pounds of cotton twist had been introduced into India. From the extent of these importations some idea may be formed of the vast field for the cotton trade which exists in Southern Asia. The Tantys must have taken very readily to the weaving of British warp, for in 1824 only 121,000 pounds were introduced for their looms, while five years thereafter they consumed twenty-five times the quantity. This rapid extension of commercial intercourse from England to India was owing entirely to the spirit of private merchants; the Company were as remiss in this respect as they have always been in ameliorating the culture of cotton.

The average price of the twist imported into India in 1829 was 1*s.* 3¾*d.* per pound. In the year 1834 4,267,653 pounds of cotton twist and yarn were imported from Great Britain into the East India Company's territories and Ceylon, of which the total declared value was £315,583, being at the rate of 1*s.* 5¾*d.* per pound. The greatest importation, however, took place in 1831, when it amounted to 6,624,823 pounds in weight, and to £467,861 in value. In 1834 about 40,000,000 yards of cotton cloth were imported into India.

For a view of the quantities of cotton twist and yarn imported into other countries in these years, see the Statistical Table at the end of the third volume.

BOOK II.

NATURAL HISTORY AND HUSBANDRY OF COTTON.

CHAPTER I.

Natural History.

THE filamentous down which invests the seeds of the *gossypium*, a plant of the natural order mâlvaceæ or mallows, is the substance called in English commerce cotton-wool, and in French *coton en laine*, from its resemblance to the fibrous fleece of the sheep. It is usually white, of various shades of purity; but it is sometimes cream-coloured, and at others iron-yellow or tawny. The filaments, when viewed in a good achromatic microscope, appear to be for the most part riband-formed or flattened cylinders, with a thickened list at either edge, and veins of embroidery running along the middle. They vary in length from half an inch to one inch and three-quarters; and in breadth from $\frac{1}{700}$ to $\frac{1}{2500}$ of an inch, tapering always to a fine point at their ends. These variations in length and breadth belong to plants of different growths and countries, the filaments being pretty uniform in the average product of each particular crop. The lustre of cotton, as seen in the microscope, is pearly, whereas that of flax is vitreous. Whether a cylinder or a riband, the cotton fibre is seldom or never straight like that of flax, but is either twisted right and left or coiled like a cork-screw. Those of the best Sea

Island, the most valuable species of cotton, very commonly appear to be beautiful spiral springs, singularly adapted to the spinning process, readily entwining with, and sliding over, each other, during the formation of a thread, with an easy elastic force. There are no feathery margins, as some writers have described.

The word cotton may be traced most clearly to the language of Arabia, a country where the plant is indigenous, where it was probably applied to clothing purposes in the infancy of the human race, and whence, undoubtedly, it was brought into Western Europe at the era of the Mahometan conquest. The textile down is called in Arabia gotn or gootn, which signifies also soft; a word evidently identical with the Spanish godon, or algodon, formed like alkali and alkohol of the prefix article al, and the noun. Skinner's derivation from *cydonium*, the quince, from its near resemblance to the down which adheres to that kind of apple is unworthy of criticism. *Cotonea* and *cydonea* are two words equally applied by Pliny to the quince. The following names have been given to cotton in different languages:

Greek . .	Bombyx, Xylon.
Latin . .	Gossypium, Bombax.
Italian . .	Cotone, Bombagia.
Georgian .	Bomby, Bamba.
India . .	Kopa, whence the English term *cop* for a pirn of cotton yarn.
French . .	Cotonnier for the plant; Coton for the wool.
German . .	Kattunwölle, Baumwölle.
Dutch . .	Kétoen, Boomwol.
Danish . .	Bomold.
Swedish . .	Bomull.
Spanish . .	Algodon.
Portuguese .	Algodno, Algodeiro.
Russian . .	Bomaga, Chloptscha taja.

Mongul . . Kobung.
Chinese . . Cay-Haung, Hoa-Mien.

Gossypium or cotton constitutes a perfectly natural family of plants, in which the specific differences are remarkably slight. Since the filamentous down, which invests the seeds, differs exceedingly in quality and value in different varieties of the plant, corresponding botanical distinctions have been sought after with great assiduity, but hitherto with very little success. Indeed, M. Decandolle, one of the most eminent botanists of the age, confesses that the family gossypium stands much in need of more minute investigation. The botanical characters have been taken from the leaves, the stipules, the glands, the spots, the colour, the hairs on the stem, and the durability of the plant. The leaves are subject to great variations in the form of their subdivisions or lobes, not merely in the same species, but in the same individual shrub. On one stem may be found two or three very different forms of foliage, resulting from soil, climate, and cultivation. Glands have been noted as distinctive of peculiar species, but they may be found in all the gossypiums; nay, on the same shrub, some leaves may be observed having only one gland, and others with two or even three glands. The stipules are generally uniform in shape and direction. The colour, the spots, and the hairiness of the stems or branches, are too variable to form subjects of specific distinction. Nor is the durability of the plant constant in the same species. The shrub cultivated as an annual at Malta, under the incorrect title of gossypium herbaceum, may under certain circumstances last for several years. Thus the cotton growers at Motril in Spain raised

many of their cotton plantations from Maltese seeds, and yet they found the shrubs live for six or even ten years. This change of the longevity of the plant is partly due to husbandry and partly to climate. It may also be remarked, that all the lands which bear cotton in Spain are situated near the sea-coast, and that they produce perennial plants, but no annual ones. ' There they will thrive for eight or ten years, provided they encounter no accidental frost. In the second year they attain to the height of seven feet and a half, if they are not pruned across the stem. If thus cut they will send out lateral shoots three feet long. Cavanilles gave the name *Gossypium Peruvianum* to a variety which he saw in the province of Valencia, but there is not a cotton plantation in Spain where he might not have observed several different shrubs equally well marked with that fancied species. From the intermixture of seeds such a confusion has arisen in the descriptions of the gossypium, that modern botanists have hardly been able to refer any particular cotton wool to a particular species of plant, or to refer the plants now growing to those described by authors two centuries ago.

Linnæus reckons five species only of the gossypium; Lamark eight; Rohr enumerates thirty-four kinds, to which, however, proper specific characters are not assigned, and some writers have spoken of forty species. It belongs, in the Linnean system, to the class Monadelphia and order Polyandria, though placed by Cavanilles, the author of an elaborate monograph upon it, in the order Pentandria. The following is the description of Decandolle, which I have translated from his admirable Prodromus, the best modern authority upon the arrangement of botanical species.

Gossypium, or Cotton Plant.

Calyx cupshaped, obtusely five-toothed; inclosed in a three-cleft exterior calyx; the leaflets united at their base, of a heartshape, and toothed; stigmas three to five; capsule three to five-celled, and many seeded; seeds bearing a downy wool.

Fig. 3.—Sea Island, or Long-Staple black-seeded Cotton, of Georgia.
[From a drawing sent me by Mr. Seabrook.]

N. B. All the species are uncertain, being founded on precarious characters. In enumerating the species recognised by botanists, Decandolle intimates that the genus is greatly in want of an accurate monography drawn up from the life.

1. G. HERBACEUM (*Linn. Sp.* 975).—Leaves five-lobed with one gland beneath; lobes round with a point; the outer calyx serrated; stem smooth; annual, biennial, or perennial, according to situation and circumstance; petals yellow, with their bases spotted with purple.

2. G. INDICUM.—Leaves obtuse, three to five-lobed; no glands beneath the outer calyx; slightly notched at the point; stem hairy, annual or biennial; in the East Indies; flowers yellow, with purple claws.

3. G. MICRANTHUM.—Leaves obtuse, five-lobed, very smooth; one gland beneath; outer calyx many cleft, longer than the petals; stem smooth and dotted; in Persia and Ispahan.

4. G. ARBOREUM. — Leaves palmate, five-lobed, lobes obtusely lanceolate, pointed with a short bristle; one gland beneath; outer calyx pretty entire; perennial in the sandy soils of India.

5. G. VITIFOLIUM.—Lower leaves palmate, five-lobed; upper ones three-lobed; one gland beneath; outer calyx fringed; inner calyx three glands at the base; stem smooth and dotted; in the East Indies.

6. G. HIRSUTUM.—Upper leaves undivided and heart-shaped; lower three to five-lobed, with one gland beneath; the small branches and the petioles hairy; outer calyx three-toothed at the apex; in South America; flowers yellow, perennial.

7. G. EGLANDULOSUM.—Leaves five-lobed, without glands; three of the lobes oblong acuminated; stem woolly; outer calyx three to four-toothed at the apex.

8. G. RELIGIOSUM.—Upper leaves, three-lobed; lower five-lobed, one gland beneath; branches and petioles with black dots; outer calyx with three leaflets fringed downy; the wool of the seeds of a pale saffron colour; in the East Indies.

9. G. LATIFOLIUM.—Leaves acute, lowest undivided, the rest three-lobed; one gland beneath.

10. G. BARBADENSE.—Upper leaves three-lobed; lower five-lobed, three glands beneath; stem smooth; seeds free; in Barbadoes.

11. G. PERUVIANUM.—Leaves five-lobed; three glands; lower leaves undivided; outer calyx fringed; three glands at the base; in Peru; flowers yellow with purple claws.

12. G. PURPURASCENS.—Leaves three-lobed, downy beneath; ovato-lanceolate acute; outer calyx fringed; branches somewhat downy at the end; capsule three-valved; in South America.

13.—G. RACEMOSUM. Very smooth, leaves subcordate three-lobed acuminate; flowers at the ends of the branches somewhat spreading; outer calyx fringed; capsule three-valved; in Porto-Rico.

Species to be examined :—

G. Obtusifolium.
G. Acuminatum.
G. Glandulosum.*

The following details are from other botanists :—

* Decandolle, Prodromus.

Fig. 4.
Short Staple, or Green Seed Cotton. [From a drawing sent me by Mr. Spalding.]

1. *Gossypium Herbaceum.*—This is the species most generally cultivated in Europe, as in Sicily, in Calabria, and in the province of Bari. It should be called *fruticosum,* shrubby, because its stem is woody and not herbaceous. It rises commonly to the height of a foot or a foot and a half. It exists native at Aleppo, in Upper Egypt, Arabia, and in Senegal. It is distinguished from the other species of gossypium

by having the five lobes of its leaves rounded, and terminated with a sharp point. Its capsule is three or five-celled; each cell contains about five seeds of an ash colour. The stems, which increase in hardness and size with the heat of the climate, are somewhat reddish, near their lower part velvety, or hairy towards the top, and variegated with black points. The branches are short; the leaves green, soft, pretty large, and divided into five short lobes. The axillary peduncles towards the extremity of the boughs end in a large beautiful yellow flower; the three leaflets of the flower-cup are large, and deeply toothed on their edges.

This species is properly an annual, and requires from seven to eight months from its germination to the complete maturation of its capsules. To this species may be referred the cottons of Cyprus, the islands of the Grecian Archipelago, Macedonia, Natolia, Syria, and the coasts of the Caspian Sea. But Olivier says, that this cotton plant lasts fifteen or twenty years at Santorino and other places in the Levant, and that it is cut down every year close to the ground, as the caper plants are in the South of France.

Cattle are fed in Sicily with the cotton seeds, but, unless the fibres of the wool be thoroughly separated, the animals become diseased in consequence of pellets formed in their stomachs, some of which amount to a pound in weight. Lambs often die of this malady, called by the natives *mal di pallotta*, the ball disease.

It appears that this species of cotton was also cultivated in the South of France nearly three centuries ago. In a discourse addressed to Charles IX. at his

visit in 1566 to Hyeres, the orator takes occasion to boast of the oranges, palms, and cotton plants, which were raised in the fields round that town. The same fact is attested by the bishop of Senez in a curious work on agriculture published in 1606, in which he enumerates sugar canes, cinnamon, and cotton, as productions of Provence. Bauhin, the botanist, likewise states that the cotton plant was grown in France, having been introduced from Italy. It is curious to remark how entirely this species of agriculture fell into disuse, and was forgotten.

2. *Gossypium Barbadense.*—This species is supposed to be a native of the American continent. It is a shrub five or six feet high. Its stems and its branches are smooth, and the leaves have a polished surface. The lower leaves have five lobes, the upper ones three. These are entire, acute, and have three glands on their back surfaces. The flowers, which are very large, have a deep yellow colour. The capsule is also large and produces a large body of cotton. The seeds are black. When triturated with water they afford a milky emulsion which is used medicinally at Cayenne. This is the species in most general cultivation in the West India islands.

3. *Gossypium Indicum.*—This species forms a shrub from ten to twelve feet high, having its branches covered with a down, somewhat woolly towards their tops. The leaves are of a moderate size, have three short oval lobes without glands, and are frequently variegated beneath with small black spots. The petioles and veins are velvety; the flowers are large with short peduncles; the petals are yellowish, and marked at their base with a brown-purple spot. The

capsules are oval, sharp-pointed, three-celled, and open with three or four valves. They contain blackish seeds, wrapped up in very white cotton wool. This plant grows spontaneously in moist situations in the East Indies, and is also cultivated in that quarter of the globe. Some remarks of Linneus on the Gossypium Herbaceum belong more properly to this species, which rises sometimes to the height of fifteen feet, and is on other occasions only three feet high.

4. *Gossypium Arboreum.*—This species is the tree-cotton; it rises sometimes, in favourable situations, to the height of fifteen or twenty feet. It is a native of India, Egypt, and Arabia. It is well characterized by its brownish-red flowers, by the hairiness or bristliness of its upper branches, by its palmate leaves with fine lance-shaped, digitate lobes, and by a gland on the posterior veins. The peduncles are short, solitary, one-flowered; the leaflets of the outer calyx are entire, or three-toothed; the capsules are ovate, sharp-pointed, have three or four valves, as many seeds in each cell, and are enveloped in an abundant cotton wool, white and excellent. It is reckoned the finest of the Indian varieties of cotton, particularly on account of its flexibility and whiteness.

5. *Gossypium Vitifolium.*—The vine-leaved species. It grows in the Isle of France, in the Celebes, in India, and was at one time much cultivated in St. Domingo. Its branches are nearly free from down, but they are studded like the leaf-stalks with tuberculous points; the leaves are large, palmate, and cut down into fine lobes. The flowers are large, yellowish, and spotted with purple at their base. In St. Domingo this species was triennial, and had black seeds when it was grown

in a propitious soil near the sea shore. It attained to the height of twelve or fourteen feet. When the plant grows in a soil unfavourable for its perfect development, the seeds are greenish, the cotton staple is coarser, and is difficult to separate from the seeds. The seeds are egg-shaped, and are from six to eight in each cell. Capsule three-celled.

