes to the public, and the obligation of which I have always had before my eyes.

J. D'HOMERGUE.

September 1, 1829.

No. XII.

Thrown silk, what it is, and what previous operations it requires.—Winding on bobbins.—Cleaning or purging.—Doubling, and the various machines required for these purposes.—Floss silk; how employed, and what machinery is necessary.—The preparation of raw silk an art difficult to acquire.—No secret in it; it lies entirely in experience and practice.—A good reeler will make three pounds of

silk in one day.—Not long ago it was thought a good deal for one woman to make one pound in that time.—The art has been improved.—Enormous sums lost in France in the infancy of the art.

Thrown silk is nothing else than raw silk, which, after sundry preparatory operations, is *twisted* by means of a machine called the *throwsting* or *twisting* mill, in French *le moulin à tordre*, and is the celebrated machine which was introduced from Italy into France by M. Benay, as mentioned above in No. V, for which he was so splendidly rewarded. It might, therefore, by a more intelligible expression, be called *twisted silk*.

The operations preparatory to twisting, or passing through the mill, are the following:

1. *Winding on bobbins*—in French *devider**. The raw silk is wound in this manner by means of a machine called, in French, *devidoir*. A drawing of it is given in the Manual, published under the authority of the house of representatives, plate 3, fig. 1. But this drawing is old, and the machine has been since very much improved and simplified.

2. *Cleaning* or *purging*—in French, *purger*. By this operation the raw silk is freed from the burrs or lumps that still adhere to it, and acquires the necessary degree of evenness. It is performed by means of a machine called, in French, *purgeoir*. I have not seen a drawing nor a description of it in this country.

3. *Doubling*, by which two or more threads of raw silk are united together, according to the degree of thickness required. This is done by means of a machine called, in French, *doubloir*, of which there is a drawing in the Manual, plate 4, figs. 1 and 2,

* Winding the silk from the cocoons, or *reeling*, is called, in French, *filer*, to spin. Hence the word *filature*. These explanations are given to facilitate the reading of the French books on this subject.

but liable to the same objection as that before mentioned.

4. After these three operations, the silk is put to the mill to be twisted, which is called *throwsting*. It comes out of the mill ready for the weaver's loom. Sewing silk, which, it will be recollected, is made out of the silk of imperfect cocoons, receives here its last finish. The other qualities of silk, single, organzine and tram, may either be sold for exportation, under the name of *thrown silk*, or be immediately employed in manufactures at home. Silk thus prepared is sometimes said to be *organzined*, the word *organzine* being then understood in a generic sense, and comprehending tram and singles, as well as organzine proper.

There is a drawing in the Manual, plate 3, fig. 2, which is said to represent the throwsting mill, and to have been taken from a French Encyclopedia;—but it is not certainly the throwsting mill as at present used; it seems rather to have been taken from another machine, called the *tavelle*, of which I shall speak presently.

Sewing silk and twist are of all silks those which require the most labour. The former must undergo three times, and the latter six times, the processes of winding, doubling and twisting. It is in this sense that I have said that sewing silk (in which I meant to include twist) is the *perfection of thrown silk*.

The reader will here easily perceive the reason of the difference between the Connecticut sewing silk and that made in Europe, and he will be sensible that without the necessary machines it is impossible to bring it to the requisite degree of perfection.

Of the other silks, tram silk alone requires to undergo these processes three times, organzine twice, and singles only once.

Floss silk, which I have explained before to con-

sist of the tow and coarse fibres of the silk extracted from the cocoons, and of the waste and refuse silk collected during the process of reeling, put together in a mass, then carded and spun on the common wheel, of which are made ribands, silk tapes, stockings, gloves, mittens, night caps, vestings, and all kinds of hosiery, may be either sold as raw silk for exportation, or employed in the manufacture of coarse articles of the above description; but if it be meant to give to those articles any degree of fineness, the floss must undergo the same processes as other raw silk; it must be wound, cleaned, doubled and twisted in the *tavelle*, a machine made on the principle of the throwsting mill, but differently constructed, and of a much smaller size. Many comfortable articles might be manufactured in this country of this silk in its raw state: this branch of domestic industry might very well take the place of the sewing silk manufactures of the Connecticut ladies, and find them an agreeable and profitable employment; and it would prepare the American weavers for making the finer articles, when the manufacture of thrown silk shall have been introduced into this country.

At that period sewing silk will be a regular article of American manufacture; then ribands and fine hosiery of all descriptions will be the first things that will be attempted; after which the finer manufactures of stuffs made of singles, organzine and tram will follow in succession. It will be necessary at that time to acquire the art of dyeing in the delicate colours which silk manufactures require; and it is proper to observe, that the plainer colours are the most difficult to be obtained, as the more the colours are mixed, the less easily are defects in the dyeing to be perceived.

Thus the American nation will, by gradual but sure steps, reach the desirable point to which her

whole ambition should be directed, that in which her own native silk, that precious gift which a kind Providence has bestowed upon her of such excellence and with such extreme profusion, will fill the land with riches, and make America what France now is—a country that no reverses can put down, and that even conquest and the devastations of hostile armies cannot impoverish. Whatever fate fortune may have in reserve for me, it will be to me a proud source of happiness to have, by these communications, in any degree contributed to the lasting prosperity of a country which I have been early taught to venerate and cherish as the cradle of liberal principles—the source of all that is dear to mankind.

Some of my zealous friends have often told me, "Beware of the Americans! they are a shrewd, intelligent, ingenious and inquisitive people. Don't tell them too much, or they will find out all your secrets." Alas! I have no *secrets;* I am only in possession of an *art*, which I would freely, if I could, communicate to every man, woman and child in America. Ask skilful musicians what their secret is? They may execute before you the master pieces of their art; you see the motions of their hands, you hear the sounds of their voice—but without study and *practice* it is in vain to attempt to imitate them, though nature had gifted you with the soul of an Orpheus. It is the same with the various arts of preparing and manufacturing silk—the secret *lies in practice.* Ingenuity, it is true, first discovered these processes; but it required centuries before they were brought to their present state of perfection. A striking example of this is at hand.

In the Manual above frequently quoted, (page 141) it is related as an astonishing fact, that a woman at Novi, in Piedmont, reeled *one pound* of silk in a day. There is no doubt of the fact; but the

Manual does not say that that happened upwards of forty years ago, as appears from the book to which a note refers. Now, in consequence of successive improvements, a woman, as I have said before, (No. X.) may reel off three pounds of raw silk in one day, that is to say in 12 working hours. Thus the art has been gradually advancing since Colbert, who was himself skilled in manufactures*, by the encouragement which he gave to *Benay*, who first imported the *throwsting mill* into France from Italy, laid the foundation of the great riches which his country has derived from the silk trade. Before that time immense fortunes had been sunk, in the vain attempt to establish in that kingdom the silk manufactures, which Italy then exclusively possessed. At Nimes, the place of my birth, tradition has preserved the memory of millions lost in that manner by the ancestors of some of the most respectable families, who still love to speak of the folly of their forefathers†.

The state of Connecticut, by beginning at the wrong end, and making sewing silk, which cannot find a price in the money market, before she had learned even to prepare the raw material, has been seventy years following the same course, without advancing a single step. She may proceed in the like manner for ages, misemploying the gifts of

* The celebrated minister Colbert was brought up in the house of the *Mascrannis*—rich manufacturers of Lyons, and was early imbued with their principles. Dictionnaire des grands hommes, *verbo* COLBERT.

† M. de Villeroi sank in this manner 1,800,000 francs, and M. de Marguerites, 1,000,000. One M. Froment ruined himself entirely; to what sum his loss extended I do not know; but it is a notorious fact, that in consideration of the sacrifices that he made, his family still enjoy a pension from the French Government, which is to be continued until the extinction of the male line. There are similar examples at Lyons, but I do not know the particulars.

Providence, and will meet with no better success. Every attempt to manufacture silk that will not be begun on right principles, will only retard the period when America will be in the full enjoyment of the blessings which nature has prepared for her.

J. D'HOMERGUE.

September 3, 1829.

No. XIII.

The author means to conclude with this number.—Object that he has had in view.—Great demand in Europe for *fine* raw silk.—Ridiculous pretensions exposed.—These essays will serve as a test for similar ones.—Difficulties in the way of introducing the silk business into this country.—Teachers of the art cannot be easily procured from abroad.—Proofs of this assertion.

I have, at last, reached the end of the course which I proposed to myself in writing these essays. At first I had nothing in view but to communicate to the American public the interesting discovery which it was my good fortune to make, and to prove, by actual experiments, the great superiority of the American silk, in quality as well as quantity, over that of Europe; which was afterwards followed by that of the hardly less important fact, that the cocoons produced by worms fed on the leaves of the wild American native mulberry tree, do not yield to others in the beauty of their silk, and only differ from them by the greater quantity of floss that they contain. Urged, however, by

the solicitation of some patriotic friends, and particularly of the gentleman to whom I am indebted for aid in the composition of these essays, I was induced to combat the erroneous opinion that appeared generally to prevail, that the manufacturing of *sewing silk* was *a* principal, if not *the* principal object to be pursued in the employment of the American material; an error which, if persevered in, would have led to the ruin of thousands; and I have endeavoured to show, with what success the reader best can tell, that the first thing to be attended to was the preparing of raw silk for sale; by which I think I have proved that great profits are to be made, in anticipation of the greater advantage that will accrue to this country from the complete establishment of silk manufactures, which time and experience cannot fail to produce. I could say a great deal more on the subject of *raw silk*. I could heap proofs upon proofs to convince the most incredulous of the great profits to be derived from it; but I must take care lest, by saying too much, I should at last become tedious. I shall content myself with asserting that, while in France, I have seen letters from silk merchants, in which they said to their correspondents in Piedmont "Send us fine (raw) silk; never mind five francs (one dollar) per pound, more or less; but send us *fine* silk." I think I am not too sanguine, when I give it as my opinion, that the beautiful silk of the United States, when properly prepared, will be sought for with avidity by the merchants and manufacturers of Europe, and that America will sell, at her own prices, as much of it as she can make.

The reader will perceive that, in these essays, I have not been satisfied with mere assertions, and that I have proved, as I went along, the principal points that I have ventured to make. In order to

be the better understood in a matter almost entirely technical, I have drawn, with all the clearness and precision in my power, as it were, the chart of the silk business, from the winding of the silk from the cocoons to the delivering it over to the weaver's loom. By this means I have enabled all intelligent men to judge of the numerous schemes that are brought forward from time to time, and to form a correct opinion of the merit of the pretended inventions and improvements with which the newspapers abound. Thus, we hear of machines for winding silk from cocoons *without handling it*, which is absolutely impossible; for, if a single thread should break, what is to be done? We have heard of others, by means of which silk can be reeled and twisted at the same time; which implies that reeling, winding, cleaning, doubling and twisting, or in other words, that raw silk and thrown silk may be made by one and the same operation: and in a late New York paper I find an improvement on the reel, which the inventor calls the *mill* of Languedoc, advertised for sale, while it is evident that it would be much better for the ingenious artist to obtain a patent for his discovery, and make his fortune by the preparation of raw silk. On all similar pretensions, these essays, by laying open the whole course of proceeding in the silk business, will operate like Ithuriel's spear, and show them in their natural and proper shapes. I have no doubt, however, that the numerous machines employed in the different branches of the silk manufacture, are destined to receive great and material improvements in this country, whose future Whitneys will distinguish themselves as they have done in the cotton business; but every body will understand, that he who will improve upon a machine, *must first learn how to use it.*

In the same manner, the information that I have

thus taken the pains to diffuse will show the extent of what can be done with American silk, by mere natural means, and without the aid of European skill and machinery. When we hear of vestings, silk stockings, gloves, mittens, and thick solid stuffs, not very wide, made in this country, or of silk sent to Europe and returned in the form of those manufactured articles, we may safely believe it, because we know that they may be made of *floss silk*, not wound on the reel, but spun on the common wheel, and *à fortiori* of the finest silk of the cocoons, if it should be thought proper to put it to that use. But if we should be told that satins or velvets, or even the lighter stuffs, which are yearly imported from Europe at such an enormous expense, as taffeties, lustrings, gros de Naples, levantines, and the like, or even ribands, silk stockings, and other articles of hosiery, and sewing silk, equally finished here with those of England, Italy and France, and such as may be readily sold for money or on credit; in short, what may be called truly *merchantable* and *profitable* commodities, every one who has read these essays will be possessed of sufficient data to decide on the correctness of the assertion, and will know that it is impossible that such wonders can have been performed without the assistance of the art, or—Aladdin's lamp.