This species differs from the next in the number of glands on its leaves and calyx. The vitifolium has six glands on its calyx, and only one on its leaf. Its leaf-lobes divaricate more than those of the Peruvianum.

6. *Gossypium Peruvianum.*—The cotton plant of Peru is a shrub three feet high. Its leaves are large, heart-shaped, downy, and furnished with three glands. The lower leaves are entire, oval, acute; the upper leaves have five acuminated lobes. The inner surface of the flower-cup is besprinkled with blackish points. The corolla is large, yellow, somewhat velvety, and reddish-coloured at the base; the capsules are ovate, acuminated, and three-valved. The seeds are blackish, and wrapped in a long-stapled, white wool. There are three glands in the calyx. The capsule is three-celled, and contains in each cell many seeds.

7. *Gossypium Hirsutum.*—This species was discovered in the hot regions of America. Its stem rises to the height of two or three feet, and then divaricates into boughs, which bristle with hairs. The leaves are also hairy on their inferior surfaces, and are three or five-lobed. The upper leaves are entire and heart-shaped; the petioles are velvety. The flowers near the extremities of the boughs are large, and somewhat dingy in colour. The capsules are ovate, four-celled,

nearly as large as an apple, and yield a very fine silky cotton wool, much esteemed in commerce. The seeds are greenish.

8. *Gossypium Tricuspidalum.* The three-pointed cotton plant. This is an Indian shrub, three or four feet in height, with spreading branches, somewhat velvety towards their summits, and covered, as well as the petioles, with small black dots. The flowers are white, with sometimes a sulphur tinge, or a rose or purple hue, on the edges. The capsules are short, acuminated, and contain a soft white cotton which adheres very firmly to the seeds.

9. *Gossypium Micranthum.*—The small-flowered cotton plant. Its stems are reddish, about a foot and a half high, smooth, and besprinked with blackish dots, which are also found on the petioles and peduncles. The leaves have five very obtuse lobes, and a gland above their base. The outer calyx has three deep divisions, fringed, and longer than the corolla; the inner calyx is shorter, and five-toothed. The petals are yellow, oval, acute, marked with purple at their base, and a little velvety above. This plant is a native of Persia. It was cultivated in the Jardin des Plantes at Paris under the name of Gossypium Purpurascens, and was brought thither from the Antilles.

10. *Gossypium Religiosum.*—The cotton of the Nuns. In this species it is extremely difficult to pick the wool from the seeds, the filaments being so short, and so closely condensed, as to be inseparable by rollers. Hence the nuns at Tranquebar were employed to pick the wool from the capsules. One pound of Tranquebar cotton employs a woman thirty hours to separate; and a pound of Cambaye cotton,

twenty-six hours. Three quarters of an ounce of cleaned cotton is the total product of a shrub three feet high. This plant is a native of the Cape of Good Hope, and has been cultivated in the Jardin des Plantes under the name of the White Cotton of Rome. This species is distinguished from the others by the protrusion of its long style before the expansion of the flower, and by the spotless whiteness of its blossoms, which changes into red. The yellow Cotton Plant of Siam, grown in the Jardin des Plantes, resembled the Religiosum in every thing except the colour of its wool, which was nankeen.

Roxburgh gives the following descriptions:—

Gossypium Herbaceum (Roxburgh).—Bi-triennial, young parts hairy; leaves hairy, palmate, with sub-lanceolate acute lobes; *leaflets* of the exterior calyx dentate; capsules ovate, pointed; seeds distinct, clothed with firmly adhering white down under the long white wool; kootn of the Arabians, karri-kapass of the Bengalese. "This," says Dr. Roxburgh, "and its varieties are by far the most universally cultivated by the natives of India."

Trunk short, nearly straight, woody, often lasting three or even four years; bark ash-coloured or brown, and by age becomes cracked in various directions; branches numerous, with their tender extremities well clothed with long, soft, diverging hairs, and marked with numerous rust-coloured dots; general height, when cultivated on a middling soil, about three feet, though in a rich garden loam they rise to eight or even ten feet; leaves alternate petioled, hairy on both sides, palmate; lobes from three to five, in young plants

lanceolate, in old almost ovate; size very various; colour pale green; *glands;* in large luxuriant leaves there is generally a single one near the base of each of the three middle or large nerves; but Dr. R. does not think they can ever be so much depended on as to form a part of the specific character in this or any other of the species. *Petioles* hairy, nearly as long as the leaves; *stipules* obliquely linear, lanceolate; *peduncles* solitary, short, hairy opposite to the leaves, or on one side of them; *flowers* solitary, large, pale yellow, with the bottom of the bell of a dark crimson colour; *calyx exterior,* leaflets sometimes nearly entire, sometimes acutely dentate, or even gashed, hairy, with a gland on the base of each; *inner* obscurely five-toothed; *corol* large, campanulate; *stamens* numerous; *stigma* clavate, three or four-ribbed, and spiral; *capsule* ovate, pointed, three or four-celled; seeds a few in each cell, distinct, clothed with much firmly adhering whitish-grey down under the long white wool or cotton.

Of this species there are an infinite number of varieties from soil, situation, method of culture, &c. I shall make a few remarks on as many of these as I have been able to rear under my own eye.

I. *Dacca cotton.*—This sort may be reckoned the first variety, or deviation from the common herbaceum, in general cultivation over Bengal and Coromandel; it is reared about Dacca in Bengal, and furnishes that exceeding fine cotton wool employed in manufacturing the very delicate muslins of that country. It differs from the common in the following respects:—1, in the plant being more erect, with fewer branches, and the lobes of the leaves more pointed; 2, in the whole plant being tinged of a red-

dish colour, even the petioles and nerves of the leaves, and being less pubescent; 3, in having the peduncles, which support the flowers, longer, and the exterior margins of the petals tinged with red; 4, in the staple of the cotton being longer, much finer, and softer.

These are the most obvious disagreements, but whether they will prove permanent Dr. R. could not say.

II. The *Berar cotton,* with which the fine Madras long-cloth is made. It differs from the above two sorts; 1, in growing to a greater size, in living longer, in having smoother and straighter branches; 2, in having the leaflets of the exterior calyx more deeply divided, and the wool of a firmer and more durable quality.

III. *China cotton.*—Its wool is reckoned 25 per cent. better than that of Surat. It differs from the former sorts; 1, in being infinitely smaller, with but very few short weak branches; 2, in being annual; 3, in having the leaflets of the exterior calyx entire or nearly so.

Gossypium rubicundum (*Roxburgh*)—is found in the gardens of the curious over most parts of India, where it is in flower great part of the year. Dr. Roxburgh does not believe it to be ever cultivated for its wool.

Gossypium Barbadense (*Roxburgh*).—Shrubby; leaves smooth, with five acute short broad lobes; leaflets of the exterior calyx deeply laciniate; colour of the corolla uniformly yellow; capsules oblong, pointed; seeds distinct, black, and without any other pubescence than the long white cotton wool.

Bourbon cotton is the name this species is known by

Fig. 5.—Gossypium Barbadenses.
Copied from a drawing by Dr. Roxburgh, in the Library of the East India House.

amongst the English in the East Indies. It does not appear to be a native of India, but was introduced from the Island of Bourbon some twenty years ago; at what period it was brought from the West Indies into that island is uncertain; it succeeds better in the more elevated, drier, and less fertile soil of Coromandel than in Bengal, where the plant grows to a greater size, but yields less cotton. Stem short, ligneous; in a good soil grows to a foot or more in circumference; branches

numerous, spreading in every direction; well grown plants rise to from eight to twelve feet, and spread nearly as much; bark of the woody parts ash-coloured.

Such is a description of the species of gossypium, derived from the best sources of information.

M. Rohr, who made an extensive tour through the West Indies to establish distinctive characters, between the different cotton plants, subservient to the commercial supply of cotton wool, attempted to introduce a new arrangement of the species of gossypium founded on the appearances of the seeds. I shall give a brief outline of his scheme for the sake of certain practical points which he ascertained, though, viewed in a systematic light, it is altogether nugatory.

M. Rohr distributes the cotton plants grown in the West Indies into four groups:—1, the rough black seeded; 2, the dull-brown seeded, with smooth veiny surfaces; 3, seeds covered with short hairs, through which the colour of the coats may be seen, but the veins can hardly be perceived; 4, seeds more closely covered with thick hairs. Each of these grand divisions is subdivided by M. Rohr into several species, which he has denoted by vulgar or trivial names, quite independent of those assigned by the botanists; his characters can therefore be of little use on account of their vagueness, as also of the seeds changing their appearance with the soil and climate in which they are produced.

Group I.—*Cotton with rough black Seeds.*

To this group M. Rohr refers, 1. The wild or withy-wood cotton of our colonies. It rises nine feet high, and spreads out from six to eight feet. Each tree

produces at the utmost only one quarter ounce of cleaned cotton. 2. The green-tufted cotton, from the green colour of the down on the unripe capsules. The fine cotton of Martinique belongs to this group. The shrub is three feet high, and yields a crop of two ounces and a half, which is gathered successively during seven months, beginning in November. 3. The sorrel-green cotton plant, and the sorrel-red, both cultivated near Spanish town, afford, the former four ounces, and the latter seven and a half ounces of cotton wool. 4. One of this group has seeds with a barbed point. The shrub is seven feet high, and yields three ounces of cotton. 5. The cotton plant, having barb-hooked seeds, such as the red shanks of St. Thomas and Santa Cruz. It is six feet high, and yields five ounces in a favourable season. 6. The *jahr-rund,* or year-round cotton plant, so named because it affords a succession of ripe capsules at every season. It grows in Jamaica and St. Domingo, as also in Montserrat, where it is called the loaf cotton, because it carries a tuft round the point of the seed. It is a productive and durable species. It grows to the height of six feet, and yields seven ounces of an average crop. These are properly coarse *year-rounds;* the fine year-round belongs to *Porto-Rico.* 7. There is a cotton plant with large flocks, called in St. Thomas *Old Bess.* It grows to the height of eight feet, and yields four ounces of wool; but its delicacy has thrown it into discredit. 8. The *Guiana cotton.* The seeds adhere to each other in the cells, and assume the form of a long thin pyramid. Its wool is white and long stapled. It has a variety of names, as Cayenne, Surinam, Demeraia, Berbice, and Essequibo. It yields

two crops every year, amounting together, in favourable weather, to a pound and a half; but, in rainy seasons, to only half a pound. In Jamaica it is called ridney and link cotton. Each plant occupies a space of ten or twelve feet when grown in a good soil. 9. *Brazil cotton.* The seeds of this kind strongly adhere to one another, so as to form a broad short pyramid. It is an excellent cotton shrub.

GROUP II. *Brown-black seeded Cotton-trees, smooth and veined.*

1. Indian cotton.—It produces twice a-year, and affords a very white cotton, which may stand long in the pods without being coloured by the rains. Its wool is finer than any of the preceding cottons, and may be easily cleaned. It occurs at St. Martha and Carthagena, in shrubs eight feet high, spreading to the extent of ten feet, and yields eight ounces. 2. The Siam cotton, with brown, smooth seeds; the *coton lisse* of Martin, as also the white and red or nankeen Siam, belong to this head. These shrubs attain the height of twelve feet the second year, and afford one crop annually, which is gathered from February till April. The capsules fall off as they ripen, and those which adhere open no more than half. The red yields only three or four ounces, and is not worth the cultivating; the white, however, yields double that quantity.

GROUP III. *Thinly-haired Seeds.*

The cotton shrub of Curaçoa.—The wool when well cleaned is very white and beautiful, and must be plucked from the seeds by hand. It is too costly for European commerce, and is therefore manufactured on

the spot into fine stockings. Each shrub, as usually grown, yields only an ounce and two drams of wool; but when it is planted at wider intervals each shrub yields seven ounces and two drams. The capsules go on ripening in succession from February to June, and the harvest is therefore very troublesome. The crowned-cotton of St. Domingo resembles the Indian in quality, and yields two annual crops.

Group IV. *Thickly-haired Seeds.*

Cotton of the Nuns.—Gossypium Religiosum.—The seed of this species is small, nearly globular, covered with a greyish-white down and some hairs, of which those round the point are much longer than the seed, and diverging, but few in number. Two varieties of this cotton are known; that of Tranquebar, with the lobes of the leaves pointed; and that of Cambaye, with the lobes rounded. Neither of them produces more than three quarters of an ounce of wool. The filaments are very short, condensed closely round the seed; not to be removed, therefore, by rollers, and very difficult to separate, even by the fingers. A pound of Tranquebar cotton takes a woman thirty hours to detach; and a pound of Cambaye cotton twenty-six hours. Such irksome and unprofitable labours were, therefore, devolved upon the nuns, whence the name *Cotonnier des Nonnes* was derived, as we have already said.

MICROSCOPIC EXAMINATION OF COTTON FILAMENTS.

The specimens were kindly furnished to me partly by Messrs. Trueman and Cook, the eminent brokers in London, and partly by Henry Houldsworth, Esq. of Manchester.

Sea-island.—Turnbull, 1833. Price 2*s.* 2*d.* per lb. This is one of the finest cottons; raised from good select seed. Average diameter $\frac{1}{2000}$ of an inch; many much smaller; distinct spiral character; some rather flimsy ribands; long staple, about $1\frac{1}{2}$ inches.

H. Seabrook, 1833. A healthy good quality of cotton. Price 2*s.* 1*d.* Filaments less than $\frac{1}{2000}$ of an inch broad; very spiry and uniform flattened cylinders; almost no flimsy ribands, nor warts.

Eaton's, 1833. Short and coarse Sea-island; but healthy. Price 1*s.* $3\frac{1}{2}$*d.* per lb. Very uniform spiry filaments; no ribands; diameter of flattened cylinders $\frac{1}{1900}$ of an inch.

E. 1833. Pretty fine but not very strong; 1*s.* 7*d.* per lb. Flattened cylinders of about $\frac{1}{2000}$, mixed with a great many flimsy ribands, some of them irregularly contorted; a few warts.

Wilson, 1829. Grown from select seed, and was of superior quality, but has deteriorated, apparently by keeping. Price 4*s.* 6*d.* in 1829. Fine uniform filaments rather less than $\frac{1}{2000}$ in diameter; spiry; seems crimped transversely with irregular bendings; the effect probably of age.

Burden's Growth, from select seed, sent over in 1826, and kept in a small quantity and in a dry place ever since. Its quality was superexcellent for making the highest numbered yarn, when first received in this country, both as to fineness and strength. It

Fig. 6.

Fig. 7.

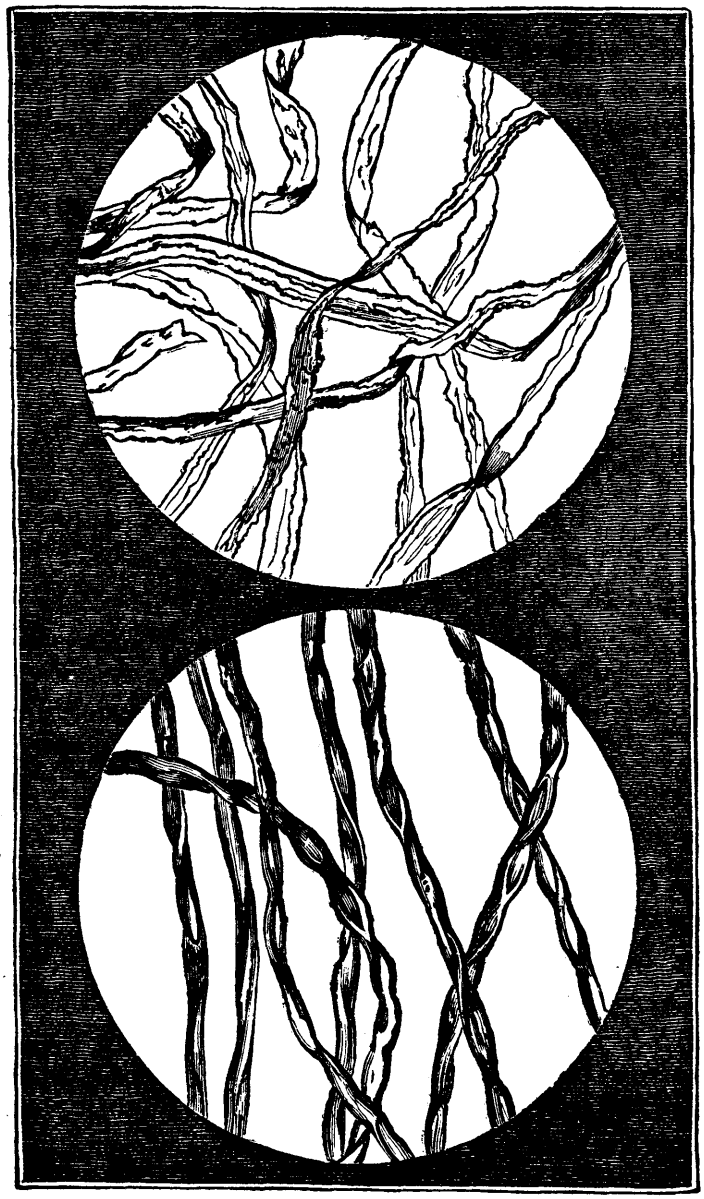

Fig. 6.—Sea-island Cotton, of which muslin and bobbinet lace are made.

Fig. 7.—Religious Cotton, threads of which are worn by the Brahmins round their necks.

cost 5*s.* per lb. It has evidently deteriorated by keeping; filaments about $\frac{1}{2200}$ in diameter; very equable, with few or no ribands; several spongy warts, called nips by the cotton-spinners, which adhere to the sides of the filaments; these are frequent on the finest Sea-island cottons; crimped transversely by the effect of age, and apt to break at these points of shrinkage.

C. 6. 1826. Not so good as the preceding. Cost 5*s.* per lb. Extremely fine filaments, measure only $\frac{1}{3000}$ of an inch; considerably warty, with the appearance of shrivelling, and irregular contortions from age; spiry character.

A. A. 1832. Not so good for fine yarn as Wilson's. Cost 2*s.* 5*d.* Diameter of filaments from $\frac{1}{1500}$ to $\frac{1}{2000}$ with a few much smaller; pretty uniform and tortuous; few ribands; nippy or warty.

The above specimens were furnished by Mr. Houldsworth.

The following were from Mr. Cook:

Georgia Sea-island.—Filaments generally cylindrical, with occasional spires, like a screw; a few of riband-shape; diameter from $\frac{1}{1500}$ to $\frac{1}{2000}$ of an inch; a very uniform cotton.

Georgia Upland.—Some thin ribands; but the general character of the filaments is spiry cylindric, like the Sea-island, but less uniform in diameter, and about one half its length; a few very fine filaments of perhaps $\frac{1}{6000}$ of an inch diameter.

Maranham. — Cylindrico-spiral, but the fibres vary in diameter from $\frac{1}{1500}$ to $\frac{1}{2500}$; a few ribands $\frac{1}{1000}$ broad.

Demerara. — Very spiry flattened cylinders from about $\frac{1}{1500}$ to $\frac{1}{2000}$, a few much smaller; hardly any ribands.

Surinam. — Fibres pretty cylindrical of about $\frac{1}{1500}$ diameter; many of them screw-shaped, and a few very small; but on the whole this is a very regular wool.

Pernambuco. — Cylindrico-spiral filaments from $\frac{1}{1500}$ to $\frac{1}{2000}$; a few twisted ribands of $\frac{1}{1000}$ broad; several warty excrescences on the sides of the filaments.

Bahia. — Thin cylindrico-spiral filaments, mixed with several ribands spirally twisted; diameter about $\frac{1}{1200}$; no perfect cylinders.

New Orleans.—Cylindrical fibres with many spires, about $\frac{1}{1400}$, mixed with several far finer threads.

Para.—Regular ribands, mostly thin and about $\frac{1}{1300}$ broad; few fibres of cylindric form; no regular screws, but a few ribands coiled in open spires.

Carthagena.—Mixture of ribands and flattened cylinders, the former about $\frac{1}{1000}$ broad, the latter $\frac{1}{1500}$ diameter; a few spires; wool very unequal.

Grenada.—Mixture of cylinders and ribands of about $\frac{1}{1500}$; several spires, and a few very slender filaments; a fine cotton, but not very equable.

St. Domingo.—Chiefly narrow twisted ribands from

$\frac{1}{1000}$ to $\frac{1}{1200}$ broad, with a few flattened cylinders; and some spiry fibres.

Earsden Egyptian.—Uniform spiro-cylindrical filaments, from $\frac{1}{1500}$ to $\frac{1}{2000}$; few thin ribands, all translucid.

Smyrna.—Ribands from $\frac{1}{900}$ to $\frac{1}{1500}$; a few cylindrical fibres, but hardly any spires; some of the ribands irregular and very filmy, with embroidery veins.

Bourbon.—Fibres less cylindrical than the Surinam; many of them only $\frac{1}{2000}$ in diameter, mixed with ribands from $\frac{1}{1000}$ to $\frac{1}{1500}$ broad; filaments uniformly fine, but not very spiry.

Lady Flora Madras.—Very unequable wool; flimsy ribands mixed with several cylinders slightly spiral; a few warty excrescences; diameters from $\frac{1}{1000}$ to $\frac{1}{2000}$.

Mount Stuart Elphinstone Surat, good.—Many ribands $\frac{1}{1000}$ broad, mixed with cylinders, from $\frac{1}{1500}$ to $\frac{1}{2000}$; very little spiry appearance.

Esther Surats, good, fair.—Many ribands from $\frac{1}{500}$ to $\frac{1}{1000}$ broad and flimsy in texture; hardly any cylinders.

Royal George Surats, middling.—Flimsy contorted riband from $\frac{1}{600}$ to $\frac{1}{1200}$ broad; hardly any cylinders; a few warts.

Easor Bengal.—Groups of irregular flimsy ribands, with a few small flattened cylinders, from $\frac{1}{1000}$ to $\frac{1}{1500}$.

The fibres terminate usually in very fine points, abruptly tapered. To these points the mechanical

Fig. 8.

Fig. 9.

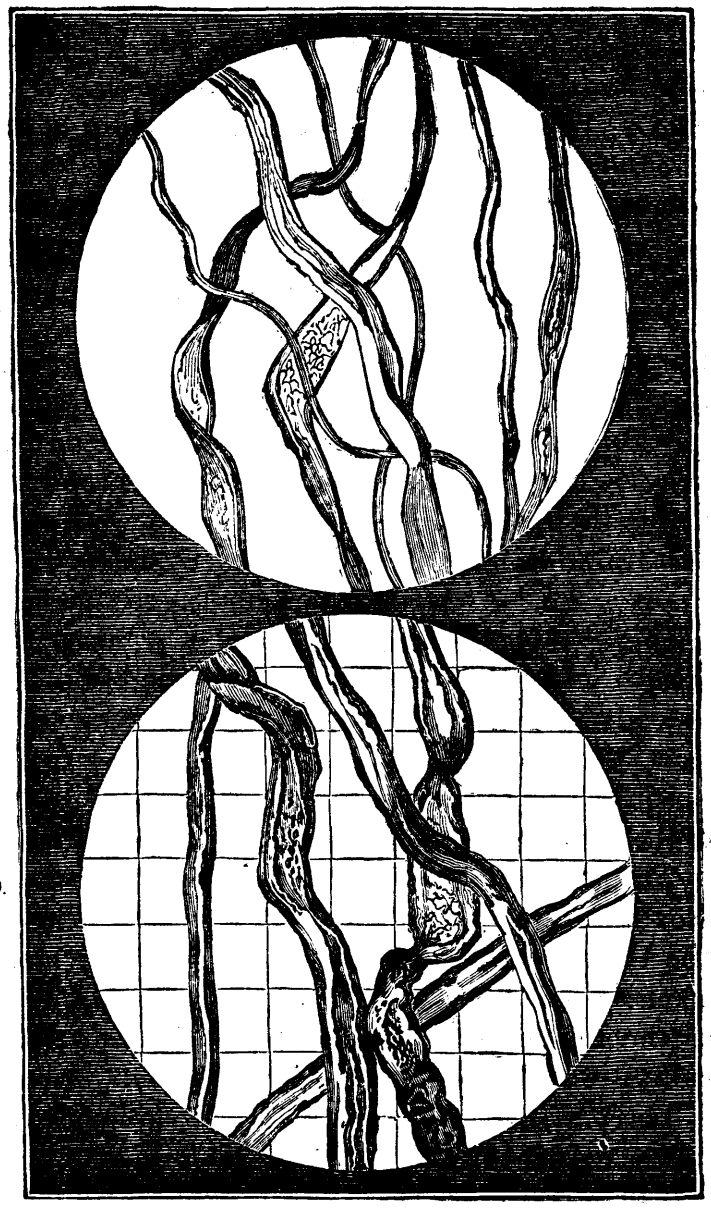

Fig. 8.—Surat Cotton.

Fig. 9.—Smyrna Cotton, shown upon the micrometer lines, in glass, $\frac{1}{1000}$ of an inch apart.

irritation of cotton, when applied to ulcerated surfaces, may probably be ascribed; and possibly in some measure to the exceedingly fine edges of the ribands. Flax or lint consists of smooth cylinders, and is therefore free from the irritating quality. The entanglement of cotton filaments, to which their superior spinning properties are owing, may be ascribed chiefly to their spiral structure, and elasticity; so that when one is pulled out, it draws forth many others. If, during this extrication of the filaments, a twisting motion be communicated to them, they will form a cohesive thread. The finer, the more uniform, the more cylindrico-spiral, the longer and more elastic the filaments are, the more capable they will be of forming fine yarn. When they are short, and consist of rather broad and flimsy ribands, they will be ill adapted to machine spinning, though still susceptible of being spun by the tact of delicate fingers. We can thus understand how the Hindoo women manage to spin fine yarn from the Dacca cotton, which is the growth of an unequable wool consisting of flimsy ribands, like most of the India cottons.

The most intelligent manufacturers at Dacca, says Roxburgh, think that the great difference between the Dacca muslin and that of other places, lies in the spinning, and allow little for the influence of the soil, or the variety of the *gossypium herbaceum*, which is cultivated at Dacca.

There can be no doubt that the cotton filaments are hollow cylinders, prior to the dry state of maturation, they then become flattened and tortuous, in a greater or less degree. The more nearly cylindrical they remain, the stronger and more pliant to the spindle will they be

found. On these accounts, as well as from their greater length, the filaments of the Sea-island, Egyptian, Guiana, and Brazilian cottons hold a higher value in the market, than the Upland Georgian, or the East Indian. In examining a sample of cotton wool, the spinner draws it out slowly between the fore-fingers and thumbs of his two hands, and observes how the filaments successively escape from pressure. He then draws out the staple in the other direction, and thus alternately from hand to hand. In this manner he judges of the length, smoothness, fineness, and strength of the cotton. Of the strength, however, a better judgment may be formed in the yarn, by seeing what weight will break it.

One sort of cotton is seldom worked up alone in our cotton-mills, but two or three different kinds are frequently mixed together. Thus the cheap and short stapled cottons of India, must be willowed and carded along with some of the American cottons, to make them work to the best advantage. Much of the success and profit of the cotton spinner, depends on the skilful blending of dissimilar cottons, whereby one kind is made to conceal or supply the defects of another.

The relative value of different cottons is exactly represented in the table of prices current, published by the brokers. Thus at Liverpool, on the 1st December, 1835, the best cottons of each name were sold at the following prices per pound, duty paid:—

	s.	*d.*		*s.*	*d.*
Sea-island	1	6	to	2	6
Demerara and Berbice .	0	9	,,	1	0
Pernambuco . . .	0	10¾	,,	1	1½
Egyptian	0	11½	,,	1	2½
New Orleans . . .	0	7⅛	,,	1	0

	s.	d.		s.	d.
Bahia	0	8¼	to	0	10
Upland Georgia . .	0	7⅛	,,	0	11½
West Indian . . .	0	7¾	,,	0	9
Surat	0	6⅛	,,	0	8
Madras	0	6½	,,	0	8
Bengal	0	5¼	,,	0	6½

This order of price and value has remained, with slight exceptions, nearly uniform for the last twenty-five years. In this period, however, several improvements have been made in the mode of cultivation and cleaning, especially in the interior of Georgia and Carolina; and yet their cotton stands beneath others, in the growth of which probably less skill is applied. It is hence manifest that a good deal depends on the soil and climate. One point is clearly fixed; the superiority of cotton grown near the sea, to that grown inland, the soil and climate being similar. This fact leads to the conclusion that the saline matters near the shore, so remarkable in the Sea-island plantations, must supply a food propitious to the growth of good cotton. How far this inference is well founded will appear from a consideration of the chemical consti tuents of cotton.