I have hitherto shown only the fair side of the prospects which America may expect to realize, by means of the silk which the country is calculated so abundantly to produce. I have now a less pleasant duty to perform; for I cannot avoid speaking of the difficulties that she will have to encounter before those expectations are in a fair way of being realized. Those difficulties have been experienced by all the manufacturing nations of Europe, successively, and I can see no reason why the Unit-

ed States should be exempted from them. The various preparations of silk, and the numerous forms in which it is afterwards manufactured, from satins, velvets, brocades, and gold and silver tissues, to ribands, stockings and gloves, are all arts of difficult acquisition, and of which the nations who possess them are particularly jealous. We have seen what immense sacrifices sovereigns have made to introduce those arts into their dominions. We have seen with what pains and at what expense the kings of France obtained the services of Michaeli and Benay, the king of the Netherlands those of Barramendy, the manufacturers of England those of Despoulies, who only taught them the process of manufacturing some particular kind of stuffs; we have seen the immense sums that were sunk in France, when endeavouring, without assistance, to find out a method only of preparing silk for the loom, which they never succeeded in until the throwsting mill was brought in by a person skilled in the use of it; the same difficulties still exist, and they must be conquered before the United States can think of enriching themselves, even by the mere preparation of raw silk; that is also an art that requires experience and practice, and at every step beyond it difficulties will again occur. It is idle to think of importing journeymen or journeywomen; for such are not to be had, and if they could, much advantage could not be drawn from them, each knowing only that part of the business which the division of labour has allotted to him. The manual labour, except in passing through the throwsting mill, is all performed by women, whom nothing could induce to lose sight of their village steeple, much less to emigrate to a distant country, of the language of which they are ignorant. We find from a publication which lately appeared in the newspapers of this city, that even the women of

Connecticut, employed in the manufacture of sewing silk, could not be induced to remove to Philadelphia; no, not a single one of them; so that the gentlemen who wanted to introduce here that branch of business, at last resolved to send for a manufacturer from Europe, with whom they not agreeing, the opportunity was not laid hold of. Much less will the women of Italy or France abandon their country for a similar object; the more ignorant they are, the more they will be acted upon by the fear of unknown dangers, nor will they be easily persuaded to leave their husbands and children to try their fortunes in the new world. As to the overseers, or those who superintend the labours of the women, they are all well paid at home, and are not inclined to emigrate. Besides, it is extremely rare to find a person who knows more than one single branch of the silk business. The head manufacturers are in general better informed; but those are too independent to think of leaving their country.

As some persons may think that I exaggerate, I take the liberty of giving an extract of a letter from Mr *J. W. Morse*, a respectable American at Marseilles, to a gentleman of this city, by which I believe my assertion will be found fully substantiated. The letter is dated Marseilles, March 21, 1829.

"It is very difficult, indeed, to find a person who possesses a knowledge of the reeling and the different processes before being made into sewing silk, as it is done by four or more persons, who have each their particular part, and who continue for years doing nothing else. The women who reel do nothing but reel, and therefore it is difficult to find a *man* who is acquainted with this branch of the business. I have made application, through the medium of several respectable silk merchants here, at three of the manufacturing towns of the neigh-

bourhood, but without success. It appears it is not the first time that application has been made for the same object."

These are the difficulties which the United States will have to overcome, before they can introduce any kind of preparation of silk into this country. Nothing is so difficult as to obtain from Europe persons who are skilled in those branches of business. A circumstance which lately happened in this city, and to which I am not willing more particularly to allude, will not, I fear, be calculated to encourage such persons to come hither, even if they should be so disposed. No promise of a fortune, I believe, will henceforth be sufficient to induce them to it.

It is certain, however, that sooner or later the United States are destined to be a *rich silk growing and silk manufacturing country*. The fulfilment of this high destiny may be retarded, but nothing can prevent its taking place at some future time.

The next number will conclude these essays.

J. D'HOMERGUE.

September 7, 1829.

No. XIV.

Eulogium on America.—Excellence of the climate for raising silk worms.—They are and may be produced without the use of hot houses and thermometers, recommended by the European writers —Various proofs of this assertion.—Worms raised in this country in thirty-

one days, which requires in Europe forty-five, and sometimes forty-seven days.—Reasons why the author does not publish the Almanac he promised.—Apology for his continuing to write.

This is, indeed, a blessed country; like the northern nations of the old world, it is not reduced to boasting of the most common productions of the earth; of her leeks, of her kale, of her potatoes, or of a piece of animal food, like Caligula's horse ennobled;—nor, like those of the south and east, while loaded with the bounties of nature, does she groan under the iron yoke of despotism; her granaries are filled with the corn of Africa and Sicily; the oil of Italy and the wines of France only wait for the hand of skillful industry to flow in streams through the land; her fields are enriched with the cotton of the east and the sugar of the west, and the bowels of her earth teem with the iron of Scandinavia, the coals of Albion and the gold of Ophir. In the midst of all these riches, her genius conquers the elements, and her statesmen give examples of free government to the world, which the world strives in vain to imitate; she extends the hand of friendship to all mankind, her tents are the alien's home, and he (if such there be) who would oppress the friendless stranger, finds his hand suddenly palsied, and the stranger stands upright, in the face of the country that protects him and smiles on him with benevolence.

These thoughts occurred to my mind while I was admiring the richness of the silken treasures which nature has provided for this country. I am going to consider this subject in a point of view which, I believe, will be found as interesting as it is new; the facts that I shall state, although they may strike every body's eye, have not only not yet been noticed, but appear to me to have been most unaccountably overlooked by those who have professed to treat of the culture of silk in this country.

In China, the native country of the silk worm, that useful insect is born, grows and thrives in the open air. Like the common caterpillar, it nestles upon trees, and there winds its beautiful cocoons.—In Europe, on the contrary, in Italy and the south of France, notwithstanding the boasted mildness of those climates, the egg is hatched and the worm is raised in *hot houses*, with infinite trouble and care. In the works of Dandolo and Bonafous, the most approved European writers on this subject, the one an Italian, the other a Frenchman, we find the most minute directions for regulating from day to day the heat of the stoves; and the farmer who raises silk worms must have the thermometer constantly in his hand, the degrees of heat being fixed for every day of the growth of the animal, and almost for every hour. The numerous works on the art of raising silk worms are in a great measure filled with these details.

In the first number of these essays I gave an account of some experiments which I made on cocoons raised on the farm of Messrs Ter Hoeven, near this city. I described the silk extracted from these cocoons as the most beautiful I had ever seen, and as superior in quantity as well as quality to that of Europe. These cocoons were produced without the aid of the thermometer, and even without any artificial heat.

I have said (in my ninth number) that I had seen cocoons spun by worms raised by a lady near Baltimore, *without any care*, and the silk of those cocoons was equally beautiful. I said, indeed, that the worms appeared to have suffered; but that might have been from causes unconnected with the degrees of heat that they experienced. I am informed that in Connecticut, where sewing silk is made in great quantity, the directions of the European writers with respect to heat are not attended to; and

in short, although I have seen cocoons produced in various parts of this country, I have never heard that those directions are any where followed.

These facts made me reflect a great deal, in order to discover by what cause they might be produced; nevertheless, my mind was not satisfied. I turned to the American writers, and particularly to the Manual published under the authority of congress, to which I have before several times referred. There I expected to have my doubts completely removed; but I was surprised to find that the learned compiler recommended the whole method of the foreign writers; not on the ground of observation and experience, but on mere general reasoning, and on the authority of those writers themselves. Let us hear him speak for himself.

After several arguments, principally derived from the vicissitudes of the American atmosphere, he thus continues, page 49: "Thus, whether amusement or profit be the object, a thermometer is *essential* (to the raising of silk worms.) It will be asked, do the people of Connecticut use thermometers? if not, do they not succeed without them? It is *believed* that they are not employed; and the consequences are, that millions of worms *must* die from the causes mentioned; that the profit is thus greatly diminished; and that many worms which do survive become debilitated, spin small cocoons, and produce diminutive moths and bad eggs. Hence the race is liable to degenerate." Elsewhere, page 69, the writer resumes the same argument, without, however, referring to any facts but the vicissitudes of the American climate, and confirms his reasoning by saying, "all the practical writers, expressly consulted on this subject, are agreed." Then alluding to an assertion of Sauvages, a French writer, who said, and, I think with reason, as he speaks from experiments, that the silk worms will bear a greater degree of heat than

that to which Dandolo limits them in their early age, he says: "Dandolo writes after years of practice upon a very large scale, and recommends the degrees of heat which always insured him success. Other practical writers agree with Dandolo. No one, it is presumed, will be at a loss to decide which of those *authorities* is most worthy of being followed."*

It appears to me that the author of the Manual relied here too much on foreign authorities, and too little on his own judgment, which it is most probable would have led him to different conclusions. When he ventured to assert that in the state of Connecticut, because Dandolo's directions, as he believes, are not followed, "*millions* of silk worms *must* die, or become debilitated, and that their race *will* degenerate," I cannot help wishing that he had ascertained the fact, which might have been, I should think, easily done, as Connecticut is not at so great a distance from the capital, nor, indeed, from any part of the United States, that information from thence could not have been obtained on which reliance might have been placed. Conjectures can but illy supply the place of positive facts.

Sensible of the respect that I owe to the opinions of American writers, and particularly to that of the

* Dandolo wrote his book principally for the North of Italy. After giving his directions respecting the temperature to be preserved, and other things to be attended to in the raising of silk worms, he says: "In countries where *by the effect of the climate* the temperature is always hotter than that which I have mentioned as the proper one for the period of mounting, (16 degrees Reaumur or 66 degrees Fahrenheit), the air is dry, without being agitated, as is almost always the case in the vicinity of mountains. In those countries it is sufficient to leave a free current to the air where it is the coolest. Although it is useless, for *hot countries*, to enter into the details mentioned in this book, yet I have thought that in an elementary work, it was proper to fix the rules of the art for every country and every climate, &c."—*Dandolo*, p. 205.

one to whom I allude, it will be easily perceived that I found myself greatly embarrassed. I saw silk worms raised and fine silk produced every where in this country, without the use of stoves or thermometers, yet I was aware of the strength of the objection drawn from the vicissitudes of the American atmosphere, and indeed I have, in the second number, expressed my astonishment at the success of the culture of the silk worm, notwithstanding this great and serious obstacle. Disappointed in the means that I had recurred to in order to fix my opinion upon the subject, and to find a rational cause for the wonders that every day struck my eyes, I determined at last to study as well as I could the climate and temperature of this country, persuaded that I should find here the solution of this great problem. I knew from experience, and from the uniform assertions of European writers, that a temperature not below the 14th degree of Reaumur, or the 62d of Fahrenheit's thermometer, could not be hurtful to the silk worms, and on this basis I proceeded in my researches.

I in the first place examined the meteorological observations which are daily inserted in the Democratic Press, published in this city, and there I found to my great satisfaction that from the 22d of May to the 22d of June of the present year, (the usual season for raising the silk worm), the thermometer had not fallen below 69½° of Fahrenheit in the open air, although during that period the weather was sometimes unusually cool. In addition to this, I was shown by Mr Elias Durand, of this city, a gentleman who is very fond of philosophical studies, a view which he took within the last ten years—but in what year he could not recollect, having mislaid the original of his drawing—in which he exhibited, by lines of different colours, the relative temperatures

of Paris and Baltimore for every day during one twelvemonth.

The rise and fall of the thermometer in those two cities, from one day to another, was, as he assured me, accurately marked from meteorological observations taken in each place, during the same period. The American temperature appeared much colder in winter, and much warmer in summer; but what I remarked with the greatest pleasure, was, that from the last week in May, inclusively, to the end of June, the thermometer did not fall below 65 degrees of Fahrenheit, which was rather extraordinary, as I have been informed that in these middle states it seldom falls lower in that period than 68 degrees.—This, however, is a fact on which there must be many in this country better informed than myself; but if we take it for granted, it is evident that during the proper time for raising silk worms, the temperature is hardly ever such as to endanger their health; and, unless it be so, I can perceive no way to account for the success of the American farmers in raising their silk worms, and producing such beautiful silk as that of America must be acknowledged to be, without any of those precautions respecting the degrees of heat which are taken by the silk culturists of Europe, and recommended by the writers of Italy and France. I am almost tempted to believe that the silk worm would succeed here in the open air, even on the leaves of trees, as it does in China. It appears to me to be well worth making the experiment, particularly in the southern states of this Union.