In the year 1825, a dispute having arisen between some eminent calico-printers concerning the validity of an ingenious patent, I was employed to analyze certain kinds of coloured cotton goods, and to compare the results with the analysis of clean cotton wool. Having procured a fine carded fleece, from a spinner who used chiefly the Sea-island cotton, 2,000 grains of it were slowly burned in a silver basin; the residuum being thoroughly incinerated at a red heat, to consume every particle of charcoal, formed a light

grey ash. The weight of this ash, upon an average of six similar experiments, was nineteen grains, being nearly one per cent, of the cotton wool.—*See Journal of Science for January*, 1826.

One hundred parts of these ashes yielded:

1. *Matter soluble in water, sixty-four parts,* consisting of—

Carbonate of potash . . .	44·8
Muriate of potash	9·9
Sulphate of potash . . .	9·3

2. *Matter indissoluble in water*—

Phosphate of lime	9·0
Carbonate of lime	10·6
Phosphate of Magnesia . .	8·4
Peroxide of iron	3·0
Alumina a trace, and loss .	5·0
	100·0*

The results of the preceding analysis seem to throw considerable light on the predilection of the cotton plant for the neighbourhood of the sea, which supplies plentifully the saline substances requisite to the perfect development and constitution of its woolly fruit. It may hence be inferred that the compost or manure best fitted for cotton plantations should contain neutro-saline matter with alkaline, calcareous, and magnesian bases. The presence of magnesia deserves notice, as it indicates marine food. Here, as in many other examples, the vegetative powers of the roots, seem to eliminate potash from the stone detritus of the soil,

* An Examination of the Differences in Chemical Composition between Cotton Wool, Cotton Cloth, and Turkey Red Calicoes, by Andrew Ure, M. D., F. R. S.

which replaces the soda in the sea salts. For otherwise we should have found salts with a basis of soda, instead of potash salts in the ashes of the cotton.

The following are the commercial characters of the different kinds of cotton wool imported into our market.

1. *American Cottons.*

Georgia Sea-island.—This is raised on the sea coast of Georgia and the small islands which form the neighbouring Archipelago. Though not decidedly yellow, it has somewhat of a dull butter tint, which distinguishes it from white cotton. It is remarkable for its long staple, the filaments being three times longer than those of the Indian cotton wool. It has a silky softness. It is sometimes dirty, but the well cleaned and the best is preferred to every other quality for spinning fine yarn; and indeed it is indispensable for the finest. The reason of this superiority appears to be the cylindrico-spiral form, and equability of its filaments, which facilitates their torsion into a uniform thread.

Georgia Upland.—This cotton grows in the interior of the country, as its name denotes, and though far inferior to the preceding, it is a valuable wool for coarse yarns. It is white, occasionally dirty, of a short unequal staple, light and weak. It was long called Bowed, because it was originally cleared from its seeds by the blows of a bow-string, a most fatiguing operation, which Whitney's saw-gin has superseded.

Tenessee.—Resembles the last sort, but is generally cleaner and better

New Orleans.—Like the last two, but somewhat superior.

Pernambuco.—Has a fine long staple, clean and uniform. It is much used by the hosiers.

Maranham.—This is not quite of so good a staple as the last, nor so well cleaned; it holds the same rank as Demerara cotton.

Bahia.—Slightly superior to Maranham.

Surinam.—A long stapled cotton, a faint yellow ting but a clean cotton; in request for hosiery.

Demerara.—This is a fine white glossy wool, gene rally very well cleaned, and picked before packing It spins into a clean stout yarn, and has now risen to a level at least with the Pernambuco.

Berbice.—Like Demerara.

Egypt.—This cotton has been much improved in the course of some years, by the enlightened policy of the Pasha. He imported seeds from Cyprus, Smyrna, Brazil, Georgia, and other countries, and has produced a cotton which occasionally comes near the Sea-island. It is seldom well cleaned.

West Indian.—In the Bahamas a tolerably good cotton has been grown from the Bourbon seed, though much inferior to the Bourbon itself. The staple is fine and silky, but the cotton is not well cleaned.

Barbadoes.—This is of middling quality; staple rather short, but silky and strong. It contains too much of the seed husk.

East India Cottons.

Bourbon.—This is the most uniform of the oriental sorts. It is clean, and has a fine silky staple. It

ranks next in value to Sea-island, but is not now imported into our markets.

Surat.—This cotton has an exceedingly short fibre, is dirty, being often mixed with leaves and sand.

Madras and Bengal.—These are much the same as the preceding sort. Some of the Madras cotton has been raised from Bourbon seed, but, from inferiority of soil and culture, it is little better than the common Indian cotton, which is the product of the gossypium herbaceum. These cottons can be spun into fine yarn only by the delicate fingers of the Hindoo female.

The following summary of the botanical species of cotton will probably accord best with commercial distinctions. 1. *Gossypium Herbaceum,* the herbaceous cotton plant; two to three feet high, of one summer's growth, with round capsules, about the size of a walnut, opening with three valves, and containing seeds of the size of peas. In Europe it is cultivated in Macedonia, Malta, Sicily, and Calabria; it grows also in the Levant and the East Indies. 2. The second species is likewise for the most part an annual, though it may occasionally last two years; it is the hairy cotton plant, *gossypium hĭrsutum,* which sometimes grows to the height of a man, with egg-shaped, four-celled capsules, as large as a middle-sized apple. It is a native of America, and is cultivated particularly in Carolina. 3. Among the cotton shrubs, with woody stems, is the *gossypium* tree, which grows from eight to twelve feet high in the East Indies, Egypt, and in some provinces of Spain. The yellow cotton plant, or *gossypium religiosum,* of India and China, as well as

the *gossypium Barbadense*, or the West India cotton, belongs to the *arborous kind*. The cotton-tree, *bombax pentandrum*, which grows in India and America, belongs to quite another family of plants from the *gossypium*. Its trunk, attains the height of twenty feet, and possesses considerable strength.

The capsules or seed-pods of all the cotton plants are at first green, but become afterwards brown, and sometimes nearly black. At the period of maturity they burst open with a slight explosive sound, when the wool must be immediately plucked, to prevent its injury or loss by the weather. It is then ginned.

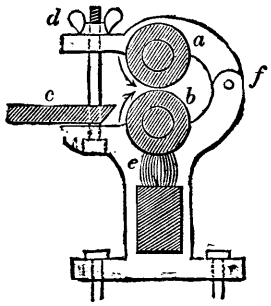

Fig. 10.—Section of Roller-gin.

Fig. 10 exhibits a section of the simple roller-gin; *a b* are the two rollers, each of which is about three-quarters of an inch in diameter, and six inches in length. They are made to revolve in opposite directions, as shown by the arrow, by means of toothed wheels, fixed upon the ends of their axes outside of the wooden frame. The under roller turns in fixed bearings, but each bearing of the upper roller rests at the extremity of an arm, which turns round a pin at *f*, so that by means of the adjusting screw *d* it may be brought nearer to the under roller in any desired de-

gree: *c* is the table on which the seed cotton is laid; and *e* is a brush placed beneath, which removes the filaments of cotton adhering to the roller *b*.

The general characters of a good cotton-wool are fineness, length, strength, softness, and equality of the filaments, and freedom from knots and impurities. The more remarkable it is for these qualities, and the less waste it suffers in spinning, the higher price it fetches. The cotton is commonly named from the country where it grows, each kind being classed into three sorts, the prime, the marketable, and the ordinary—the first being appropriated to warp or lace yarn, the second to weft of different qualities, and the third to coarser yarns. To judge of the species of cotton wool, the continental dealer takes a handful of it from the bag. This is pressed and drawn out between the thumbs and two forefingers, which affords an indication of its approximate length and fineness. This flock of filaments being again seized by the middle is drawn out once more, which affords a second indication. This process of arranging the filaments in a parallel riband is many times repeated, till their average length, softness, fineness, and strength, are determined. The experienced cotton broker and spinner acquire a remarkable delicacy of tact in this way, so that they can decide in the dark upon the country, quality, and price of the cotton wool. By a suitable mixture of a little long stapled cotton wool with short stapled, the latter becomes susceptible of being spun into much better yarn than it could afford of itself. Sometimes also the long stapled will bear a considerable admixture of the short stapled without losing its fitness for furnishing fine yarn.

The following are the most common distinctions of cottons recognized on the continent of Europe: 1, the North American; 2, the West Indian; 3, the South American; 4, the East Indian; 5, the Levantine; 6, the African; 7, the Italian; 8, the Spanish.

1. Among the cottons of North America, or the United States, are to be noted that of Georgia short and long stapled, Louisiana, New Orleans, Carolina, and Tenessee. The short stapled Georgia is worked up chiefly into the coarser yarns of No. 30 and under, but when mixed with the Egyptian Mako, it may be spun up to No. 40. The bluish-white cotton of Louisiana is of a better quality, but ranks below the long stapled Georgian, the Brazilian, and certain of the West Indian cottons. It is fit for spinning as high as No. 50, but is sometimes deteriorated by a number of little seeds left in it by imperfect ginning. The Carolina is also preferred to the Upland Georgia, as well as the cotton of Tenessee and New Orleans, which are often weak-fibred; yet some of the latter are fine enough to spin yarns as high as 100.

2. The West Indian cotton wools of the best sorts resemble in length of staple the Sea-island, the Bourbon, the superior Spanish, and the South American. That of Porto-Rico is held to be the best; after which come the others in the following order nearly: Curaçao, St. Domingo, Martinique, Guadaloupe, Barbadoes, Jamaica, St. Christopher, St. Lucie, St. Thomas, Grenada, St. Vincent, Dominica, Tortola, Montserrat, Bahama, Cuba, St. Jago, Antigua. The last may rank with the best of the Levant cottons. Of the West India cottons it should be remarked that their cultivation has been much neglected of late

years, since sugar came so much into play; and that their qualities do not correspond with the above, which is their ancient and natural order. The Guadaloupe has often a reddish tinge, has a long staple, and is easy to spin. It, and the best of the St. Domingo wool, will furnish yarn as high as 100 in number.

3. South America is capable of affording excellent cotton wool, of which the best example is the Brazilian called Maragnan, Bahia, and Pernambuco, which have sometimes been made into yarn as fine as No. 200, and upwards. They deserve to be placed immediately after the Sea-island Georgian and the Bourbon, although the Maragnan is often ill cleaned. The Minas-Geraes, the Para, and Ceara are of inferior quality, and are rarely spun into finer yarn than No. 60. The Rio Janeiro is a slight, dirty, and dingy kind of cotton wool, upon a par with the worst sorts of the West Indian. Among the remaining varieties of the South American, the Cayenne is most esteemed, on account of the length, whiteness, and lustre of its filaments, and it may be classed with good Brazilian. After it, comes the Surinam, with long yellowish staple, which has been occasionally spun into No. 200; those of Demerara, Essequibo, and Berbice are generally inferior, as well as of Lima, the Curaçaos, and Cumana. The Carthagena is coarser and dirtier than the preceding, but has greater length and strength of staple.

4. The East India cotton wool is, generally speaking, inferior to the American, and even to the better sorts of the Levant cottons. The Surat, which is the most abundant, is ill cleaned, yellowish, tolerably fine, but very short in the staple. The Madras, Siam, and

Bengal are of very variable quality. The last is white, silky, and has sometimes been spun into No. 50. The Nanking cotton was at one time celebrated, but it is now little known in Europe.

5. Under the Levant cotton wools are comprehended all those grown in European and Asiatic Turkey; such as that of Macedonia, of Smyrna, and the Levant properly so called—all of which are distinguished by considerable whiteness, but have a moderate length of staple, so that they can rarely afford yarn finer than No. 60. The best kinds of the Macedonian cotton are the Uschur or the Zehent wool, and the Salonichi; Cira wool is a very poor article, not workable into finer yarn than No. 20. A great variety of cottons come into the market under the name of Smyrna, because this is the general shipping port for most of the cottons of Turkey in Asia. They are perhaps inferior to the best Macedonian and East Indian, and furnish chiefly coarse weft yarns, and candle wicks. The best varieties are the Arar, Kassabar, and Kirkadadoch. The most highly esteemed sorts are the Subuschat and Kinik; those of Cyprus and Acre are inferior; the worst are those of Bender and Altah.

6. Africa furnishes from the isle of Bourbon the best species of cotton wool, almost as much prized as the finest Sea-island, but it suffers a greater waste in the manufacture. It is uniform, clean, fine, and silky, rivalling the Levant in whiteness; it may be spun into the finest yarn. The Egyptian or the Alexandrian cotton wool, known in commerce under the name of Mako or Maho, has a fine readily twisting filament, admits of being mixed with other kinds of cotton wool,

but is often foul and interspersed with unripe fibres. It has of late years quite supplanted the Macedonian in the cotton manufactures of Austria. The Senegal cotton ranks with the middling cottons of the West Indies, and with good Levants.

7. The principal cottons, known in trade under the title of Italian, are grown in Malta, Sicily, and Naples, the Sicilian being the best; the next are the cottons of Castellamare and Della Torre in the neighbourhood of Naples, which approach in quality to the cotton of Louisiana. The Malta cotton ranks with the inferior West Indian. The Biancavilla, a variety of Neapolitan cotton, suits well for mixing with the Mako, and then affords (in the proportion of three to two of Mako) a good yarn of from 30 to 50 in fineness of number. Mixed with Upland Georgia it is spun into Nos. 30 and 40.

8. The best kind of Spanish cotton wool is the Motril, from the kingdom of Granada, which deserves to be placed immediately next to the first Brazilian. From the fineness of its staple it may be spun into yarns of a high number.

CHAPTER II.

Of the Cultivation of Cotton, or Cotton Husbandry; and the Cotton Wool Trade.

HAVING been favoured by two of the most scientific and successful cotton planters in Georgia, Thomas Spalding, Esq., of Sapelo island, near Darien, and Whitemarsh B. Seabrook, Esq., of Edisto island, with two manuscript memoirs upon the culture of the gossypium, I gladly avail myself of the liberality with which they have contributed, at my request, their valuable services to the present work.* The information thus freshly drawn from the fountain head, shall be presented to my readers as nearly as may be in its original form. It will prove highly interesting to all who are engaged in this spreading branch of agriculture, but more particularly to our adventurous countrymen in India, where the cotton husbandry has been heretofore grossly mismanaged, as appears from the testimony of Dr. Wallich, and other competent observers.

Mr. Spalding considers that in reference to cotton grown in the United States, only four species of the gossypium need be considered.

* The request was conveyed through my very intelligent friend Edward Woolsey, Esq., of Leman Street, London, to Thomas Cooper Vander Hurst, Esq., of Woodlands, Carolina, who applied to the gentlemen whom he knew to be the most skilful planters in Georgia for the best information on the subject.

1. The *herbaceum,* having a smooth stalk two feet high, branching upwards, with five-lobed smooth leaves, and yellow flowers at the end of the branches; the flowers being in harvest-time replaced by roundish capsules full of seed-cotton.

2. The *hirsutum,* or hairy American cotton, has hairy stalks branching laterally, two or three feet high, palmated three and five-lobed leaves, with yellow terminal flowers, replaced by large oval pods filled with seed-cotton.

Fig. 4, p. 63, represents this species, being carefully copied by the wood-engraver from a coloured drawing of the Upland cotton plant by Dr. Capus, transmitted with the memoir of Mr. Seabrook.

3. The *Barbadense,* or Barbadoes shrubby cotton. It has a shrubby stalk branching four or five feet high, three-lobed smooth leaves, glandulous underneath, with yellow flowers, replaced by oval pods filled with seed-cotton.

4. The *arboreum,* or tree-cotton, has an upright, woody, perennial stalk, branching six or eight feet high, palmated four or five-lobed smooth leaves, with yellow flowers filled with seed-cotton.

The seeds of the first and second varieties, besides the proper filaments of cotton-wool which invest them, are covered entirely in the second, and partially in the first, with a dense short fur, resembling closely the under fur of a hairy animal. In the United States all the cotton seeds have an increasing tendency to get a clothing of fur, whereby they become more difficult to clean, but are in no other respect deteriorated. Whether this change arises from some regular law of nature, which promotes the formation of fur on trans-

ferring plants and animals from a hotter to a colder climate, or from some accidental intermingling of the seeds or pollen of the plants, must be left for future investigation.

The Sea-island cotton of Georgia, and likewise of Carolina, is derived from the fourth, or what Mr. Spalding calls the tree-cotton. It would be perennial did the climate permit, as is proved by the circumstance of its lasting many years when the soil is new and propitious. He has known it in warm alluvial lands to survive for five years, and has often seen it vindicate its title of Arboreum, or tree-cotton, by the height to which it grew; for he has measured plants eighteen feet high, which assumed the character rather of trees than of shrubs. But when the plant grows so large, it yields no return of cotton-wool to the cultivator, for it continues to be covered with blossoms or unripe pods when the winter sets in, and is very liable to be blighted in a single night by the action of frost at any period after the 1st of November.

Fig. 3, p. 60, exhibits the Sea-island cotton plant, from a coloured drawing also sent me by Mr. Seabrook. I believe these two figures to be the only exact representations of the Gossypium hitherto published in connexion with the commercial quality of the filaments. "When the Sea-island kind was first introduced into Georgia," says Mr. Spalding, "it was very subject to this overgrowth; and though my memory is fresh as to the time, I do not remember of a single pod having rewarded our first labours by giving the promise of ripeness in a future season. Fortunately the winters of 1785 and 1786 were mild, and the cotton then under experiment had been mostly planted

in new, warm, and fertile soils; the frost penetrated slightly into the earth, and did not extinguish the life of the plants, but suffered them to resume their vegetable activity in spring. Those cotton stalks which had been killed by the cold weather were cut down to the surface of the ground, and the shoots that grew up from the roots of the preceding year's plants were earlier in their development, came sooner to maturity, did not rise so high, displayed their blossoms fully, and more speedily formed their pods. In the second year of this great agricultural era the plants bore their fruit seasonably, and ripened it well, being by this time somewhat acclimated. Expectation was now on the tip-toe, holding forth hopes to the United States of their becoming ere long a great cotton country.

"The mighty revolution thus commenced in the manufactures and commerce of nations was the work of a few active minds scattered through the two Southern States of the American Union, not cheered in their difficult and doubtful enterprise by the bounties of their own government, or by the diminished duties of others, but rather put to the ban of two rival empires in the old world and the new, by which they were alternately harassed by tariffs and commercial restrictions at home on exportation, and increased taxes on importation into Europe.

"Labours destined at no distant period to give freights to thousands of ships, as well as profitable employment and cheap clothing to millions of men, women, and children, were for a long time placed in the most vexatious jeopardy. But leaving bad and blundering statesmen in the hands of Him who visits the sins

of the fathers on the children to the third and fourth generation, we shall proceed," says Mr. Spalding, " to describe one of the most useful forms of industry.

" The provinces from Virginia to Georgia had been colonized by the mother country with commercial views, and the persons who had migrated to them were not the exiles of oppression in laws and religion, but had crossed the Atlantic in order to better their fortunes under the auspices of the English government; hence, when the war of the American revolution began, the distractions about to break a great nation in pieces, which had for the first time, at least in modern history, originated with the rulers and not with the people, created dissensions among the Southern colonists, many of whom thought the remote evils from unrepresented taxation should be borne in preference to the immediate desolation of civil warfare."

After America had established its republican government, Great Britain, feeling bound to make a provision for those colonists who had espoused her cause in the war of independence, offered them portions of land in Nova Scotia and the Bahama Islands. At this conjuncture Arkwright was maturing his spinning machinery, and creating a considerable demand for cotton wool, which induced the colonists who crossed over from the Bahamas to turn their attention to the cultivation of the cotton plant, and to procure the best species of seed then known in the world. The small isle of Anguilla, in the Carib Sea, long celebrated for the excellence of the cotton wool raised upon it, furnished the first seed to the Bahama settlers; by the year 1785 they had succeeded in raising cotton upon two of the Bahamas, viz., Long Island and Exuma.

Mr. Spalding's father, then settled in Georgia, received from Colonel R. Kellsall, a planter in Exuma, a bag of cotton seed; some other Georgians also received similar contributions from their former companions.

Josiah Tatnall may be particularly mentioned in our history of the cotton husbandry of the United States, as a person who received a supply of cotton seed from his father, surveyor-general of the Bahamas. From that handful of seed sent over in the winter of 1785, all the Sea-island cotton plants of Georgia and South Carolina have been produced.

There is a long range of islands lying between George Town in South Carolina and St. Mary's in Georgia, which extends from 32° 30′ to 30° of North latitude, through a space of about 200 miles. These islands were originally covered with live oak, and the other evergreens of a Southern climate; they had been the abode of a particular tribe of the red men of the West, who were fishermen rather than hunters: the accumulation of oysters, clambs, and other kinds of shells mingled with the remains of the bones and pottery of the ancient Aborigines is so vast as to fill every stranger with astonishment; and these calcareous matters had become intimately mixed with the sandy soil and decayed vegetables into a peculiar loam, of a light and fertile nature. A former colony of English settlers had made the shores of these islands the sea of some indigo plantations. It was upon two of these islets, separated from the continent by a few miles of grassy salt marsh, that the Sea-island cotton was first made to grow.

" If Frederick the Great has been admired for honouring the farmer who first cultivated a superior

species of rye in Prussia, what honour is due to the ingenious planter who first produced the admirable long-stapled silky cotton, without which the spindle and bobbin could never have rivalled the finger and thumb of the Hindoo in spinning muslin yarn, and the cotton trade of Europe would have been still tributary to India for all the finer fabrics! The following names of the first growers of Sea-island cotton deserve to be recorded,—Josiah Tatnall, and Nicholas Turnbull, on Skideway island, near Savannah; James Spalding, and Alexander Bisset, upon St. Simon's Islands, at the mouth of the Altamaha; and Richard Leake, upon Jekyll Island, adjoining St. Simon's. For many years after the introduction of the Anguilla cotton-seed it was confined to warm high land in the above islands, under the influence of a saline humid atmosphere; gradually, however, the cotton-husbandry was extended to the lower grounds, and beyond the limits of these islands to the adjacent shores of the Continent; latterly, even to the coarse clay soil deposited by the great rivers at their confluence with the sea-tides. In all these grounds the cotton-plant thrives well, and produces a long stapled wool."

The only essential point seems to be a saline atmosphere; with it any soil in Georgia or Carolina may produce fine cotton, without it no soil will do so.

It is within the district from St. Mary's in Georgia to George Town in South Carolina, extending not more than fifteen miles inland, that the Sea-island cotton is still confined. Whenever its cultivation has been attempted, to the North, South, or West beyond these limits, a certain decline in its quality has been observed to take place.

Many variations have occurred in the cotton-husbandry since it became an object of importance; when first attempted, the farmers deposited the seed either in hillocks raised slightly above the general surface, or in holes five feet asunder every way; the interjacent spaces being dug up, pulverized, and kept free from grass and weeds by the hand-hoe or the plough. But it was soon perceived that this scanty sowing was apt to leave a great portion of the field unoccupied with plants, and was consequently an unproductive mode of farming. As the cotton plant is one of the tenderest scions of vegetable life, it was found necessary to increase the quantity of seed in order to ensure a sufficient number of healthy plants on a given surface of ground; fortunately Tull's ridge-husbandry became known to the colonists, and was adopted for the Sea-island cotton with great success.

The present process, which has continued without change for the last twenty-five years, is to form the ground into ridges, five feet in breadth, extending in straight lines over the whole field; if the land be at all low and subject to be overflowed, these ridges are intersected by ditches at intervals of 105 feet from each other, for receiving the water that may collect in the hollow spaces between the ridges on which the cotton plants are reared. These hollows correspond to the water furrows in wheat husbandry, and serve the same purpose of drainage; the ridges should rise about ten inches above the level of the intervals, the crown being flat and regular; a trench is then made along the middle of the ridge, from two to four inches deep, according to the time of planting, which extends from the 1st of March to the 1st of May, the pre-

ferable period being from the 1st to the 15th of April. When cotton is planted early in March, before the sun has warmed the soil to any great depth, it is necessary to deposit the seed in drills, not more than two inches deep, or there will not be warmth enough to excite germination; later in the season, when the heat is greater, moisture must be secured, which is done by making the drills four inches deep.

The Georgian has been taught by experience not to be sparing of his cotton seed, and he therefore commonly uses a bushel to the English acre. The persons employed in sowing the cotton are generally divided into parties of three individuals each; one person opens the drill along the top of the ridge, then the most intelligent drops the seed into the trench, and the third follows with a hand hoe to turn back the soil while still moist over the seed in the trench; this operation may be very well performed by the foot, by the pressure of which the crumbling soil may be brought into close contact with the seeds. Women are principally employed in these rural labours.

After every care in the sowing, the planter is never sure that a sufficient number of plants will spring up, for a single night's frost, often so late as the month of April, will ruin the whole prospect, and require a renewal of the labours; nay, one day of a strong north-east wind will blight a field of promising plants, and, upon the best and richest soils, when both these sources of danger are past, there is another enemy equally destructive,—the cockchafer or cutworm, which prevails in the month of April: as the cotton comes through the ground and remains several days, like the pea or other pulse, with only two radical leaves, every one of

the plants cut above or below the ground by the worm is destroyed, in consequence of which whole fields have not unfrequently to be replanted in the month of May.

When apprehension from these accidents is over, the labour comes on of thinning the plants, which would injure each other, from being too much crowded together; the prudent husbandman divides this labour into three periods, successively weeding out the weakly plants as the vigorous ones increase in size, to be left to grow from six inches to twenty-four inches apart, according to the fertility of the soil and the expected size of the shrub. The cotton plant is of the tap kind, which sends its root straight down into the ground, and draws much of its nourishment from the atmosphere by means of its broad leaves; as the fields should be entirely shaded from the sun when the plants are fully developed, the distance between their roots should be adapted to this circumstance.

At every one of these thinnings, as they are called, the field is carefully cleared with the hand-hoe from weeds, and fresh soil is gathered round the remaining plants to support them against the wind, whereby they are easily bent over on account of their tall slender stem; these several operations continue till about the 20th of July, by which time they have been repeated from three to six times successively, according to the soil and season, and at that period the summer rains usually set in; they are not tropical in their violence, but are often pretty heavy; up to that time of the year no country can possess a more temperate climate than the Sea-island district; the atmosphere feels springy and enlivening, being refreshed by gentle winds which blow almost daily from the sea-shore. But dark and

dense clouds now begin to gather upon the Western hills, and the equilibrium of the weather becomes unstable; from the 28th of July to the 1st of August the winds change their direction from the South-east to the South-west, and are accompanied with clouds replete with lightning and rain to deluge the fields. At this season all field-labours must cease, for any attempt to stir the ground now would be apt to loosen the roots and make the plants with their large leaves overloaded with moisture fall down; indeed, they are only sustained in consequence of the repeated dressings up of the soil round their roots at the previous operations. The month of August is a period of great solicitude to the cotton-grower, as the heavy rains frequently cause the plant to part with its fruit, and even its leaves; the August full moon is likewise the time when the caterpillar makes its appearance. It is the offspring of a small brown moth, resembling the candle moth, which deposits its eggs upon the leaf of the *Gossypium* always a night or two before the full or new moon; they hatch a few hours after they are deposited, and are so small at first as to be hardly discernible by the naked eye; they do little or no damage during the first nine or ten days of their life, like the silkworms, eating little in their infancy; but a few days before they complete their growth they become so excessively voracious as to destroy an entire plantation in a few hours. Mr. Spalding has seen 400 acres of cotton of a promising aspect, which four days thereafter did not possess a green leaf, or scarcely a solitary pod upon a plant.

Experience has led to the belief that these caterpillar ravages may be expected once in the space of seven years.