I cannot now speak with any certainty of the variations of the thermometer in any particular season in the south of France, where I resided, but this I can say, that when I arrived here, about the end of May, I found the weather excessively hot, and more so than that to which I had been accustomed in the same season

in my own country. I am told that the hot weather in America sets on about the 20th of May with particular violence; but of this I cannot judge by one year's experience. It undoubtedly began in this manner in the present year.

I am inclined therefore to believe, that at the particular period to which I have referred, the temperature of this country is different from that of the south of Europe, and more favourable to the raising of the silk worm. A fact which cannot be controverted comes in aid of this opinion.

In Europe, the raising of the silk worm, from the hatching of the egg to the completion of the cocoon, occupies 45 and sometimes 47 days. (See Dandolo, Bonafous, and the writers generally, *passim*). In this country, on the contrary, 31 days are sufficient. I am ascertained of this fact, 1. By Messrs Ter Hoven, who raised, as they told me, in that space of time, the worms that spun the cocoons from which I extracted the beautiful silk mentioned in the first number of these essays; 2. By Nicholas Norris, Esq, of Baltimore, who assured me that in the same number of days he had raised a great quantity of silk worms to the completion of their cocoons; 3, and lastly, By Dr Pascalis, who wrote to me on the 3d of last month that a quantity of worms, which he does not specify, had "mounted and spun their cocoons" in 31 days, and that not a single one had died, though they had suffered from cold, hunger and dampness, during the most terrible month of June that he had ever known. These are his expressions. It is true that he adds that his worms had been submitted to the process of electricity; but I do not think that made any difference, and their success must, in my opinion, be attributed to the favourable temperature of the climate.

In one of my former numbers I mentioned that, at the request of my Baltimore friends, I had promis-

ed to publish an Almanac containing the most essential directions for silk culturists; but the more experience I acquire respecting the climate of this country, the more I find that it requires more knowledge of it than I am possessed of, to venture upon prescribing rules to the American farmer. I should have visited nurseries, observed the growth of the mulberry trees, and watched the progress of the silk worms, to entitle me to act the part of a teacher in this branch of national agriculture. My wish to be useful to this country made me presumptuous, the same sentiment makes me acknowledge my error.

When I intimated that this essay should be the last, I had not in contemplation the communications that I have just made. I did not expect to come so near a solution of the problem that occupied my mind. It is possible, therefore, that I may trespass again on the indulgence of the public.

J. D'HOMERGUE.

September 17, 1829.

No. XV.

Introduction of the throwsting mill into England.—Difficulties which attended it.—Description of the machine, and manner of working it.

Since I wrote my last number, a curious English work has fallen into my hands, printed at London, in the year 1791. It is entitled "The History of

Derby from the remote ages of antiquity to the year 1791. By W. Hutton, F.A.S.S." Derby is a considerable *silk manufacturing* town, and it appears from this book that it was there the manufacture of silk was first established in England by the introduction of the *throwsting mill.* The author gives a full and interesting account of that event, in which the reader will see what difficulties attended the enterprise, and what immense profits it brought to the nation and to the fortunate importer of the machinery. It will show also what labour and expense is required to make *sewing silk*, and confirm what I have endeavoured to prove, that it is not with that article that the United States ought to begin, as, in order to be made good and merchantable, it indispensably requires the use of the *throwsting mill* and of its auxiliary machinery. It will be recollected that the English do not make raw silk, but purchase it of foreign nations, and nevertheless still make great profits by its manufacture, which would be much more considerable if, like the United States, they were in possession of the *raw material.*

Without further preface, I proceed to giving extracts from the work above mentioned, beginning at page 191.

"*Silk Mill.*—All the writers, from Gregory to Gough, who have travelled through Derby, for half a century, give us a description of the *silk mill.* But it is doubtful whether an adequate idea can be formed of that *wonderful* machine, when described by an author who does not understand it himself."

The author proceeds to say that he was born in Derby, and served a seven years apprenticeship to the silk mill, during which he received numerous floggings, of which he gives a most minute and moving description, accompanied with moral and philosophical reflections on flogging, with which I

shall not entertain the reader, but proceed to what more immediately relates to my subject.

Page 195. "The Italians had the exclusive art of silk throwing; consequently, an absolute command of that lucrative traffic. A gentleman of the name of Crotchet thought he saw a fine opening to raise a fortune; he therefore erected a small silk-mill in 1702. Every prospect of the future undertaking was favourable till the scheme was put in practice, when the bright ideas died away. Three engines were found necessary for the whole process; he had but one*. Crotchet soon became insolvent."

"John Lombe, a man of spirit, a good draughtsman, and an excellent mechanic, travelled into Italy with a view of penetrating the secret. He staid some time; but he knew admission was prohibited. He adopted the usual mode of accomplishing his end, by corrupting the servants. This gained him frequent access in private. Whatever part he became master of, he committed to paper before he slept. By perseverance and bribery he acquired the whole, when the plot was discovered, and he fled with the utmost precipitation on board a ship, at the hazard of his life, taking with him two natives, who had favoured his interest and his life at the risk of their own. But, though he judged the danger over, he was yet to become a sacrifice.

"Arriving safe with his acquired knowledge, he

* Four engines are now wanted, to wit, the winding, cleaning and doubling machines, and the mill itself. But it seems the *cleaning* or *purging* machine had not yet been invented, and the women who wound the silk on bobbins, had to pull out the burrs that adhered to it with their fingers, which must have been a long and tedious process, and the silk must have frequently broke. Now, by means of the machine, the operation is very rapid, and large quantities of silk are cleaned at the same time without breaking.—See below, p. 77.

fixed upon Derby as a proper place for his purpose, because the town was likely to supply him with a sufficient number of hands, and the able stream with a constant supply of water. This happened about the year 1717.

"He agreed with the corporation for an island or swamp in the river, five hundred feet long, and fifty-two wide, where he erected the present works, containing six apartments, and 468 windows, at the expense of about £30,000. This island, with another, called the Bye-flat, were part of the continent, but separated, ages past, by cutting two sluices to work four sets of mills. The ground continuing flat farther west, would yet allow one or two sets more.

"This ponderous building stands upon huge piles of oak, from sixteen to twenty feet long, driven close to each other with an engine made for that purpose. Over this solid mass of timber is laid a foundation of stone.

"During three or four years, while this grand affair was constructing, he hired various rooms in Derby, and particularly the town-hall, where he erected temporary engines, turned by hand. And although he reduced the prices so far below those of the Italians as to enable him to monopolize the trade, yet the overflowing of profit was so very considerable as to enable him to pay for the grand machine as the work went on.

"Being established to his wish, he procured, in 1718, a patent from the crown, to secure the profits during fourteen years. But, alas! he had not pursued this lucrative commerce more than three or four years when the Italians, who felt the effects of the theft from their want of trade, determined his destruction, and hoped that of his works would follow.

"An artful woman came over in the character of a friend, associated with the parties, and assisted in

the business. She attempted to gain both the Italians, and succeeded with one. By these two, slow poison was supposed, and perhaps justly, to have been administered to John Lombe, who lingered two or three years in agonies, and departed. The Italian ran away to his own country, and Madam was interrogated, but nothing transpired except what strengthened suspicion."

The author proceeds to give a description of the funeral of Mr John Lombe, which he says was the most superb ever known in Derby, the deceased being considered as a benefactor to the country. He does not appear to have possessed any other remarkable quality, except that he was a man of a "peaceful deportment." The writer then continues his narrative.

Page 202. "John dying a bachelor, his property fell into the hands of his brother William, who enjoyed, or rather possessed the works but a short time; for, being of a melancholy turn, he shot himself. This superb erection, therefore, became the property of his cousin, sir Thomas Lombe. I believe this happened about the year 1726.

"If the Italians destroyed the man, they miscarried in their design upon the works; for they became more successful, and continued to employ about 300 people.

"In 1732 the patent expired, when sir Thomas petitioned parliament for a renewal, and pleaded 'That the works had taken a long time in perfecting, and the people in teaching; that there had been none to acquire emolument from the patent.' But he forgot to inform them that he had already accumulated more than £80,000. Government, willing to spread so useful an invention, gave sir Thomas £14,000 to suffer the trade to be open and a model of the works taken, which was for many years

deposited in the tower, and considered the greatest curiosity there.

"A mill was immediately erected at Stockport, in Cheshire, which drew many of the hands from that of Derby, and, among others, that of Nathaniel Gartrevalli, the remaining Italian, who, sixteen years before, came over with John Lombe: him I personally knew; he ended his days in poverty. Since then eleven mills have been erected in Derby, and the silk is now the staple trade of the place: more than a thousand hands are said to be employed in the various works, but they are all upon a diminutive scale compared to this.

"The describers of this elaborate work tell us, mechanically, that 'it contains 26,000 wheels, 97,000 movements, which work 71,000 yards of silk thread while the water-wheel, which is eighteen feet high, makes one revolution, and that three are performed in a minute. That one fire engine conveys warmth to every individual part of the machine, and that one regulator governs the whole.' By these wholesale numbers the reader is left about as wise as before. The design of writing is to communicate the same intelligence to the understanding as might be conveyed through the eye or the ear upon the spot. Had the author made the number of his *wheels* 10,000 less, he would have been nearer the mark; or if he had paid an unremitting attendance for seven years, he might have found their number 13,384. Perhaps his *movements*, an indeterminate word, will also bear a large discount, but as I am neither in the humour to calculate nor contradict, I shall leave him in possession of his own authority. What number of *yards* are wound, every circuit of the wheel, no man can tell; nor is the number open to calculation. The wheel revolves about twice in a minute. Nor is the superb *fire engine*, which blazes in description, any more than a common stove, which warmed

one corner of that large building, and left the others to starve:—but the defect is now supplied by fire places. The *regulator* is a peg in the master-wheel, which strikes a small bell every revolution: near it is a pendulum, which vibrates about fifty times in a minute. Twenty-four returns of the pendulum is the medium velocity of the wheel. Although there are a vast number of parts, any one of which may be stopped and separated at pleasure; yet the whole, extending through five large rooms, is one regular machine, which moves and stops together. Every minute part is attended with two wheels, one of which turns the other. If you separate the two, the last stops of course, while the former moves gently on.

"The raw silk is brought in hanks or skeins called slips, and would take five or six days in winding off, though kept moving ten hours a day. Some are the produce of Persia: others of Canton, coarse, and in small slips; some are from Piedmont, these are all of a yellowish colour; and some are from China, perfectly white. The work passes through three different engines; one to wind, the second to twist, and the third to double.* Though the thread is fine, it is an accumulation of many. The workman's care is chiefly to unite, by a knot, a thread that breaks; to take out the burrs and uneven parts, some of which are little bags, fabricated by the silkworm as a grave for itself, when nature inspires the idea of leaving the world: the bags are neatly closed up and hung to a thread, as the last efforts towards its own funeral. They generally moulder to a darkish dust; sometimes are totally gone; but I have frequently taken them out alive. The threads are continually breaking; and to tye them is principally the business of children, whose fingers are nimble. The machine continually turns a round bobbin, or small

* See note above, p. 73.

block of wood, which draws the thread from the slip, while expanded upon a swift, suspended on a centre. The moment the thread breaks, the swift stops. One person commands from twenty to sixty threads. If many cease at the same time to turn, it amounts to a fault, and is succeeded by punishment. From the fineness of the materials, the ravelled state of the slips and bobbins, and the imprudence of children, much waste is made, which is another motive of correction; and when correction is often inflicted, it steels the breast of the inflictor."

In the book from which the above extracts are taken, which belongs to the Library Company of Philadelphia, the following note is written in pencil at the bottom of the page, probably by some English silk throwster: "The foregoing is a very imperfect account of the silk mill; it is totally silent on the subject of the machine which immediately connects with the great wheel, and is concealed from the eye of a visitor."

I admit that the account is by no means a full or correct one; partly in consequence of the modern improvements in the machinery, which the author could not be acquainted with, and partly also because he does not appear to possess a remarkable talent for description. It will, however, be sufficient to confirm a great part of what I have said in the preceding numbers.

J. D'HOMERGUE.

September 24, 1829.

NO. XVI.

A few general observations.—Conclusion.

It is time to put an end to these essays. The favour with which they have been received has induced me to extend them further than I should otherwise have done. My object was only to show the superiority of American silk over that of other countries, and to point out the best mode of employing it in a profitable manner. If I have succeeded in these respects in proving to the satisfaction of the reader the assertions that I have made, my end is completely attained.

The culture of silk has, from the first colonization of this country, more or less engaged the attention of the American people; and yet nothing has resulted from it beyond the fabrication of an inferior kind of sewing silk, which can only be applied to domestic uses. Those who have written on the subject have in vain endeavoured to discover the causes of this failure. Dr Pascalis (Practical Instructions, p. 26,) says, that it may be accounted for by circumstances independent of the climate; and so far he is right; but he does not specify what those circumstances are, reserving it for future numbers of his work. It appears to me that the whole may be referred to one single cause—the want of knowledge of the *art* to transform the produce of the American silk worm into a *saleable* article. The cocoons, it is well known, cannot cross the seas; if they are more than ten or fifteen days on salt water, they are liable to become mouldy; it is therefore necessary

that the silk should be extracted from them, before it can be transported to the countries where it is manufactured. But that cannot be profitably done without a perfect knowledge of the art of reeling it in the manner that is required abroad, to suit the different kinds of stuffs to be made out of it; and that art, simple as it may appear, requires much time and labour to acquire, in order to make the material fit for sale under the name of *raw silk*. And then it is not yet ready to go to the loom; but it must undergo four different preparations, which require a great deal of costly machinery, which has been partly described in the 12th and 15th numbers of these essays. So long as, at least, the art of making exportable silk shall not have been introduced into this country, there will be no sufficient inducement for the American farmers seriously to attend to the culture of the silk worm.

The author whom I have just cited, and who wrote before these essays appeared, seems to have been well aware of the folly of employing the beautiful silk of this country in the manufacture of an inferior kind of sewing silk. "Why," says he, in the work above cited, p. 36, "is the best silk employed and turned into sewing silk, for which there is always waste or inferior silk enough; and why is not the best silk kept for the loom? The answer is obvious—Because the people do not yet know how to prepare it in any other shape, so as to make it fit for sale. They extract from the cocoons the filaments with which they are covered, and call them raw silk; but nobody will purchase that article to be exported abroad, so that nothing remains but to convert it into *sewing silk*, which can only be disposed of in barter among country neighbours. But hear what the same author says again on this subject, in the Prospectus of his Silk Culturist:—"The value and use of silk, as a *staple* or produce of the coun-

try, or as a *commercial article* of manufacture, cannot be well ascertained, save when there is a proper and certain scale, whereby to judge of its quantity and quality; then it becomes a *tangible capital*, readily disposable by those who possess it, and are acquainted with the call or demand, and where or how to barter for it."

The same gentleman, in a recent letter, informs me of a fact of which I was not aware, and which would tend to show that silk worms might be raised as well without artificial heat in the south of France as in this country. He says that above sixty years ago the peasants of the Cevennes raised more and better silk in their miserable huts, with broken panes, without fire and without thermometers, than the gentlemen and ladies of Toulouse, in their handsome apartments, well closed, and often hanged with tapestry, and warmed with good fires; in consequence of which a warm controversy arose between the respective partizans of the town and country methods. In order to put an end to it, the local government was obliged to permit an experiment to be made in a public garden, under tents, sheltered only from the wind and rain. It succeeded so well, that the possibility of raising silk worms without artificial heat was affirmatively decided. The doctor quotes as his authority the work of Archibald Stevenson, an Englishman, who made a report of these facts to the Royal Society of London. I have never seen that work, nor the report alluded to.

Dr Pascalis further states, that the same thing took place in Italy, and that he is in possession of facts and documents to attest it. Then he asks why the method of Dandolo and Bonafous, with their thermometers, &c. has become so fashionable, and he answers, with great propriety, I think, that by those means it is thought that a greater quantity of

silk is produced. Admitting that to be a fact, that method may be usefully followed in countries which, like Italy and the southern provinces of France, have a limited territory; but in this widely extended country, where, without artificial heat, the cocoons produce one-third more silk than they do in Europe, with all their thermometers and other artificial means, there seems to be no reason why those European methods should be adopted, at least for a considerable time.

Little more now remains for me to say. I have been asked what part of the United States I thought best suited for the establishment of silk manufactories, and particularly for the preparation of raw silk. I do not know enough of this country to answer this question comparatively. All I can say is, that I believe Philadelphia to be extremely well suited to that purpose: 1st, Because it is essentially a manufacturing town; 2d, Because of its vicinity to the great seaports of New York and Baltimore, and because it is itself well suited for foreign commerce; 3d, Because I know by experience that this and the neighbouring states are capable of producing excellent cocoons and beautiful silk; 4th, Because of the lightness of the Schuylkill water, which quality, in reeling, greatly contributes to the beauty of the silk; and lastly, Because of the tenderness of the leaf of the mulberry tree, greatly exceeding that of those of Europe; but this may not be peculiar to Pennsylvania and its vicinity.

I have said all, and indeed a great deal more than it was my intention to say when I began these essays. But the subject seems inexhaustible. Nevertheless, I perceive that it is time for me to conclude. I therefore take my respectful leave of the American public, to whom I have thought that the results of a long experience in practical arts which have never yet been introduced into this country,

would not be unacceptable. If I have succeeded in pointing out, in a sufficiently clear and satisfactory manner, a new and untrodden road to national wealth, and it has been my good fortune, by my simple statement, to convince the understandings to those to whom these essays are peculiarly addressed—I mean the men of enlarged minds, to whom the country looks up as their instructors and their guides in the thorny paths of national policy—I shall have cause to rejoice in the suucess of my boldness in thus intruding myself upon the attention of a great and enlightened people.

J. D'HOMERGUE.

October 1, 1829.

[Here end the essays originally published in the National Gazette. The following is additional.]

NO. XVII.

The throwsting mill imported into this country by an English silk throwster.—Useless until filatures of raw silk shall have been established.—Postscript.

While these revised essays were in the press, I have been struck with an article, originally inserted in the New England Farmer, whence it made its way into the Cincinnati Daily Advertiser, and thence into the Washington Telegraph, from which I have extracted it, which I cannot suffer to pass unnoticed,

as it contradicts, in fact, the principles that I have laid down, and would tend to show that the American nation are prepared to manufacture silk stuffs before they have even learned how to prepare the raw material. The newspapers abound with similar paragraphs, written with good faith, on vague rumours, and sometimes founded on individual pretensions, which in the end turn out to be deceptive. On such an important subject none but well ascertained facts should be advanced, and those who think they are promoting the honour of their country by giving it the credit of things impossible to be performed, ought to consider that they are in fact counteracting the object that they have in view. The United States will be a great and a rich silk manufacturing country; but this must happen by natural means, and not by means of wonders and prodigies. The age of illusions is past, and the enlightened patriot, who wishes his country to rise to the pitch of greatness to which it is destined, will not be satisfied with delusive appearances; but will industriously seek, and steadily pursue, the most effectual means to convert them into realities.

The paragraph to which I allude is taken from the Washington Telegraph of the 12th instant, and is as follows:

"THE GOOD WORK.—A silk factory has been established at Dedham (Mass.) by Mr Edward Brown, who has served a regular apprenticeship to the business in London, and is considered a superior workman. He at present confines his attention to the weaving of silk fringe and tassels, sofa bindings, and articles for upholsterers, which are composed of rich stuffs, not having yet imported any broad looms. His father is soon expected from Europe with suitable implements for weaving silk velvets, and other silk cloths of all descriptions. He is now engaged in manufacturing raw American silk, raised by J. H.

Cobb, Esq. the present season, and will soon considerably extend his business."

The Cincinnati editor, commenting on this paragraph, observes with exultation that "the great difficulties complained of, such as the winding the silk from the cocoons, and the machinery necessary for its manufacture into cloth, are already removed." He does not absolutely say that those difficulties never did exist; but he either means to imply it, or supposes some miracle that has made them disappear. It would seem that in the course of the next year, at farthest, the United States are to manufacture silk stuffs, of every kind, and even velvet, the richest, next to gold and silver tissues. Whether this is really to take place, and by what means it is to be done, will be the subject of this additional number.

If I have been rightly informed, Mr Edward Brown is a silk throwster from London, regularly bred to the profession, and who has resided for some time, perhaps a few years, in the state of Massachusetts, where he has been in search of employment. It is said that he has brought with him a *throwsting mill*, of what size or power I am not informed, and that he has been endeavouring to dispose of it, but could not find a purchaser. This is what I have heard of that gentleman, if he be the same who has been thus mentioned to me, and I am by no means disposed to doubt his talents or his abilities in the art which he professes. I shall only take the liberty to contend that he cannot have established a manufactory of silk stuffs at Dedham or any where else in the United States, and that if he should at the present moment attempt to do it, he will only succeed in effecting his own ruin and that of all who may be concerned with him in the undertaking. I am glad, however, that there is such a person in this country, because, if he and his friends will only have patience, and if his circumstances al-

low him to wait, it is not unlikely that at a future day there will be employment for him, and that he will benefit this country as well as himself. A good silk dyer will at the same time not fail of sufficient encouragement. But that time is not yet at hand.

If Mr Brown is well acquainted with his business, (as I am disposed to believe he is), he must be also acquainted with the qualities of raw silk, and he must know that that which is reeled in this country (at least such as I have seen) cannot be employed in the manufacture of silk stuffs; nay, cannot be converted into thrown silk, without an immense loss by waste. In France, where raw silk is reeled in the highest degree of perfection, it will sometimes happen that one-fourth of the quantity passed through the mill goes to waste. This happens when the reelers are not closely watched, particularly young girls not completely instructed, or who have not acquired sufficient experience. As the throwsting mill twists the silk by an uniform and continued action, the weak threads pressed by the stronger break, and the silk becomes unequal, uneven, and unfit for use. I have no doubt that of the silk reeled in this country by uninstructed reelers, three-fourths at least would be wasted in twisting, and in the other operations preparatory to it; and whatever capital might be embarked in this business would be miserably sunk. The fortune of the great Philadelphia banker, Mr Girard, would melt in such an undertaking.

Mr Brown must know, also, that after reeling, there are three necessary operations preparatory to throwsting, to wit, winding, cleaning and doubling*, all of which are to be performed by women, properly instructed, and with suitable machines. I have no doubt that the latter might be made here, and

* See above, No. XII.

perhaps the women might be instructed by Mr Brown; but that would take time, and could not supply the defects in the reeling, which I do not believe Mr Brown to be able to teach, as the reeling of silk is not practised in England, the raw article, ready reeled, being purchased there from other countries. Therefore, the manufactory (if such be really intended) must fail from its very foundation. Raw silk, not properly reeled, cannot be put to any profitable use, and every attempt to establish silk manufactories before the art of reeling is well established in the country, must prove ruinous to the concerned.

It is said in the paragraph cited, that Mr Brown means to begin with the weaving of silk fringe and tassels, sofa bindings and the like; but Mr Brown must know, that although the silk for making these articles need not pass through the throwsting mill, yet it must be reeled, wound, cleaned and doubled, like any other silk. I do not however disapprove of his beginning with those articles; but with good reelers he will soon find that there is a better use to be made of the silk of his cocoons.

The paragraph says that Mr Brown cannot yet proceed to manufacture velvets and other stuffs, because he has not yet imported any *broad looms*. I do not know what looms are meant by this description; I am satisfied that all kinds of silk stuffs may be wove with the cotton loom in use in this country, with some slight alterations, which can easily be made.

Upon the whole, I have no hesitation in giving it as my decided and well matured opinion, that any attempt to manufacture silk stuffs in this country, before raw silk can be properly reeled and prepared for that purpose, will prove ruinous to all who shall venture to connect themselves with such a rash undertaking.

J. D'HOMERGUE.

December 15, 1829.

P.S. I have been repeatedly urged by my patriotic friends to subjoin to these essays some general directions to the American farmers, concerning the planting and cultivation of the white mulberry tree and the raising of silk worms. Yielding to similar suggestions, I at first contemplated publishing my ideas on the subject, in the popular form of an Almanac*, but afterwards it occurred to me that I might be led into mistakes by the little knowledge that I have yet acquired of the climate and temperature of this country, and I abandoned the design†. My friends, however, persisting in their opinion, have represented to me, that there are no sources in this country, from which the desired information may be obtained, except the works of foreign writers, who were not better acquainted than myself with the American climate, and that the translations or extracts from these works which have been published in the United States are by no means easy to be procured, particularly at a distance from the great seaports; that they are moreover voluminous, and full of details more calculated to discourage than to instruct. My bookseller has also thought that such an addition would give a practical character to this little work, enhance its value, and promote its circulation and sale. I have, therefore, consented to satisfy his wishes in the best manner that has been in my power, and the reader will find here subjoined "General directions to American planters and farmers for the raising of silk worms."