When cotton fields have escaped injury from rains,

winds, and worms, they display as beautiful a scene as the admirer of vegetable nature could desire to behold: wide waving groups of viny foliage blended with three coloured blossoms of brilliant hues, and pods of darker shades in various states of ripeness. When the flower comes forth it has a fine yellow colour, which it retains during the first day; under the influence of the night it changes to a red or crimson hue; in the third day it darkens into a chocolate brown, and then falls to the ground, leaving a pod already half an inch in diameter. The interval between the appearance of the blossom and the maturation of the fruit is very variable, being altogether dependent on the season. Mr. Spalding has at one time observed hundreds of flowers which afforded perfectly ripe fruit in the space of twenty-one days, and at another he has seen six weeks required for the same effect, but such delays are always hurtful.

The cotton pods begin to open about the 1st of August; from which time to the 1st of December the whole attention of the cultivator is directed to the *picking in* of the cotton as the pods daily open. During the autumnal season in Georgia and South Carolina upon the sea-coast, the winds are violent and the rains heavy, so that the picking is a tedious though not a laborious operation; and the persons employed may be expected to gather from the fields twenty-five pounds a-day when the weather permits them to work. In the more favourable times, fifty pounds is a good daily average picking of seed cotton; but latterly ten pounds may be a day's work.

Taking the mean product of cotton plantations, Mr. Spalding considers that four acres will not yield more

than five hundred weight of clean cotton separated from the seeds by the gin, of which four hundred weight is white, and one hundred weight coloured or stained cotton wool. These five hundred weights of cotton wool have averaged to the planter for the last fifteen years twenty cents (about 10*d.*) per pound for the white, and ten cents for the stained, fetching in American money ninety dollars to the husbandman. Mr. Spalding justly remarks, that this is a small remuneration, not calculated to excite the envy or hostility of those engaged in other productive occupations.

The process of preparing Sea-island cotton for the market begins as soon as it is generally gathered in from the field, and it is tedious and troublesome in a high degree. The seed cotton, as plucked from the pod, is put into a bag to the amount of about half a bushel, the bag being suspended from the neck or waist of the reaper; when full, it is emptied into a large basket, which contains the amount of each person's gathering in the course of a day. In the evening the crude cotton is brought home, weighed, and deposited in the storehouse; whence, next morning, if the weather be fine, it is taken and spread upon drying-floors, made of two-inch thick American pine; from twenty to forty feet of floor being required for every hundred acres of cotton under cultivation. One day's exposure here is sufficient for cotton plucked in dry weather, but several days may be required for the cotton picked during rain. As strong cold drying winds and bright suns are equally injurious to the delicate staple of the Sea-island cotton, it is left no longer upon the drying-floors than is absolutely necessary to prevent it from heating in the house by fermentation. It is also usual and

proper to pass it through what is called a whipper, to strike off any sand, broken leaves, or other extraneous matter.—*See the Primitive Willow,* vol. ii. p. 4.

The whipper is a long cylindric cage made of reeds or bars of wood (and might be made of wire) six or eight feet in length, and two feet in diameter, being close at one end and open at the other; and is supported at the two ends by feet of different lengths, so that the barrel slopes from the horizontal position about one foot. At the higher end, a hopper of about a bushel capacity rests upon the upper sides at the enclosed end of it. This hopper lets the cotton to be cleaned fall into the barrel or cage, along the axis of which a shaft runs which may be turned round by the hand, by a crank or winch attached to the shaft at its upper end. This shaft has cross bars upon it which reach to within an inch of the inside of the cylindric cage. The cotton as it falls from the hopper is whisked round about by these cross bars all the way in its descent towards the lower end of the cage, by which means any sand or other impurities fall through the interstices. This machine resembles in form and effect the bolting-sieve of a flour-mill.

The *whipping* was formerly applied both to the ginned cotton wool and to the seed cotton, but it is now confined to the last operation, as it was supposed to produce a stringy appearance in the cotton wool. When these operations are completed the harvest may be considered as closed, and the preparation of the wool for the market begins.

Many machines have been designed for separating the seed from the Sea-island cotton, but all at last resolve themselves into two wooden rollers, revolving

against each other in opposite directions;" see fig. 10, p. 90. The rollers may be about half an inch in diameter, and turn round from 100 to 500 times in a minute. It is found that the smaller the rollers, and the slower their motion, the more cleanly will the cotton fibres be separated from the seeds; for, if the rollers be an inch in diameter and if they revolve very rapidly, they will draw in soft seeds, small and false seeds, or motes as they are called, and crushing them in their passage, will stain and otherwise injure the cotton staple. Much money has been expended upon complicated machines, driven by the power of horses, water, or wind, at first in the Bahama islands, and afterwards in Georgia and Carolina, "but at last most of the growers of Sea-island cotton have returned to their first and most simple tool,—*viz.*, two wooden rollers, kept together by a wooden frame, and inserted into iron cranks, having a round journal, and a square shaft, upon which is fixed a wooden or iron fly wheel from two to three feet in diameter. The iron cranks which turn the rollers are connected by strips of wood with a treadle worked by the foot. This treadle runs under the machine, and is connected at the further end to the floor of the house (like the treadle of a turning-lathe) by sockets within which it moves. The man stands therefore in front of the rollers, with a board interposed, upon which he holds a large handful of Sea-island cotton, which he presents from time to time to the rollers kept revolving by the action of the foot upon the treadle. This labour becomes easy from habit, as the feet may be changed in the operation. The task expected from the labourer upon this machine is from twenty-five to thirty pounds

weight of cotton per day. The gin itself costs when new and complete ten American dollars. Women are reckoned the best *ginners*, as they are more careful to keep the rollers supplied with wool in the act of revolution, but they were found to injure their constitution, and they have been replaced generally by men. As it is a light indoor winter work, it is much sought after by them.

"What is a little surprising," says Mr. Spalding, "this foot-gin which we received from the West Indies, is mentioned, if I mistake not, in the remains of Nearchus's voyage down the Indus, as employed in these countries for separating the seed from the wool."

The seed cotton is prepared for the ginning by careful inspection and sorting, in which the yellow cotton, the motes, and any hard or rotten fibres that may have passed through the whipper are separated from the white wool. This work requires the greatest care and attention, and is well executed by women seated upon benches, with tables before them, where the seed cotton as taken from a basket is spread in small parcels, examined, picked, and then thrown into another basket. A woman may sort from 60 to 100 lbs. in a day. It is now exposed for a little to the sun to take off any remaining dampness, and immediately thereafter subjected to the ginning machine. The wool thus separated from the seeds is again returned to the women placed in a large room well lighted and furnished with small tables, covered with slit reeds or wire-work; and it is here freed from every impurity. Thirty pounds are a good day's work for a woman. The cotton is now ready to be bagged for the market.

The hempen bags in which Sea-island cotton is shipped are made of Scotch sackcloth, forty-two inches wide in the web, weighing about a pound and a half to the yard. Each bag requires from four and a quarter to four and a half yards, and ought to receive fully 300 lbs. weight of cotton. Two men are generally employed together to pack, and they finish two bags in a day.

The room into which the cleaned cotton has passed is set apart for the packing operation, and must be kept free from dust. Adjoining to it is a small apartment under the same cover with a round hole in its floor, just large enough to contain the bag when full of cotton. The open end of the bag is fastened by twine to a wooden hoop which extends beyond the hole, so as to hang the bag upright by its mouth. One of the men then gets into the bag with a heavy wooden or iron pestle in his hands, and first presses the cotton with his feet as it is thrown in, and then beats it down with the pestle until the requisite quantity is forced into the bag.

Let us now compute the quantity of labour expended upon each 300 lbs. bale of Sea-island cotton before it is shipped: 1000 lbs. of seed cotton are required to produce 300 lbs. of marketable cotton wool; and fifteen persons are employed in its preparation for the gin. Twenty-five pounds are the average produce of a gin *per diem,* so that twelve days' labour are required to gin a bag full, and ten women take a day to mote the cotton wool. Thus thirty-eight days' service, including the packing, are worked up in preparing a bag of cotton wool for the market. Two others are usually employed in spreading the cotton

that is to be ginned upon the drying floor. The bag itself costs, with cord, &c., a dollar and twenty-five cents of American money. This sum with seventy-five cents for freight is to be deducted from the price of the cotton, as no return is ever made for the bag by the purchaser.

The quantity of Sea-island cotton has not materially increased within these last ten years, nor is it likely that it will increase. The particular soils and climate which have heretofore produced it, and to which it probably owes its peculiar qualities, are confined to the narrow limits above stated. Whether it be that the cultivation of the Sea-island cotton has afforded fewer inducements than other objects of husbandry, certain it is that the number of those engaged in it, even within these limited districts, has not increased; and they are the successors of the first cultivators who are still engaged in the business. They are generally an educated people and stationary, less anxious for change than most of their countrymen, and not indifferent to the honour and happiness of their fatherland.

The short staple cotton, so called in contradistinction to the Sea-island or long staple, wherever grown in the United States, is derived from the first and second of the four varieties above-described. They were both cultivated in small quantities in the United States from Georgia to Virginia at the close of the revolutionary war, by the poorer classes of the white population, for the purpose of mixing with sheep's wool in their domestic manufactures. The cotton was at that time separated by the old and young, labouring with their fingers, as they sat round

their evening fire, and was spun by the women upon the hand-wheel. But it was not till after the introduction of the West Indian seed that the short-stapled cotton was cultivated for the market. There can be no doubt, however, that a different cotton seed was at a subsequent period introduced into Virginia from some part of the Turkish dominions, most probably from Smyrna, and this is the *herbaceum* of Linnæus.*

No sooner was the attention of the southern States excited towards the culture of cotton as a profitable branch of husbandry, than it began to spread from the sea-shores into the interior, but a great difficulty then arose from the adhesion of the fibres to the hairy green seed, which was not overcome till Whitney and Miller's saw-gin became known. The hairy cotton, the second of the four varieties, had obtained the preference over the others upon the inland grounds of Georgia and Carolina, because the wool, though shorter in the staple, was much stronger, and came to maturity at an earlier period in the autumn. The simple roller gin, which answered well to separate the long staple from the black seed, was quite ineffective for the short staple, because the fur upon its seed stuck to the rollers and obstructed the entrance of the proper textile filaments. But wherever Whitney's machine became known it was laid hold of with avidity, and with little regard to the patent privilege of the inventor. Whitney's saw-gin was first mounted on a good scale at Mr. Miller's plantation, sixteen miles above Savannah, in the year 1795. See fig. 11, p. 141.

* The green-seeded Georgian cotton is probably derived from the accidental crossing of the *hirsutum* and *herbaceum* species.

This gin acts perhaps a little too roughly on the fibres, tearing a few, and causing a loss of about one-sixth of the wool when compared in its product to that of the roller gin applied to the Sea-island seed cotton. The power of the saw-gin is, however, so great as to give it a preference, since one machine of ten pounds value can clean a whole bale of cotton daily by the work of a single horse.

Henceforth the short stapled cotton began to be grown in all directions round Georgia as a common centre; north into the two Carolinas, west into the hill country, and into all the southern states, accommodating itself to the different soils and climates of the interior, which the Anguilla cotton would not do. It may be remarked, however, that the short stapled wool is of a better quality when raised near the sea than at a great distance from it; and it thrives most luxuriantly in alluvial soils, a little impregnated with salt, as in some of the districts of Louisiana. There the soils, which are deeply tinged with red, and well seasoned with salt, between the waters of the Arkansa and the Red River, give forth the most abundant crops of the best quality of that description of cotton. From the information of intelligent cotton farmers, Mr. Spalding states, that a thousand pounds of seed-cotton or two hundred and fifty of ginned wool may be raised with reasonable diligence from an English acre of land in that district; whereas, in the hill country from the Mississippi to the Carolinas, not more than five hundred pounds of seed-cotton can be obtained.

The system of agriculture throughout all these districts is essentially the same; the hand hoe used exclusively on the sea-coast being replaced by the plough

in tilling the ground of the interior. The plough breaks up the soil more thoroughly than the hoe, and does eight acres at the same expense as four can be done by the hand instrument; but both are employed in the method of ridge husbandry. The distance between the ridges is five feet, and that between the plants in the furrows varies from six to twenty-four inches, according to the circumstances formerly mentioned. As the winds of autumn are much less violent in the interior than upon the sea-coast of Georgia and Carolina, and as the capsules that contain the short staple expand much less in ripening than those of the Sea-island, the upland cotton harvest is much less precarious than the other, less of its cotton is lost by the capsules falling off spontaneously, and less trouble is occasioned in plucking the shrubs. In fact the short stapled pods are allowed to hang upon the plants till they are white with the wool, so that they may be reaped at two or three gatherings, instead of ten or twelve employed in the Sea-islands, and therefore at not more than half the cost of labour.

Several varieties of this kind of cotton grow well and perfect their fruit all the way from the southern borders of Virginia to the south-western streams of the Mississippi, over a length of twelve hundred miles, with a depth of two hundred miles inland; and in every soil, whether clay, loam, or sand, provided the waters be kept well drained from the surface of the land. The mean quantity over all is given by Mr. Spalding at one hundred and twenty-five pounds of both Sea-island cotton wool, and of the short stapled wool, to an English acre, but the amount of labour is much greater for the former than for the latter. Cotton does not

exhaust the ground, but from the density of its shade, and the size and swelling of its roots, it soon makes the soil too loose to sustain the plant; and, if cultivated continually on the same land, the plant becomes affected with a disease greatly resembling the blight in wheat, and gives birth to seeds which have a propensity to extend the evil. Mr. Spalding ascribes this disease to an insect puncturing the shrub, followed by a parasitic plant, and recommends fire as the best remedy for ground so affected: all the weeds and grass on the land should therefore be burned.

"There is no plant which requires rotation of crops more than the cotton, and there is no country where that practice is more important than in the southern states. The cotton fields should therefore be reaped with an intermediate crop of grain, and all root crops should be avoided. This simple triennial course, with manure applied during the grain year to as great an extent as may be convenient, will preserve the fields from any material decay."

In conclusion we may state that eight acres cultivated by the plough will yield the farmers annually, on a fair average of seasons, one thousand pounds of short stapled cotton wool to each labourer employed upon them. Their cotton has paid them about ten cents a pound during the last seven years, or one hundred dollars for each mean year's work. There are exceptions undoubtedly to this estimate, for a few men have received much higher prices, particularly for Sea-island cotton, and a few also have raised a much larger quantity than 125 pounds to the acre, "but exceptions," says Mr. Spalding, "can never serve as a guide in conclusions as to either the wealth or productiveness

of a whole country. The besetting sin of agricultural statements is their exaggerations."