I have said nothing on the planting and cultivation of mulberry trees; in the first place, because it would have swelled this work too much, and also, because I do not think that information on this subject is so much or so immediately wanted as on the

* See above, p. 39. † See above, p. 70.

other branch of this important object of culture. Mulberry trees appear to be raised without much difficulty in every part of this country, and it appears to me that the mode of its cultivation is pretty generally understood. But the raising of silk worms requires a great deal more care and attention. Therefore I have confined myself to it, and I have endeavoured, with all the clearness and precision that has been in my power, to say just as much as I have thought necessary, and no more. I have left a great deal to be supplied by the intelligence of the American farmer, on which I am sure that I have not relied in vain.

These directions are more particularly calculated for the latitude of Philadelphia and the states to the south of it, of the climate and temperature of which I have acquired some slight knowledge during my short stay in this country. Whether they will be equally suited to the northern and north western states I will not pretend to say, as I have had no opportunity to satisfy myself upon this head. If it be true, as I have heard it said, that silk worms are also raised in those parts of this country without artificial heat, these general instructions may, even there, not be entirely without their use. However it may be, I submit them with great diffidence, as the result of my experience and observation in distant climates, combined with the very limited knowledge that I possess of that of this country.

J D'HOMERGUE.

December 26, 1829.

GENERAL DIRECTIONS

TO

AMERICAN PLANTERS AND FARMERS FOR THE RAISING OF SILK WORMS.

I. OF THE EGGS OF SILK WORMS.

The eggs of silk worms exactly resemble in their appearance and colour the seeds of the poppy. Hence those seeds are sometimes sold in Europe by dishonest men as silk worms' eggs, or mixed with them. But it is easy to detect the fraud, and at the same time to separate the good or live eggs from the bad ones. The eggs must be washed in pure water; all that are good will go to the bottom, and the bad ones will swim. This separation ought to be made by every one who purchases worms' eggs. It is also necessary to keep them clean, and free them by washing from a kind of gum which adheres to them. Those who purchase or receive from others the eggs of silk worms, will do well always to observe this direction, although the eggs may have been washed by those who raised them, as many of them may have perished by dampness, excessive heat, or want of care.

After the eggs have been washed, they must be dried by exposure to cool and dry air. As the eggs are produced in the month of July, which is a hot month, they must be kept in some cool place until the proper season for hatching them, which is in May. No degree of cold can hurt them, provided they do not freeze. If they are purchased or re-

ceived in the hot season, they must not be dried in the sun after being washed, but in the cool of the morning or evening, when the air is perfectly dry and the dew is not falling. The manner of preserving them will be mentioned hereafter.

II. OF HATCHING THE EGGS.

The general rule in Europe is to put the worms' eggs to hatch as soon as the mulberry trees begin to bud. The tree here spoken of is the *Italian white mulberry*, (the proper food of silk worms), which should be every where extensively planted. It buds generally about the 11th of May. Ten days afterwards, say about the 21st, they put forth their leaves. These ten days are employed in France in hatching the eggs, by exposing them to a heat which is graduated by means of stoves and thermometers. But in this country nature seems to have done every thing, and I can see as yet no need of recurring to art. The worms' eggs may then here be put to hatch when the *leaves* of the mulberry begin or are ready to appear. I think in this country this happens about the 21st of May, when the sun passes from *Taurus* into *Gemini*. If, however, by some change in the temperature, the mulberry trees should put forth their leaves later than usual, the time of hatching should be delayed proportionally. But I am inclined to think that that but seldom happens in this country.

The manner of putting the eggs to hatch is as follows:—They should be put in a pasteboard or wooden box, not covered at the top, and the sides not more than half an inch high, so that the worms, when hatched, may easily crawl out, as will be presently mentioned. The size of the box should be suited to the quantity of eggs to be hatched, so that they be not on the top of one another; but they may touch each other. The box then should be covered with paper, perforated with holes of the size of a

large pin's head, so that the worms when hatched may easily pass through them. I have found that the worms in this country, as far as my experience goes, are generally hatched in three days after being put into the box. When they are near coming out, young mulberry leaves should be put on the top of the box, leaving spaces. The worms, as soon as hatched, will smell those leaves, crawl up to them through the holes in the paper cover, and begin feeding. Then the leaves, covered with worms, are gently taken up, and laid on the table or hurdle that has been prepared to receive them.

The eggs should be put to hatch in a warm place. The heat should be at least 80 degrees Fahrenheit. When I arrived in this city, on the 19th of May, the thermometer was at 82½ degrees within doors. It is therefore probable that about the same period it does not often fall below 80 degrees, particularly in the south. The European writers have taken great pains to graduate the heat during the ten days which are employed in those countries for hatching worms' eggs. All these precautions do not appear necessary in this country.

III. OF THE REARING OF SILK WORMS.

In Europe the silk worms, after they are hatched, are generally laid, with the leaves on which they are feeding, on wicker hurdles, in order, as it is thought, the more easily to keep them clean. I think they may as well be laid on clean pine tables, and may in that manner also be kept clean, as I shall presently show.

During the first day after the worms are hatched, the room in which they are should be kept in the same degree of heat; but afterwards, as the heat and the strength of the insect increase together, the room should be cooled from time to time, by letting in a draught of air. In general, the windows should be now and then opened to let in the dry air from

the north and north west. Dampness is fatal to the silk worm, and should be constantly guarded against.

Cleanliness is also of the greatest importance; when it is wished to clean the table on which the worms are, it is only necessary to place close to it another table, on which are put mulberry leaves; the worms will immediately crawl to them, and leave the other table empty, which may then be cleaned. This is necessary to be done the oftener as they increase in size, as they then make more ordure. In the beginning it should not be done until after their first moulting. They generally moult or shed their skin four times. During the moulting, which lasts 24 hours, they lie torpid, and do not feed. They should then be left quiet.

Care should be taken that the worms do not lie on each other, as it prevents them from feeding. When they do, they should be separated. They should have as much space as possible; the more they are at their ease the better they thrive.

Nothing is more prejudicial to the silk worm than to be fed with damp leaves. A quantity of dry leaves should therefore always be kept in reserve, in case of rain. Wet leaves must be dried in the hot sun. The leaves should not be gathered until the sun has absorbed all the dew.

The quantity of food to be given to the worms must be calculated according to their ages. In the first days they should not be overfed.

In plucking the leaves to feed the worms, the buds should not be touched, nor the branches of the tree broken. Nothing but leaves should be gathered. The mulberry puts forth three times in each season; if the branches are broken or the buds plucked off, the tree suffers considerably, and does not produce so much. All the leaves should not be plucked off, but some left on the tree.

IV. OF THE RISING OF THE SILK WORM.

When the silk worms are ready to make their cocoons, which in this country, generally, is on the 31st day after they have been hatched, a kind of artificial hedge, not above one foot high, must be prepared, by means of some brushwood without any leaves, which is to be fixed along the wall, behind the table on which the worms are. They crawl of themselves in this hedge, which is called *rising*, and there make their cocoons. This brushwood must not be fixed straight up along the wall, but should be inclined above and below, in the form of a semicircle towards the table on which it is to rest, because the worms always move in a circular direction; and also in order that, if they should fall, they may not fall upon the table or floor, but on some part of the artificial hedge, whence they may crawl up and carry on their work.

It is easy to know when the worms are ready to rise. They crawl on the leaves without *eating* them; they rear their heads, as if in search of something to climb on, their rings draw in, the skin of their necks becomes wrinkled, and their body becomes like soft dough. Their colour also changes to a pale yellow. When these signs appear, the table should be cleaned, and the hedge prepared to receive them.

From the moment that the cocoons begin to rise they cease to eat; they must not be touched, nor their cocoons, until they are picked off, as will be presently mentioned.

V. OF PICKING OFF THE COCOONS.

The worms generally form their cocoons in three days after their rising; but they are not perfect until the sixth day, when they may be picked off from

the hedge. In Europe this is not done until the eighth day, nor should it be done sooner in this country, if during the six days there have been violent thunderstorms, by which the labours of the moth are generally interrupted. The cocoons must be taken down gently, and great care taken not to press hard on them: because, if in the least flattened, they fall into the class of imperfect cocoons, and are greatly lessened in value.

In picking the cocoons from the hedge the floss or tow with which they are covered must be delicately taken off, always taking care not to press too hard on the cocoons.

After the cocoons are thus taken down, some are preserved for eggs and others kept for sale.

I shall speak of them successively.

VI. OF COCOONS KEPT FOR EGGS.

In order that the farmer may judge of the quantity of cocoons that it will be proper or advisable for him to put aside and preserve for eggs, it is right that he should be told that fourteen ounces of cocoons will produce one ounce of eggs, and one ounce of eggs will produce a quintal of cocoons.

In selecting the cocoons to be kept for eggs, it is recommended to select the white ones in preference, and keep the coloured ones for sale; attention should be paid to having an equal number of males and females, and they are generally known by the following signs: the male cocoons, that is to say those which contain the male insects, are in general smaller than the *female*, they are somewhat depressed in the middle, as it were with a ring; they are sharp at one end and sometimes at both, and hard at both ends; the female cocoons, on the contrary, are larger than the male, round and full, little or not at all depressed in the middle, and not point-

ed at either end. They may easily be discerned by a little habit.

It is particularly recommended to take off all the floss or tow from these cocoons, so that the moth may find no difficulty in coming out.

After the cocoons have been taken down from the hedge, those which are intended for eggs should be laid, but not crowded, on tables, that is to say, the males on one table and the females on another, that they may not copulate too soon, and before they have discharged a viscid humour, of a yellow reddish colour, which prevents their fecundity. They discharge this humour in one hour after coming out of the cocoon, which is generally ten days after these have been taken down from the hedge; but this may be accelerated by heat.

At the expiration of one hour after the moths have come out of their cocoons, the males and females may be put together on tables or on the floor; the tables or floor ought to be previously covered with linen or cloth, on which, after copulation, the females lay their eggs. One female moth or butterfly generally lays 500 eggs; the male and female remain about six hour together, during which time they copulate; after which they separate, and the female is 48 or 50 hours laying eggs; but the greatest quantity during the first 40 hours.

From the moment the moths have come out of their cocoons until the females have laid all their eggs, the room must be kept entirely dark; the light debilitates them and makes them produce but few eggs, and the worms that come from them are weak and puny.

When the female moths have done laying eggs all the insects must be taken away, and may be given as food to the fowls. The eggs must remain on the cloth where they have been deposited during

fifteen or twenty days, until they shall have become of an ash or slate colour, when they are perfectly ripe, and may be considered as good eggs. Then the cloth or linen must be folded, and kept in a cool and dry place, until it shall be thought proper to take off the eggs, which is done by putting the cloth into pure water, and when thoroughly wetted, scraping gently the eggs from the cloth, taking care not to injure them. When thus scraped into the water all the good eggs will go to the bottom, and the bad, if any, will swim at the top, as mentioned above, Art. I.

The eggs being thus washed, must be dried in the open air, and when perfectly dry, the best mode to preserve them is to put them into hollow reeds, or canes, perfectly dry, and closed at the two extremities with a thin piece of flaxen or cotton linen well fastened. It is also the best means to transport them from one place to another.

VII. OF COCOONS INTENDED FOR SALE.

In order to prevent the cocoons from being perforated by the moths escaping from them, which greatly lessens their value, it is necessary to kill the moths. This is generally done by baking in an oven or by steam, but the best mode, which is peculiarly well adapted to warm climates, is to lay the cocoons on linen or cotton sheets, but not too close, or one upon another, and to expose them thus to the heat of the sun in open air, when it is perfectly dry, during four days, from 11 A.M. to 4 P.M. taking great care in handling them not to crush or flatten them, which is of the highest importance. In that time there is no doubt that the moths will be killed.

The processes of steaming and baking are not always safe, because they may be overdone and the silk greatly injured. I have seen instances of it in this country. Yet if the weather should prove ob-

stinately damp or rainy, those processes must be recurred to, but not in dry sunshiny weather, when they can be avoided.

The last thing to be spoken of is the packing of the cocoons to send to market. They must be put in boxes with great care, not pressed too close, lest they should be flattened, and close enough that they should not suffer in like manner by striking hard upon each other in consequence of the motion of carriages or stages. The boxes being dry and well conditioned may be transported by steam-boats; if transported by sea, they should not remain longer than fifteen days on salt water, lest they should become mouldy. On river water, and particularly by steam-boats, there is not the same danger. The boxes in every case should be covered with a tarpaulin or good oiled cloth, that they may in no case suffer from dampness or rain.

The price of good cocoons in France is from twenty-five to thirty-five cents per pound of sixteen ounces; I mean of perfect cocoons. Perforated cocoons, from which the moth has escaped, those which are spotted, and the imperfect ones, called *chiques*, mentioned in the essay No. V. command no price, and are generally given away by the silk culturists. There are but few of them, because those who raise silk worms being experienced in the business, produce hardly any but good cocoons. When these are sold, the bad ones are thrown into the bargain.

The price of cocoons in this country cannot yet be settled; but it will be the interest of the silk culturist to sell them in the beginning as cheap as possible, to encourage the silk manufactures, which alone can procure them regular purchasers, and without which their produce must lie upon their hands.

J. D'HOMERGUE.

APPENDIX.

A

Proceedings of the House of Representatives of the United States for the promotion of the growth and manufacture of silk.

HOUSE OF REPRESENTATIVES, *Dec.* 29, 1825.

On motion of Mr Miner, *Resolved*, That the Committee on Agriculture be instructed to inquire whether the cultivation of the mulberry tree and the breeding of silk worms, for the purpose of producing silk, be a subject worthy of legislative attention; and should they think it to be so, that they obtain such information as may be in their power respecting the kind of mulberry tree most preferred, the best soil, climate, and mode of cultivation; the probable value of the culture, taking into view the capital employed, the labour, and the product; together with such facts and opinions as they may think useful and proper.

Resolved, That the same committee inquire whether any legislative provisions are necessary or proper to promote the production of silk.

May 2, 1826.

Mr Van Rensselaer, from the Committee on Agriculture, to which the subject had been referred, made the following *Report*: The Committee on Agriculture, to whom was referred the resolution of Mr Miner to inquire whether the cultivation of the mulberry tree and the breeding of silk worms for the purpose of producing silk be a subject worthy of legislative attention; and should they think it to be so, that they obtain such information as may be in their

power, respecting the kind of mulberry most preferred, the best soil, climate, and mode of cultivation, the probable value of the culture, taking into view the capital employed, the labour and the product, together with such facts and opinions as they may think useful and proper, *Report:*

That they have examined the subject attentively, and have taken such steps as they thought best calculated to obtain information which might be useful and lead to satisfactory conclusions.

The facts developed in the course of their inquiries tend to place the subject in an important point of view. It is an interesting fact that the mulberry tree grows indigenously throughout the United States, and that silk may be raised with facility from the southern to the northern boundary of the Union. Formerly considerable quantities of silk were produced in Georgia. In 1766 more than twenty thousand pounds of cocoons were exported from thence to England. The production of the article was suspended, not from any difficulty experienced in the process, but from causes connected with the revolution. Measures have recently been adopted at Savannah with a view to the renewal of the cultivation of the mulberry tree and breeding the silk worm. In Kentucky the committee learn that sewing silk is now produced in considerable quantities, and of excellent quality. Many years ago the attention of public spirited individuals in Pennsylvania was turned to the production of silk. The Persian mulberry was introduced into Bethlehem, Pennsylvania, by bishop Ettwein, where it flourished, and still flourishes. Silk was produced without difficulty. In Chester and other of the southern counties of that state the experiment was also made with success. The great demand and high price of bread stuffs, owing to the wars growing out of the French revolution, rendered the cultivation of grain so profitable for many years, that the mulberry was neglected. In 1779, two hundred pounds of sewing silk were made in the town of Mansfield, in Connecticut; and in 1810, according to the report of the marshal who took the census, the value of silk produced in Windham county was estimated at $27,373. The

committee learn that the production of silk is still attended to and found profitable. Some beautiful specimens of sewing silk, the production of that state, have been exhibited to the committee. Of the fact, therefore, that the United States can produce silk for its own consumption, and even for exportation to the extent of foreign demand, there appears no reason to doubt. There are few persons, the committee believe, even the most intelligent of our citizens, (who have not turned their attention particularly to the subject), who will not be surprised at the view presented by the following official statement of the value of silks imported into the United States for the last five years:

Statement of the value of silk goods imported and exported in the years 1821 *to* 1825, *inclusive.*

Years.	*Imported.*	*Eported.*
1821	$4,486,924	$1,057,233
1822	6,480,928	1,016,262
1823	6,713,771	1,512,449
1824	7,203,344	1,816,325
1825	10,271,527	2,565,742
	$35,156,494	$7,968,011

What a bounty is paid by us to support the agriculturist and manufacturer of other nations, on articles which our country, with a few years of care, might supply! How important it is that the agriculturist should turn his attention to new objects of production is very fully shown by the circumstance of the diminished and diminishing demand of bread stuffs abroad.

In 1817 the exports of bread stuffs amounted to $ 20,374,000. In 1818 to 15,388,000. In 1824 to 6,799,246. In 1825 to 5,417,997.

An importation of ten millions of dollars of silks; an export of five millions of bread stuffs! The facts speak the importance of the subject, and indicate the necessity that exists of awakening the slumbering agricultural resources of our country by introducing new and profitable articles of production. Knowledge is power in agriculture no less than in politics; INFORMATION IS CAPITAL, and the

means of valuable improvement. The committee conceive that the first and most important measure to be taken is to acquire and circulate clear, distinct, and precise information on these points: the relative value of the cultivation of the mulberry and the production of silk, compared with other agricultural productions in the different sections of the Union, capital and labour being considered. The kind of mulberry best suited to the object; the most advantageous mode of cultivation; the most approved manner of managing the silk worm; and an explanation of the process till the article is ready for market. The committee incline to the opinion that the best mode of raising silk will be for every farmer and planter to appropriate a small portion of ground, as for a fruit orchard, for raising the mulberry tree, calculating to produce as many worms as his own family will enable him to manage without increasing his expenses, and without permitting it, until the experiment shall have been fully tried, to interfere with the regular course of his usual pursuits. A single acre planted with the mulberry will produce from 500 to 600 pounds raw silk, the value of which to the individual would richly compensate for the capital and labour employed, and the aggregate to the country be of great importance.

The fact is worthy of notice, that, notwithstanding the high price of land in Ireland, where a year's rent of land exceeds the price of the soil in many parts of our country, yet so valuable is the mulberry considered, that importations of trees from the Mediterranean have been made during the last year for the purpose of producing silk. Your committee addressed inquiries to several intelligent gentlemen who were presumed competent to give them information upon the subject; and among the papers received in reply, they beg leave to present to the particular attention of the house a valuable memoir, replete with interesting facts and useful information, from Edmund C. Genet, Esq. and also several communications from other gentlemen, to whose attention the committee acknowledge their obligations. As the result of these inquiries, believing that knowledge on the subject is of the first importance, the committee submit the following resolution

Resolved, That the secretary of the treasury cause to be prepared a well-digested Manual, containing the best practical information that can be collected on the growth and manufacture of silk, adapted to the different parts of the Union, containing such facts and observations in relation to the growth and manufacture of silk in other countries as may be useful, and that the same be laid before congress at the commencement of their next session.

February 11, 1828.

Mr Van Rensselaer, from the Committee on Agriculture, to which the subject had been referred, made the following *Report:*

The Committee on Agriculture, to which was referred the report of the secretary of the treasury, made in pursu ance of a resolution of the house of representatives, passed the eleventh of May, 1826, directing the secretary to prepare a well-digested Manual on the growth and manufacture of silk, have agreed to the following resolution, which they have instructed their chairman to submit to the house:

Resolved, That six thousand copies of said Manual and report be printed for the use of the house.

B.

DIRECTIONS FOR REELING SILK.

Extracted from the above mentioned Manual.

[*Preliminary observations by John D'Homergue.*—My chief view in the foregoing essays has been to prove: 1. That the preparation of raw silk, called *reeling*, is an art, without a perfect knowledge of which this country can ne-

ver expect to be able to manufacture silk stuffs, and is the great and most important object to be at present attended to, while in the mean time it will afford to the American nation a great and a certain source of immediate profit. 2. That this art requires considerable skill and dexterity, and can only be acquired by experience and practice, under proper instructors. The first of these points, I think, I have sufficiently proved; the second, perhaps, may be controverted, as it is not so easy of demonstration as the other. The Manual to which I now refer offers me a proof of this fact, which I think can with difficulty be resisted, as it contains a regular set of instructions for reeling silk, from which it will appear that that branch of labour is at least not easier of execution than I have described it, and which will confirm the assertions that I have made in several places, and particularly in page 45 of this work. It will be evident, also, to every one who will take the trouble to read the following extracts, that notwithstanding the great minuteness of detail into which the writer has entered, it is impossible for any one to learn how to reel silk from the cocoons by the aid of a written description of the process employed, and that that art, like all others, must be practically taught and practically acquired.

I do not wish it to be understood that I consider the following extract, in all its parts, as a correct description of the process of reeling. It appears from the author's own declaration in the preface to the Manual, page 8, to have been gathered from the works of various foreign writers, who are not all equally to be relied on. There are things in it which are entirely opposed to the practical notions that I have acquired, and some which appears even ludicrous to one who has a familiar experience of the art. For instance, I cannot form an idea of a workshop of three hundred reels, with as many women, each having a thermometer at her side, of the use of which (I speak here of the French and Italian peasantry) she is entirely ignorant, nor can I understand how those women can rise and leave their work at every moment to mend their fires and regulate the heat of their furnaces, while it is so easy to add a little cold water to that which is too hot, and every one knows that a coal fire is not easily regulated. It appears to me also

very strange that reelers should rub their fingers with sand-paper or the skin of a dog-fish to make them smooth, while, on the contrary, their fingers are apt to become raw by being constantly kept in hot water: all these things may have been found in French Encyclopedias, or other works of a similar kind; for that is the way that books are made, but it is not the way that mechanical arts are taught. They require instruction of a different kind, and there must be the hand and the eye of a master.

In order, however, to give a convincing proof of the fairness with which these essays are written, I insert here the instructions for reeling silk, word for word, such as they are in the Manual, with the notes of the author, and a copy of the plate to which he refers. The public will judge thereby whether this art can be learned from such descriptions; and if it can, I shall, by multiplying the copies of this extract, have rendered some service to the country.

I ought to add, that the plate represents the Piedmont reel, which is no longer in use in France, having been recently very much improved and simplified by *M. Jensoul.*]

EXTRACTS.

MODE OF REELING SILK FROM THE BEST COCOONS.

PRELIMINARY REMARKS.—The reeling must be performed in dry weather, and when the air is perfectly calm. If done in a building or shed, it should be open on one side to enjoy sun and air, and walled on the other to screen off the wind, which would blow about the fibres and threads.

The softest water must be chosen for soaking the cocoons. The proper temperature for it cannot be ascertained until the reeling is commenced, owing to the different composition of the silk. Some cocoons will require water heated from 168° to 190°; others from 190° to 202°. Some point between these extremes may be chosen to which the water should be heated in a first experiment. One thing is certain, that in the United States it must never reach the boiling point, or 212°.

The good cocoons, the white and yellow, are the easiest to wind. The sattiny and the cocalons require water less

heated than the others. If hot water be used for the last, they furze out in winding. The dupions, the choquetts, the steamed cocoons, and those which have been kept a long time after being baked, require the hottest water. The dupions require to be soaked five or six minutes before they can be reeled. The cocoons in which the chrysalides have not been killed, by either steaming or baking, give out their silk very easily, and in water less heated than the last mentioned sorts. The temperature of the water most proper for each particular species of cocoon being ascertained by the thermometer, it must be kept to that degree by dipping the instrument in it frequently; and the fire under the basin must be lessened or increased as occasion may require. A little attention will soon enable the person who has the management of the basin to preserve the water at the proper degree of heat.

The reeling is effected by the use of the apparatus represented in the plate annexed*. The person charged with the management of the cocoons in the basin must be provided with a small whisk of broomcorn, or of birch twigs, cut sharp at the points, and being seated behind the basin, previously filled with soft hot water, and the basin placed upon a furnace containing burning charcoal, she must throw into the water a handful or two of cocoons of one sort and degree of firmness, and press them gently under the water for two or three minutes, in order to soften the gum of the silk, and thereby to loosen the ends of the filaments. She is then to stir the cocoons with the end of the whisk, as lightly as possible†, until one of the fibres or filaments adheres to it, when, disengaging it, and laying aside the whisk, she is to draw the filament to-

* There are several kinds or patterns of reels. The one here referred to was imported by the writer from Genoa into Philadelphia, in the year 1826, and answers perfectly. Mr D. Tees, No. 150, North Front street, and R. F. Pomeroy, corner of Walnut and Dock streets, Philadelphia, are recommended to those who wish to have silk reels made.