Mr. Seabrook states, in a letter accompanying his memoir, that it contains no assertions which are not historical, or which could not be substantiated by living testimony; and he says he makes this observation because considerable obscurity and doubt have hitherto existed with regard to the first introduction of Sea-island cotton into the United States. In an explanatory communication from Mr. Vander Hurst, it is said that "the exportation from South Carolina in 1795 must have been 1,109,653 pounds of cotton instead of £1,109,653 sterling worth.

The terms "Mains, and Santees" he defines as follows:—*Mains* means the black seeded, or long stapled cotton raised on the main land behind the Sea-islands; *Santees*, the cotton raised in the vicinity of Santee river in Carolina; but there is no original difference in the seed, which is black in both. He thinks a light sand to be the best soil for the Sea-island cotton plant. The finest seed is not always coated with fur, but it has invariably, at one or both ends, a small tuft or beard. The produce of this sort now brings in the Charlestown market from forty cents to one hundred cents per pound, and is procured by a judicious selection of seed from the general bulk, sufficient for a nursery, from which the quantity requisite for the entire crop is supplied; but this cotton from the nursery is "the extra fine," and commands the highest price. The word "hill" is incorrect, and is properly understood only by practical planters; for there is no hill: on the contrary, it is a hole into which the seed is thrown, made on the top of

the bed or ridge. A planter's acre is 210 feet square, divided for the apportioning of labour into four square parts called "tasks," 105 feet square each, and two tasks generally make a day's work for an able hand; it cannot consequently be 210 feet square, but 210 by 105 feet only. This error of Mr. Seabrook must have arisen from inadvertency, and should be corrected. The drawings of the black seed or long staple, and the green seed or short staple cotton plant, are a contribution from Dr. Capus, from which it will be seen that the leaves of the former have five lobes, agreeably to the botanical description of the *arboreum* species.

Mr. Seabrook considers cotton plants to be the spontaneous production of all the tropical regions of Asia, Africa, and America. A few of the planters of the State of Georgia began to raise cotton as an article of export soon after the peace of 1783. Indeed the first provincial congress of South Carolina, held in January 1775, had recommended the inhabitants to raise cotton, yet little attention was paid to that judicious counsel. Ramsay, in his "History of South Carolina," says that cotton was exported from that state in 1795, to the value of £1,109,653, a statement already remarked upon as erroneous.

The long staple cotton is thought by many to be the *Gossypium Barbadense* of the West Indies. But this has a shrubby stalk four or five feet high, tri-lobed leaves, with flowers consisting of several large yellow petals, each stained at the bottom with a purple spot. The capsule or pod when ripe opens into three partitions, in each of which is a lock of white cotton, investing the seeds.

The above three distinct varieties of long stapled cot-

ton, *Sea-islands, Mains,* and *Santees,* are worth respectively at this time, in the Charlestown, market, thirty, twenty-five, and twenty cents. Each of these varieties may be subdivided into several others, which are in general distinguishable only by the seeds and the quality of the cotton. The seed of the first variety is covered entirely with *green* fur, and has a beard of that colour at one of its ends or at both.

The seed of common Sea-islands, like that of Mains and Santees, is a pure black, and sometimes it is covered wholly or partially with white fur. In 1785 the late Governor Tatnall received, as Mr. Spalding stated above, a parcel of seed of the silky or Sea-island cotton, which came from Anguilla through the Bahamas. In that year and the one following, the seed of long staple cotton, and probably that of Mains and Santees, was also brought into Georgia from Pernambuco and the Bahamas: *Sea-island* cotton was not extensively raised in South Carolina till 1799; but as early as 1789 about twenty persons cultivated it in Georgia. It is not known whence the seed originally came. Before its cultivation in the United States the cotton which commanded the highest price in England came from the island of Bourbon. In 1786 Bourbon cotton sold at from seven shillings and sixpence to ten shillings per pound. In 1799 Sea-island obtained in Liverpool from five shillings to five shillings and three pence per pound, and the cotton of Pernambuco four shillings and sixpence. The genuine cinnamon and mango trees were introduced into the West Indies from Bourbon in 1782, and some other productions at a still earlier period. May not the seed of the Sea-island cotton have been also received from the isle of Bourbon, as well as the sugar cane? and may not the Bourbon

planters have got the seed of their highly-prized cotton from Persia, since it is now known that the Persian cotton is nowise inferior to the Sea-island except in point of strength.

The cultivation of this valuable shrub extends about forty-five miles from the sea shore in the States, and its fruit diminishes in all its valuable properties in proportion to its distance from the atmosphere of the ocean. The finest and best cotton now raised in the world is produced on the islands of Edisto, John's, Wadmalan, and St. Helena, in South Carolina. There are three methods of sowing the seed; *viz.*, in long hills, in short hills, and in shallow trenches extending the whole length of the ridge. Long hills (by which is meant a row of holes two or three times the length of the hoe apart) are generally preferred in very rich land, where it is necessary that the plants should be far from each other. Of the three methods, that of short hills (or near holes, the width of a hoe apart) has been found to be the most useful as well as profitable. The quantity of seed sown to an acre is about half a bushel. The operation of hoeing is begun the last of April, and is conducted as follows:

The tops of the beds are first clean hand-picked, then 210 feet square are afterwards hoed by each slave, and every bunch of grass is carefully collected. The earth about the plants is also well scratched and loosened with the fingers. At the second working the usual practice is to haul, or draw, the earth directly from the centre of the alley (hollow) to within a few inches of the top of the bed. This is seldom done, however, when the cotton is very low, when the earth is too wet, or when it is too lumpy. If none of these

circumstances prevent, the planter either hauls twice in succession, *viz.*, at the second and third workings, or he hoes and hauls alternately. The number of workings which the crop receives seldom exceeds five or six; the last being usually given about the first week of July.

The proper thinning of cotton requires much judgment and experience. At the first hoeing, if the plants are very thick set, a few may be advantageously taken out. At the second working they are separated about two inches, where the seed has been drilled or reduced from six to eight stalks in a hill (hole); if short or long hills are used, when the period arrives for a third thinning, which is about the eighth day after the second, as the bark of the cotton stem is then sufficiently thick to bear exposure, the plants ought to be thinned six or eight inches apart, or from two to four in a hill. About a week or ten days after this, a few of the most intelligent labourers are employed to separate the stalks a little further. By the 25th of June the thinning of the crop is completed. In general, the cotton plants which grow about three feet high are left to the number of from 120 to 140 stalks in a task row (105 feet long); when they grow four feet high, to the number of 110; and, six feet high, to the number of sixty or eighty stalks.

The plough is very generally used in the cultivation of the *santees*, for making the cotton beds, which are commonly about four feet apart. It is sometimes had recourse to also for breaking up stiff lands. The number of acres planted to each hand (labourer) is from four and a half to five and a half. A good crop is 130 pounds of ginned cotton from an acre.

The gathering of the crop commences about the 20th of August, and ends about the 1st of December. From thirty to sixty pounds per labourer are usually picked in a day.

The leaf and pod of long-stapled cotton are much smaller than those of the short-stapled; the pod of the former opens into three partitions, that of the latter into five. Upland cotton may remain unpicked on the plants for weeks, or perhaps months, without injury; but the long-stapled cotton unless picked very soon after its flower blows, falls from the pod and is spoiled. Exposure to the weather renders it brittle and colourless.

Any vegetable matter is a good manure for cotton, but it must be applied judiciously. Excess of food produces a large and luxuriant stalk, but renders the fruit scanty. For high and loose sandy soils, salt mud and green marsh grass or rushes are now commonly put under the sward on which the bed is to be made several weeks or months before seed-time. For low close lands, fresh cotton seed, pine straw, marsh rushes, corn stalks, or any substance rotted in the cow-house, may be used. The quantity of manure to an acre is as follows:—of salt mud from ten to twenty cart loads; cotton seed, about forty bushels; from the cow-house, from twenty to twenty-five card-loads; green sward or rushes, a layer of about four or five inches thick and ten inches in width.

There is perhaps no plant more delicate than Sea-island cotton. Being deep rooted, it is injured by rain, especially in the month of August. It is easily blasted by wind, or by a very slight frost. When young the leaves and roots are liable to be injured by

a small bug, and the whole plant to be cut down by the grub or caterpillar. Should June prove a wet month, a visit from the caterpillar towards the end of August will certainly take place. The depredations of this insect are almost incredible. In one week it has been known to destroy completely fields containing more than 100 acres. It is however seldom known to commit ravages on the main land.

On the Mississippi the growers of cotton think that new land does not produce so fine a quality of cotton as that which has previously borne two crops of grain. In preparing the ground they use the plough alone, and lay off the rows from four to six feet, and where the soil is as rich as the low grounds of the Mississippi even eight feet is not too much. They open the ridges by running a narrow drill with the plough, sowing the seed in it as they would grain, and covering it lightly with the harrow. The only art in making a good crop of cotton consists in not suffering even a blade of grass to grow among the plants till they are fully ripe, and not to crowd them too much together, that is nearer than ten or twelve inches from each other. From the 1st of September the pods, called there boles, begin to mature and open successively until winter has stopped the vegetation of the shrub.

As soon as the boles are completely opened, the cotton, which then hangs partially out of the shells, and has become almost dry, must be gathered by hand; care must be taken by the picker to lay hold with his fingers of the several locks of cotton only, so as to remove the whole at once, without breaking off any of the dry leaves about the bole; and if any fall upon the

cotton before the picker has secured his handful in the bag which hangs at his side, they must be carefully separated. It is necessary to use a bag with a close mouth to gather the cotton, for the plants have commonly many decayed leaves upon them which are easily shaken down; and these leaves greatly depreciate the value of the cotton among spinners.

"The saw-gin of sixty wraggs or saws ought not to make more than from 600 to 800 pounds of clean cotton in twelve hours; for when forced to run faster the cotton is not so clean, and its fibres are liable to be cut and torn."

Some writers on cotton husbandry have remarked that the red soil of the interior of Georgia is apt to give a tinge to the wool grown upon it, and that the gray soil produces a fairer cotton.

The seed, when sold for fodder, fetches about a dollar the thirty or forty bushels. The cattle are very fond of it, but unless it be mixed with dry fodder, such as the husks and leaves of maize, in order to dilute it, and prevent the cotton fibres from balling in the stomach, it has a scouring effect, and is reckoned unwholesome. Cattle grazed on the saline meadows of Florida and Georgia are subject to a fatal disease called the salt sickness. Mr. Couper has discovered that wood ashes mixed with their food is a certain cure, probably by neutralizing the muriatic acid disengaged from the sea-salt in the animal system.*

One of the finest samples of Sea-island cotton which I have ever seen was sent me by D. B. Warden, Esq., ex-consul of the United States, at Paris, and forwarded

* Silliman's Journal, vol. ix., p. 22.

to him for this work by Dr. Wardeman of Charleston. It was grown on the plantation of Mr. Benjamin Freeman, situated on Wadmalan Island, about twenty miles from Charleston. This cotton was discovered about five or six years ago, and the first sent to the market sold for 6 dollars and 75 cents the pound, while the ordinary Sea-island brought only about 30 cents. The growing of this cotton was for some time kept a secret, and even in 1831, when Dr. Wardeman visited Wadmalan Island, the fields in which it was grown were guarded during harvest time to prevent the stealing of the seed, three quarts of which were sold as a favour for 150 dollars.

The plant differs from the ordinary Sea-island shrub in having longer "limbs," (primary branches,) longer "joints," (secondary branches,) in the flowers being larger, of a brighter yellow, and the hairs of the pod being longer. It is by the latter mark that the best plants are recognised, from which the seed is selected for sowing the ensuing crop. Unless this selection be carefully made, the cotton will deteriorate every year, probably from the pollen of the common Sea-island getting upon the pistils of the superior kind, as the former abounds all round about. The pod opens into three triangular portions, disclosing cotton of a remarkably pure white; the plant of this fine cotton does not bear so luxuriantly as the common Sea-island; it is from three to four feet high, and is distinguishable by tufted seeds of a greenish colour, resembling somewhat those of the short-stapled cotton of the inland country.

I have been told by an eminent cotton spinner in Alsace that the top flowers of the cotton plant afford the finest seeds, and are selected by the most skilful

planters of the Sea-island district for improving the staple from year to year.

The cultivation of cotton upon the coast of Guiana has been conducted with much judgment and success. Here the land is an alluvial mud, thrown up by the great rivers that empty themselves into the ocean in its immediate neighbourhood. Land is daily formed by these deposits. The elevation above the level of the sea is so inconsiderable as to render inundations not uncommon, and the whole country is intersected by ditches, without which husbandry would be impracticable. For this reason, the land on which the cotton shrub is to be planted must be formed into beds about thirty-six feet wide, and surrounded by drains that cross the estate, and empty themselves into the trenches which run parallel with its length; these beds are slightly elevated towards the middle, with the soil turned out of the drains, so as to throw off the redundant moisture more readily, and prevent that stagnation of water round the roots of the cotton, so injurious to its growth. The land thus prepared is divided into portions of about five feet square. Small holes, four or five inches deep, and six or eight wide, are dug with a hoe, a little light earth is scraped into each hole, a small handful of seed laid on it, and it is covered over with mould. If the weather be showery the seed will spring up in three or four days. As soon as the plants are three or four inches high, they ought to be all pulled up by the hand, except three or four to each hole; this is generally done within a month after the first planting. About the same time the ground requires a first weeding, which is repeated every month until the trees are fully grown. At the second or third

weeding one stalk only is left in each hole, and then if it be eighteen inches or two feet high, the tops are nipped off to make the shrub throw out a sufficient number of lateral shoots. The usual period of planting cotton in Dutch Guiana is during the months of December, January, April and May. If it be planted in the first two months, which is the preferable season, the shrub will require to be pruned in June to prevent its growing too high; this is done when it attains a height of about three feet above the ground, while at the same time all the shoots from the stem higher than one foot above the ground are lopped off. But if the cotton be planted in April and May, the branches will require to be nipped only twice with the finger, and the plant will generally yield some cotton before Christmas, even in October, if the weather be dry; in general, however, the cotton plant of Guiana rarely produces a full crop before it has attained its second year, its whole duration being usually estimated at four or five years. Whenever a tree fails another is planted in its place, which practice is called *supplying* a field of cotton, and is particularly attended to at the period of weeding; the cotton-trees after they are one year old are regularly pruned annually, between the months of April and July.