† The cocoons should be just touched. If they be struck roughly, the fibres of the silk, in place of coming off singly, cling together in lumps, which prevents it from winding off.

wards her, until it comes off quite clean from floss or coarse silk, which always surrounds the cocoon, and the fine silk begins to appear: then breaking off the thread, and collecting the floss first taken off, she must put it aside. The whisk is then to be applied again, to get hold of the fine fibres, all of which must be set apart, each fibre by itself, by fixing it to a piece of wood kept near to the furnace for that purpose, or to a frame of wood placed all around, and on the edge of the copper, till the whole, or the greatest part, are arranged in this manner, which are thus in readiness to be thrown in, to form the thread of silk to be wound off. This done, she is to unite a number of the fibres, according to the fineness of the intended* thread, and deliver the compound thread to the reeler, who puts it through one of the holes in the iron plate, placed horizontally above the basin containing the cocoons and water. Another thread is, in like manner, to be prepared and passed through the adjoining hole. This process is repeated with the two other holes at the other end of the plate; the two threads are then crossed twenty or twenty-five times, and the ends of each thread passed through the guide-hooks (rampins†) MM, of the traversing bar I, and on the contrary side to the hole in the iron plate through which it had previously been passed. They are then to be carried forward, and made fast to one of the arms of the reel N. The points of attachment of the two threads will be regulated by the distance between the rampins‡. Both threads being fastened to the reel, it is

* For fine silk four fibres, from four cocoons, are to be passed through each of two holes in the iron plate most distant from each other. The rule for inferior cocoons will be hereafter mentioned. Two skeins of silk, from good cocoons, are always reeled at the same time, whether the silk be fine or coarse. See the plate.

† If these were made of brass wire, the threads would more readily pass through them, and not be so liable to rust as when iron wire is used.

‡ The person having the management of the cocoons in the basin should have very smooth fingers, as the most trifling roughness of the skin will cause great embarrassment. If the skin of the fingers, therefore, of the person mentioned be rough, it must be rendered smooth by being rubbed with sand-paper or dog-fish skin.

to be turned with a regular, even motion, at first slowly, until the threads are found to run freely and easily : for it will happen that some of the ends which were taken to compose the thread were false, because, in taking off the floss, there may be two or three breaches made in the beginning of the fibres, which, in winding, will soon end, and must be added anew to make up the number designed for the thread. It might therefore be proper, in the beginning of the thread, to put a few more cocoons than it is intended to continue, which will soon be reduced to the proper number.

The crossing of the threads is so essential to their perfection, that it must not, on any account, be omitted. It is necessary to promote the dissipation of the moisture imbibed by the fibres, and thus prevent the injurious glueing of the threads upon the reel. The friction of the threads also removes the knots, inequalities, and roughness on them, and causes a perfect adhesion of their fibres, and hence insures their strength, their uniform thickness and cylindrical form, which otherwise would be flat*. The plate will give a perfect idea of this first step in the preparation of silk. It represents two threads formed from sixteen cocoons.

As soon as the pods begin to give the thread freely, the reel is turned with a quicker motion. If the pods leap up often and beat against the iron plate P, the motion of the reel must be slackened; and if the threads come off in burrs, it must be turned quicker. Of this the spinner, who has her eye upon the balls and thread, must, as she sees occasion, apprize the reeler; and at the same time

* Nouvelle Encyclopédie Méthodique, art. Soierie, p 21. From this work it appears that the number of these crossings is prescribed by the 4th section of the law in Piedmont, of long standing, for the regulation of the reeling of silk, to be eighteen or twenty times at least. For coarser silk, the number of crossings is to be increased. The various processes of the manufacture of silk in Piedmont are regulated by law, (the result of long experience as to the best mode of procedure), and are enforced by a strict inspection of public officers, in order to preserve the character which the raw silk and stuffs of that country has long enjoyed.

the fire must be increased or diminished, that the reel may be allowed a proper motion, which ought to be as quick as possible, without endangering the breaking of the thread, or hurrying the spinner, so that she cannot add fresh cocoons as fast as the old ones are ended.

The quicker the motion of the wheel is the better the silk winds off, and the better the end joins to the thread. One might imagine that the rapidity of the motion would overstrain and break the thread; but, from constant experience, it has been found that the thread never once breaks from the rapidity of the motion, but, on the contrary, that the quicker the motion is, the more advantageous it is for winding the silk.

While the reel is turning, the spinner must continually add fresh fibres to each thread, as fast as she can find the ends, not waiting till some of the number she began with are ended, because the internal fibres are much thinner than those constituting the external layers; but must constantly prepare fresh ends, by dipping the whisk among fresh cocoons, of which such a quantity must be occasionally thrown into the basin as will suffice to supply the two threads which are reeling, but not more; because, by being too long soaked in the hot water, they would wind off in burrs. The cocoons thrown in must be often forced under the water, that they may be equally soaked: for, as they swim with their greater part above water, that part would remain hard and stubborn, while the part which is under water would be too much soaked; or some hot water may be thrown upon them frequently with a brush, and also on the cocoons which are reeling, when they grow dry at top, and yield the fibres with difficulty. The supplying fresh ends, when the cocoons are exhausted, or diminish, or the fibres break, is performed by taking one end of a fibre and throwing it lightly on the one that is winding, and rolling them between the thumb and the finger, or gently pressing them.

As often, therefore, as the cocoons are partially wound, are exhausted, or the fibre breaks, fresh ones must be joined, to keep up the number requisite, or the proportion: thus three new ones may be wound, and two half wound, or four new ones, and the silk will then be from four to

five cocoons. The adroitness in adding fresh threads can only be acquired by practice. The difficulty of keeping the thread even is so great, owing to the increased fineness of the fibre inside, that (excepting a thread of two cocoons) we do not say a silk of three, of four, or of six cocoons; but a silk of three and four, of four and five, and of six to seven. In coarser silk, we do not calculate so nicely as one cocoon more or less; we say, for example, from twelve to fifteen, from fifteen to twenty cocoons. In beginning a thread of ten cocoons, from sixteen to twenty will sometimes be required to preserve an uniform thread, after a portion of the first layer has been wound off.

The quantity of silk which can be reeled in any given time is in proportion to the quickness with which the spinner can add fresh cocoons. Thus, if we suppose that every cocoon, at a medium, will either break or be wound off at the end of five hundred feet, then if five such pods are reeled together, a fresh end will be wanted at every hundred feet that are reeled; if ten are reeled together, one will be wanted at every fifty feet; if sixteen together, then at thirty-one feet, and so on. The seldomer that cocoons end or break the greater number of them can one spinner attend, which shows the advantage of sound cocoons, of an expert manager, and of every artifice which can hinder either the breaking of the single fibres, or of the whole thread.

When in the progress of reeling off a set of cocoons, the fibre is observed to diminish in size, in place of supplying additional fibres from more numerous cocoons than were at first in play, in order to keep up the uniformity in the size of the thread, the following practice is adopted in the Cevennes, a famous silk district of France*.

"In preparing fine silk, the cocoons are not wound off entirely, so as to leave the pellicle of the chrysalis bare, for two reasons: first, because the additional fibres required to be added, when the first and strong part of the

* This appears to be a preferable mode, as regards ease of performance and the preservation of a uniformity in the thread, to the old plan of increasing the number of fibres from fresh cocoons to add to others which may be nearly spent.

fibre is observed to be spent, might make the compound thread too stout, and would thus cause a waste of silk; secondly, because the fibre of a cocoon which has been entirely wound off, besides being weak, also abounds in knots, which would cause it to break in winding, and injure its uniformity, in which the goodness of the thread mainly consists. Therefore, in winding fine silk, when the cocoon has given off three-fourths and a half of silk*, it must be replaced by another cocoon; the remainder of the first cocoons are to be set aside, and their silk added to that of an inferior quality. When the first parcel of cocoons is nearly finished, take out, with a ladle, all those on which some silk has been left; let them be opened, the chrysalides taken out, and the shells put in a basket, with the coarse fibres first pulled off with the hands from the cocoons which were ordered to be laid aside. These cocoons which are partly wound off, must on no account be permitted to remain in the basin: for they will obscure and thicken the water, and injure the colour and lustre of the silk, which can then be used only for dark colours; besides this, the consistence of the silk is injured, and waste ensues in the winding†." The shells are to be buried, to prevent them from becoming offensive; or they may be added to the manure heap. As a general rule, the water must be changed when it is discoloured.

When the spent cocoons leap up and adhere to the iron plate, they must be immediately taken away, else by choking the passage they will endanger the breaking of the thread.

When the reel has remained any time idle, the thread between the basin and the wires or rampins, must be wet, to cause the thread to run easily. Keep also the teeth of the wheels, and the mortises in which the traversing bar

* Reynaud says, p. 237, that a cocoon will preserve a uniform fibre for 800 feet. A French foot is equal to 13 American inches.

† Des vers à soie et de leur Education, selon la pratique des Cévennes: par M. Reynaud, p. 234. Paris, 1824.

In Italy, the pellicle or shell, is used to make artificial flowers, which are said to surpass those from any other material. Essai sur Histoire, &c. par Delongchamps, p. 78.

plays, wet, to insure regularity and ease in their movements. In winding the good cocoons, some defective ones will be found among them, which will not wind off, or are full of knobs; these must be taken out of the copper, and kept by themselves; they are called bassinats, and are to be wound apart as coarse as possible; they make a foul silk.

The breaking of the fibres is principally owing either to bad cocoons, viz. being ill formed, (as they will be when the worms were disturbed and interrupted during their spinning), or the fibres may break by an improper regulation of the heat in the water; first, when it is not sufficient to make them wind off easy; or, second, when it is too great, and occasions burrs, which may stop at some of the holes through which the thread runs. Cocoons, also, which have two worms enclosed, will perpetually break. The whole thread may also break, by burrs stopping at the holes in the plate, or by the reel's being turned by jerks. It may be fastened, like the fibres, by laying the parts one on another, and giving them a little twist. To avoid the breaking occasioned by burrs, the rampins should be just so wide as to let them easily pass.

It would be convenient for the spinner to have a little stick erected close to the side of the basin, to hang her whisk on, and also a sharp fork, with which she may draw away the spent cocoons, or such as, being near spent, stick at the holes in the plate: and as the whisk will frequently take up more ends than are immediately to be added, and as the spinner will sometimes have occasion to employ both her hands, the brush will, at that time, conveniently hang by the basin, while the cocoons, which are attached to it, remain in the water, and the ends will be in readiness as they are wanted. When cocoons rise to the iron plate, they are to be drawn down between the fingers of the spread hand.

If the spinner be under the necessity of leaving off work for any length of time, the cocoons should all be raised with a skimming dish out of the water till her return; otherwise, by oversoaking, they would wind off in burrs; but it is best to continue the reeling without interruption,

and to let fresh, but equally experienced persons succeed those who are tired.

The person who turns the reel should have an eye to the threads, and to the guide-wires (rampins) through which they pass, that he may apprise the spinner when any thing is wrong: for her eyes will be sufficiently employed about the cocoons. The reeler might also rectify any thing discovered to be amiss in those parts of the thread which are near the reel: for one hand will always be unemployed, and a stop must occasionally take place.

Though the reeler can change hands as they tire by turning, yet, for ease, he might have a support for his arm opposite to the axle of the reel, and so turn the handle only by that motion which can be given to it by the arm moving upon the elbow as a centre.

As the heat of the water in the basin will require to be varied, according to the ease or difficulty with which the different sorts of cocoons give off their silk, the spinner should always have some cold water within reach, in order to cool that in the basin quickly, when the silk comes off too easily, and in burrs. The water is also necessary for the woman managing the cocoons, to cool her fingers, and to sprinkle the iron bar when it becomes heated. Some chips or shavings should also be at hand to increase the heat quickly, when the cocoons do not yield their silk readily.

If there should happen to be any sand in the water, the heat causes it to rise to the surface and fix on the cocoons —the thread of which will break as if cut; for this reason the utmost care must be taken to guard against it, and to remove it. Previously to being boiled, the water should be permitted to settle, and the pan must be carefully wiped; if necessary, the basin should be covered while the water is heating. If sand be perceived in the water it must be poured off, and the sand washed out, for a single grain may cause the fibre to break.

When the cocoons are first put in the water, if the silk rises thick upon the brush, or comes in lumps, it is a sign that the water is too hot; if the thread cannot be caught the water is too cold. When the cocoons are in play, if they rise often to the holes in the iron plate, the water is

too hot; if the cocoons do not follow the threads, it is too cold.

Keep an equal number of cocoons working at each end of the basin, in order to preserve the thread of silk of an equal size. When there are fewer on one side than the other, the silk becomes smaller at that side, and the thread will break. Therefore throw in the cocoons one by one, and never more than two at a time.

It will be seen by observing the position of the thread upon the reel that the different layers do not lie parallel to, nor upon, but cross one another. This is owing to the mechanism of the apparatus, and is particularly contrived to effect this object, which is essential to the perfection of the process, and one to which the acknowledged superiority of the Italian silk is to be ascribed. It is effected by the see-saw or horizontal motion of the traversing bar, and is produced by the different number of the teeth in the pinion of the axle, and in the wheels at the ends of the shaft E, and in the pinions on the top of the post K, which catch and work upon one another. Without this crossing the threads, from their gummy nature, would inevitably adhere, and render the subsequent windings and twistings of the silk very difficult, causing the threads frequently to break, and, when joined, to form knots, which in weaving cannot pass through the reeds, and hence injure the beauty of the stuffs. But the mechanism mentioned of the traversing bar prevents the threads lying over each other upon the reel, until after it has made many revolutions. Borgnis* says that a thread cannot be found to occupy the same place it had at the commencement of the reeling, until after eight hundred and seventy-five turns of the reel. During this time, the exposure of the threads to the air causes the first layer to dry completely, and hence no adhesion between them can take place. The double irregularity of movement which takes place between the traversing bar and the axle which moves it, forms also an internal motion, the effect of which is to imitate, in the unravelling of the cocoon, the same method employed by the silk-caterpillar in forming it: for

* Traité de Mécanique, appliqué aux Arts, vol. 7.

it is a fact, as before said, that the silk fibres of the cocoon are spun on it in zig-zags, like those formed by the silk reel, and consequently the operation of the reel is an imitation of Nature, of which the industry of the caterpillar, instructed by her, is the prototype.

With the view of increasing the facility of drying the threads, the law of Piedmont requires the distance between the posts or supports of the axle and the traversing bar to be "two aliprand feet," or three feet four inches and two-fifths American measure.*

Seven rotations of the reel cause the traversing bar to move five times from side to side.

Dandolo says it is a well known fact that, of two reelers, each reeling 7½ pounds of cocoons of the same quality, one will obtain only six ounces and a half, or perhaps still less, while another will turn off eight ounces.

Mr Nouaille says that "a woman at Novi, (Italy), experienced in the business, with the assistance of a girl to turn the reel and attend the fire under the cauldron, can, with ease, reel off one pound of silk, consisting of four or five cocoons, of the most perfect quality in a day.†

When a desired quantity of silk has been wound on the reel, pick off all the loose silk; then take a little handful of the coarse silk and, after washing and squeezing it, dip it in cold water and rub over the silk on the reel, stroking up also the silk with the palm of the hand: then turn the wheel with all possible velocity with open windows, if the reeling has been done in a room, for about eight or ten minutes, to dry the silk effectually; which done, take off

* Not "38 French inches between the guides (rampins) and the centre of the reel," as stated in Rees's Cyclopedia and other recent works copied therefrom. Moreover, two "*pies liprandi*" are only equal to 28 French inches. This regulation constitutes the 6th article of the Piedmont law of April 8, 1724, on the silk manufacture. The distance between the axle of the reel and the traversing bar, in the apparatus imported into Philadelphia into 1826 by the writer, is four feet eight inches.

† Trans. Soc. Arts, Lond. vol. 6, p. 177.

the reel, put it in a dry airy place, but not in the sun. This is done to clean the silk and give it a gloss*.

When one reel is taken off another should be put on, that the work may not be delayed. Every winding apparatus must have two reels.

In preparing the dupions for winding off, more are put into the basin at once than of the finest kind. They must be first well cleaned from the floss on their outsides. The water also must be boiling hot; and, as the silk they yield is of a coarser quality than the other, and has a good deal of floss upon it, the person who turns the reel must take the opportunity while the one who manages the basin is preparing the cocoons for winding, to clean and pick off the loose silk from that which is on the reel. The dupions intended for ordinary sewing silk are to be wound from fifteen to twenty cocoons. The rest may be wound as coarse as possible, that is, from 40 to 50 cocoons. These serve to cover and fill up in coarse stuffs, and are, likewise, for sewing silk. The good choquettes are to be wound according to the uses they are intended to be put to, but not finer than from seven to eight. The bad choquettes may be wound from fifteen to twenty. The satiny cocoons, so called from their resemblance to satin, require water only moderately hot. The proper heat will be found by observing the manner in which the silk comes off from the first of them which are put into the basin; and, as already said of cocoons generally, if it come off thick, cold water must be added, until the proper temperature be attained. They must not be allowed to remain long in the water, and there should be only a few of these cocoons put in at a time. The water for the dupions and choquettes must be changed four times a day.

OF DISBANDING THE SILK FROM THE REEL, AND TYING IT IN SKEINS: PREPARATION OF THE SILK FOR USE.

One cannot consider attentively the manner in which the

* This is the practice in France, according to Mr Stephenson; but the 18th article of the law of Piedmont, for the regulation of the silk filature, expressly forbids the smoothing to be done in any way except with the dry hand.—Nouvelle Ency. Méthodique, article Soie.

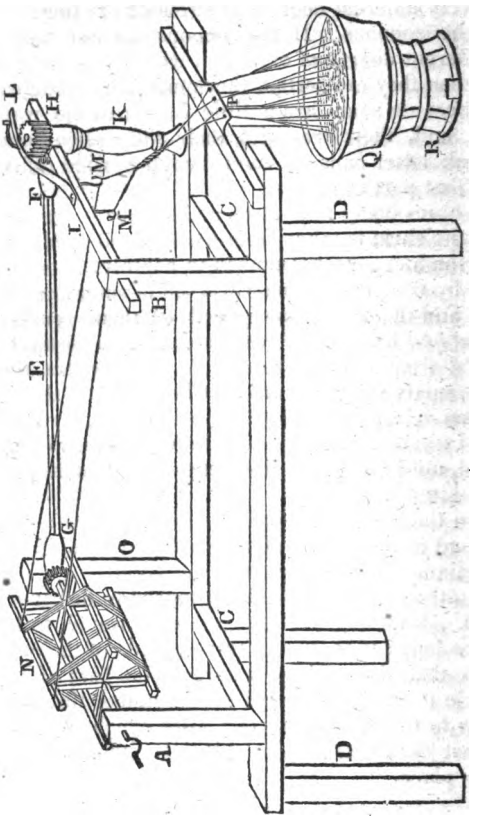
silk is reeled from the cocoons, without observing that the single fibres of which the thread is composed are liable to suffer very different degrees of stretching as they are wound from the cocoons. If the cocoons are not well sorted, this different degree of extension will be the greater; and, even when they are sorted, they must still be subject to the same, because some are a little longer in the water than others, and, therefore, give their silk easier; and, also, the weak latter ends of some cocoons wind off with the strong first part of others.

The fibres being thus stretched unequally, will occasion (when the skein is taken from the reel too suddenly) those fibres which are most stretched to contract more than the others, by which their union will be in some measure destroyed, and the thread composed of them rendered less compact and firm, the fibres appearing in several places disjoined from one another. To remedy this, the skein should remain there six or eight hours, until the unequal extension which it suffered in winding is, by the stretch which it undergoes on the reel, brought nearer to an equality; and, until the thread, by being well dried, has its fibres firmly united.

When the skein is finished, there should be a mark tied to the end of the thread, otherwise it may be difficult to find it if it mixes with the threads of the skein.

When the skein is quite dry, proceed to disband it from the reel. First squeeze it together all round, to loosen it upon the bars; then, with a thread made of the refuse silk, tie it on that place where it bore on the bars of the reel; then slide it off the reel, and make another tie on the part opposite to the one first made; after which double it, and tie it near each extremity, and then lay it by for use or sale, in a dry place.

SILK REEL.



EXPLANATION OF THE PLATE.

Silk Reel of Piedmont.—The frame is 6 feet 5 inches long, 4½ by 3 inches thick. Distance of the upright posts AB, 4 feet 4½ inches.

CC. Length of the braces of the frame, 20 inches in the clear.

DD. Legs of the frame, 2 feet 3½ inches long. E, shaft with a crown wheel at each end. The wheel F, 9 inches and 1-10 in circumference, has 22 teeth. The wheel G, 10 inches and 2 1-10 in circumference, has 25 teeth. This shaft has an iron pin at each end 1 inch long. The pin at the end G plays in a hole in the shoulder near the top of the post O, so as to enable the teeth of the wheel to catch and work in those of the pinion at the end of the axle of the reel, which axle, by means of a pin at the end, also plays in a hole in the post O. The pin at the other end of the shaft plays in a hole of the post K, and the teeth of the wheel F work in the pinion H, fixed on the top of the post K, by means of a burr screwed on the pin projecting from the post and passing through the centre of the pinion. This pinion has 35 feet. On the top of the pinion H is a crank, having a sweep of 4 inches, and receives on its top the end of the iron wire-carrier of the traversing bar I. The crank is fixed half an inch from the commencement of the grooves of the pinion. This crank is shown in the figure H. I. A traversing bar, 2 feet 10 inches long, 5-8 of an inch wide, ¾ of an inch thick, playing through the posts B K: height of the post from the frame 17 inches.

L. an iron carrier of wire, No. 1, 18 inches long, fixed to the bar I, to work free by a screw. The other end is fixed by a burr to the pin passing through the centre of the pinion H.

MM. Two wire hooks or eyes, (rampins), 7¾ inches apart, at equal distances from the ends of the traversing bar through which they pass. The wires to the commencement of the turns of the hooks are 5 inches in length.

N. The reel; arms, 2 feet 2 inches and 1-10 long in the clear; 1½ inches wide, and 8-10 of an inch thick: rails 20¾ inches long, 2 inches broad, 8-10 of an inch thick; two of the arms are jointed, to allow the skeins of silk to

be taken off when reeled and quite dry. There ought to be an extra reel to put in the place of the one taken off, to prevent the work stopping.

O. Upright support for the axle of the reel, on the ends of which the pinion is fixed, to work with the wheel G, at the end of the shaft E. The pinion of the axle has 22 teeth.

P. an iron plate with four holes, 12 inches long, slightly hollowed, projecting 3½ inches from the bar: the outside holes are 3 inches from the ends; from the centre of one hole to that of the next ¾ of an inch. Distance from the two inside and nearest holes, 4 inches and 2-10.

Q. The copper basin to contain hot water, in which the cocoons are immersed when reeling off. It is 18 inches long, 1 foot broad, and 4½ inches deep.

R. The furnace to contain charcoal, to keep the *water* hot.

Distance from the centre of the posts A B and O K 36½ inches. Circumference of the reel 6 feet 11 inches.

Distance from the top of one arm, where it enters the rail, to another arm 18½ inches.

From the axle of the reel and the traversing bar I 4 feet 8 inches.

THE END.

ERRATA.

Page 10, last line but one, for "eighteen" read "eight."
Page 35, line 2, for "silks" read "silk."
Page 41, line 6, for "propable" read "probable."
Page 60, line 13, for "told that" read "told of."
Page 104, line 11 from bottom, for "appears" read "appear."
Page 105, line 5, for "French Encyclopedias" read "French and English Encyclopedias."
Page 105, line 20, for "*Jensoul*" read "*Gensoul*."

Splendid Library Editions.

JOHN GRIGG'S

Elegant Library Editions of the British Poets and Classics.

EMBELLISHED WITH FINE ENGRAVINGS.

JOSEPHUS' WORKS, COMPLETE, IN TWO VOLS OCTAVO, with plates. By William Whiston.

BYRON'S POETICAL WORKS, COMPLETE, IN ONE VOL. OCTAVO, including the Suppressed Poems, with plates.

MOORE'S POETICAL WORKS, COMPLETE, IN ONE VOL. OCTAVO, with a portrait of the Author.

BURNS'S POETICAL, AND PROSE WORKS, COMPLETE, IN ONE VOL. OCTAVO, with a plate.

SIR WALTER SCOTT'S POETICAL WORKS, COMPLETE, IN ONE VOL. OCTAVO, with plates.

JOHN GRIGG has also in press *Goldsmith's Poetical and Prose Works*, (Washington Irving's Edition), *in* 1 *vol.* 8*vo.*

In thus publishing the works of the most celebrated British Classics and Poets, *J. Grigg* has in view to facilitate their acquisition by reducing them to a compact form, offering them at a low price, and avoiding the heavy expense in binding, thus rendering them portable to the Traveller and available to the Economist. From the attention bestowed on the execution of these editions; they are, in all respects, worthy of a distinguished place in every Public and Private Library.

J. G. will from time to time continue to publish works on the same cheap and elegant plan.