In ordinary seasons the crop in Guiana is generally finished in April, and if the season be mild, May is the fittest month for pruning, a labour which generally employs the gang of negroes for about a month. After this period the utmost care should be had to keep the ground clear of grass and weeds, which grow very luxuriantly at that season; if the weather be favourable the cotton begins to throw out abundance

of blossoms by the end of July or beginning of August; the pods form in succession, and generally begin to open in about six weeks thereafter. It rarely happens that picking is general before the end of October, and it continues all through December, making what is called the first crop. The short rainy season now begins, and during its continuance the trees vegetate with uncommon vigour, and begin to blossom. When the weather is mild the second crop should commence by the end of February, and continue till the middle of April; the rains in general render this crop very unproductive.

As salt is considered to promote the growth of cotton, the old lands in Guiana are frequently inundated with salt water; this fact corresponds with the well-known circumstance that Sea-island cotton is superior to every other species.

After the cotton has been picked, it is dried in the sun until the seed becomes quite hard, for otherwise it would heat and swell; it is exposed for about three days, upon tiles or a wooden platform, to the sun; the seed is then separated by the simple roller gin, consisting of two slender cylinders made to revolve by a treadle moved by the labourer's foot, like a turning-lathe; a Guiana workman can gin from fifty to sixty pounds a-day with this very simple machine. The ginned cotton is picked by women in order to free it from broken seeds, dried leaves, or yellow flocks of cotton; a clever hand will clean from twenty-five to thirty pounds daily; the cotton is now packed in bags, and compressed by a screw into compact bales for exportation.

The cotton plant of Guiana is particularly subject

to the attack of an insect which has received the general name of *chenille,* or cotton caterpillar, an animal about an inch or an inch and a half in length; it is a species of phalæna. One of the most singular circumstances attending the ravages of this insect is the fragrant smell which issues from the plant it feeds upon, although neither the animal nor the healthy plant possesses any odour; so powerful is this smell that it may be recognised more than a hundred yards from the plant.

The rapidity with which this caterpillar carries its ravages to distinct and even remote plantations is surprising; in the course of a single night whole fields, containing several acres, have been devoured by them. Hitherto the only sure defence against this destructive enemy is found in keeping the intermediate space between the cotton shrubs free from every species of vegetation on which the caterpillar can feed; children are also employed in picking them off the shrubs.

Cotton plantations are liable also to another calamity, called the blight; its tendency is to check or destroy the vegetative powers of the plant, and to deprive it of every productive faculty for a season. No satisfactory explanation or remedy for this evil has hitherto been offered.

A species of scarabé, the *apate monachus,* is a third enemy of the cotton plant. The larva of this insect begins its attack by boring a hole in the green bark of the cotton-tree, it penetrates into the alburnum, eats it with a revolving motion under the bark, and proceeds then to the wood and pith; the branches thus attacked dry up and perish. When a new-made hole is perceived upon a tree it should be closed carefully

with wax, which, by excluding the air, soon causes the insect to die, and saves the tree. The dead branches should be cut off and burned.

There are, moreover, red and black bugs, which sometimes suck the seeds of the cotton plant at the period when the capsules open. When seeds so gnawed get accidentally between the rollers of the cotton gin, they are crushed flat, and cause the wool to be soiled with the animal impurities of the bug.

At Pernambuco the cotton shrub is triennial; it affords a little wool the first year, more the second, and after the third crop it is abandoned, and replaced in the land by farinaceous plants, such as tapioca. The Brazil cotton is also a triennial plant.

According to Forbes, the rice and cotton fields yield a double crop in Guzerat, and they are both planted at the commencement of the rainy season, in June. The rice is sown in furrows, and reaped in about three months; the cotton shrubs, which grow to the height of three or four feet, and in verdure resemble currant bushes, require a longer time to bring their delicate fruit to perfection. They are planted between the rows of rice, but do not prevent its growth or impede its being reaped. Soon after the rice harvest is over the cotton bushes put forth a beautiful yellow flower, with a crimson eye in each petal; this is succeeded by a green pod filled with a white stringy pulp; the pod turns brown and hard as it ripens, and then separates into two or three divisions containing the cotton. A luxuriant field, exhibiting at once the expanding blossom, the bursting capsule, and the snowy flakes of ripe cotton, is one of the most beautiful objects in the agriculture of Hindostan. Herodotus says, the In-

dians in his time possessed a kind of plant which, instead of fruit, produced wool of a finer and better quality than that of sheep, of which the natives made their clothes.—*Oriental Memoirs*, vol. ii. p. 407.

Whoever has been in India, says Dr. Willick, must have found that the ryot, or farmer, will never exert himself beyond what will give him his daily food. To this state of things it is owing, for one instance, that the cotton plant is almost always reared as an annual in India, whereas in America (Guiana and Brazil) and the Leeward Islands it is triennial. He believes that India produces of itself every variety of cotton. It is his opinion, that the justly celebrated American Sea-island cotton is actually in cultivation in several parts of India, but owing to the manner of husbandry among the natives, it very soon loses all its principal characters for goodness, and returns to the quality of the original wild species. That miserable husbandry, adds he, which never allows the plant to outlive a season, if it remained even on the sea coast, would be quite sufficient to deteriorate any cotton.* Among the thousands of Indian plantations, one can hardly be found of a perennial kind. In the cleaning, conveying to the sea ports, and final packing for export of Indian cotton, there are great imperfections. The extreme badness of the boat, or ugly floating mass of wood called a *patella*, in which the cotton is sent to the general place of shipment, greatly injures its quality. Huge cotton bales are piled upon it, one over another, with little protection, during a voyage of four or five

* Dr. Willick does not seem to be aware that all the cotton of the Southern States of the American Union is the growth of annual plants.

months, from the rains so abundant at the season of conveyance, to Calcutta. Here they arrive in a very filthy state, and are then subjected to the action of bad screw presses, very irregularly worked, sometimes by the power of twenty men and sometimes by that of fifty. Thus the seeds get incorporated with the damp cotton and give out their oil, so as to discolour the cotton, and render it liable to rancidity and mouldiness.

Between the cleaned Bombay cottons, and the best cleaned American upland cottons, there is a very considerable difference of value in favour of the latter. The improvement required in Indian cotton is the introduction of a different seed to which the wool would adhere less strongly, a more frequent change of seed, much greater attention to the cultivation, and care in cleaning, drying, and packing. It ought to be sown in drills and not broad-cast. The cotton plant at Bombay is generally an annual with short-stapled wool and green seeds. It is never cleaned with the saw-gin, though, being coarse, strong, and adhesive to the seed, it would require it. The East India Company never took any measures of consequence to improve the cottons; and no lands producing the cotton plant are in the hands of Europeans.

In the eastern, as well as in the western hemisphere, the influence of the sea coast on the growth of cotton seems equally propitious. Dr. Willick brought home several samples of cotton from the coast of Martaban to the India House, which were grown near the sea. They were not exceeded by the cotton of any other country in the quality of the staple, or the facility of its separation from the seed. There is a village near

Mangrole in Kattywar, which produces a small quantity of very fine cotton. It is cultivated by natives, and grows only on one particular spot of small extent near the sea coast.

Cotton from the Bourbon seed is grown in India only near the sea; when transplanted to Benares, which is 400 or 500 miles inland, the crop entirely failed.

The Dacca cotton, from which the finest Indian muslins are made, is in small quantity, and all consumed in that district. It is quite unknown at Calcutta. The finest of the Chinese cotton is likewise produced near the sea.

Two species of cotton, in particular, are cultivated in the islands of the Indian Archipelago, which Mr. Crawford calls the *gossypium herbaceum* and *gossypium arboreum*, probably more in reference to their size, than to their true botanical characters. It is remarkable that Java, the most fertile and improved country of that region, should produce the worst native cottons. When the cotton shrub is grown in succession to rice, it yields only one crop, and then perishes from submersion during the rains. On such marshy lands, the cotton plant cannot thrive. The seed in the common cotton of Java is to the wool in the proportion of four to one by weight, and adheres much more strongly to the fibres than the black seed. One person can clean no more cotton wool from this seed than a pound and a quarter a-day.

Having detailed the most approved methods of cultivating cotton, I shall next describe the means by which it is prepared for the market. The first step, the separation of the wool from the seeds, is effected

by the gin or ginning machine, which is of two kinds, the simple roller-gin, fig. 10, and the saw-gin figs. 11 and 12.

The roller-gin, as above described by Mr. Spalding, consists of fluted rollers five-eighths of an inch in diameter, and from nine to sixteen inches long, placed parallelly in a frame which keeps them almost in contact. Were the rollers thicker or farther apart, they would crush the seeds, or draw them through with the cotton wool; whereas they are so adjusted as to pull through the fibres and exclude the seeds. With one of these little machines, a stout man can clean from thirty to forty pounds of the black seeded cotton in a day, but the labour is extremely hard. A pair of such small fluted rollers has been used in India for this purpose from an ancient period. It is worked by hand, without the advantage of the treadle and fly wheel.

In 1820, Mr. Harvie of Berbice, obtained a patent for an improvement on the roller-gin, which consisted in the application of a thin long brush to the posterior surface of the rollers, with the view of preventing the cotton from being carried round about with them, an accident apt to injure its colour and staple. This brush may be adjusted by screws attached to the roller-frame, whereby its bristles may be brought to bear with any desired force against the rollers.

It is said that the rollers are liable to get very hot during their rapid rotation, to obviate which, it has been proposed to make them hollow for the free passage of cool air, or even water. For this contrivance a patent has been obtained in the United States.

This machine has been occasionally driven by horse

power in Guiana; but the casual ties arising in the progress of ginning cotton, have led to the preference of human labour. When dexterously managed it performs the business of cleaning cotton in a very perfect manner, without injuring the staple. The principal objection to it is the small quantity of cotton which it can clean in a day. This is obviated in some measure by restricting its use to the Sea-island and other fine-stapled or black-seeded cottons.

Travellers from Senegal, report that the roller-gins sent from Paris thither turned off only four pounds of cotton a-day; and their labour cost 12 sous per pound of cotton, an expense which absorbed all the profits of the planter. The cause of this trifling product of the machine may be readily conceived. As the cylinders possess no elasticity, and as they must close evenly together to seize the cotton wool, if they are made from awkwardness to draw in a little more at any one point, they are thereby forced asunder, and become ineffective through the rest of their length.

The coarser and stronger stapled cotton of Upland Georgia was originally cleaned by the vibrating stroke of the bowstring, the cord being raised by hand and suddenly made to recoil upon the seed-cotton. The force of this impulsion separated the seeds, and opened up the wool. From this practice, this cotton was called bowed Georgia. The bowstring is also one of the ancient implements used by the Hindoos and Chinese for cleaning cotton wool. See fig. 2, p. 42.

Till Mr. Eli Whitney invented his saw-gin in 1793, the wool of the green-seeded cotton could not be separated from the seed, unless with a degree of labour very discouraging to the growth of that hardy and

productive article. But since that era, this branch of husbandry has become of paramount importance to the southern states of the American union. Having spent a winter in completing his machine, Mr. Whitney showed a few friends that it could separate more cotton from the seed in one day by the labour of one man, than could be done by the existing methods in a month. The construction of this instrument was an event of such consequence as to excite an universal interest in the state of Georgia, where Mr. Whitney then lived in narrow circumstances, under the roof of a hospitable friend. Neither the sentiments of justice nor the fear of the law, could restrain the eager crowds from breaking into his workshop by night, and carrying off his wonder-working tool. In this dishonourable way the public acquired possession of Mr. Whitney's invention before the model was finished to his mind, and before he could secure the protection of a patent. Many copies were immediately made from it with slight variations, in order to evade the patent, which he obtained soon thereafter.

Thus the inventor of a most ingenious machine was not suffered to reap in peace a reasonable share of the fruits of his labours, which proved so beneficial to his country. He was tormented with the most vexatious litigations, and though he was soon supported by a partner possessed of some capital, he was in a few years well nigh ruined. At length, in the year 1801 the legislature of South Carolina purchased from Mr. Whitney a patent license for that State for the sum of 5,000 dollars. Next year he disposed of a license to the State of North Carolina, the legislature of which laid a tax for five years, of 2*s*. 6*d*. upon every saw in every

gin that was mounted within their jurisdiction. Some of these gins contained no fewer than forty saws. This tax was collected, along with the public imposts, by the sheriffs, and after the expenses of collection were deducted, the balance was faithfully paid over into the hands of the patentee. No small portion of the funds thus honourably raised in the two Carolinas, was expended in carrying on fruitless law-suits against the piratical invaders of his privilege in the state of Georgia. "There have indeed," says the American biographer, "been but few instances where the author of such inestimable advantages to a whole country as those which accrued from the invention of the saw-gin to the southern states, was so harshly treated and so inadequately compensated as Mr. Whitney. He did not exaggerate when he said, that it raised the value of these States from 50 to 100 per cent." "If we should assert," said Judge Johnson, "that the benefits of this invention exceed 100,000,000 dollars, we can prove the assertion by correct calculation."

Whitney had to vindicate not merely his pecuniary rights, but his character; for attempts were made, as is usual in such cases, to deprive him of the honour of the invention. In 1812 he applied to Congress for a renewal of his patent, representing that he had been tormented with litigation for eleven years before his rights were legally recognised, and that thirteen years out of the fourteen of his privilege had expired with very little advantage to himself, but very beneficially to the nation; "for his invention had enabled one man to do the work of one thousand." The planters of the southern states so warmly opposed Mr. Whitney's application, that it failed of success. Meanwhile this

ingenious man, when he found his hopes blasted of reaping the fair reward of his saw-gin, betook himself to the manufacture of fire-arms, and executed several contracts for supplying the United States' service with them. Thus the implements of human destruction enabled him to realize that competency which one of the most powerful tools of peaceful industry had failed to procure.

The saw-gin consists of a wooden cylinder about the size of a weaver's beam, furnished with a series of circular saws, fixed on it at regular distances perpendicular to its axis. The machine in its original state had merely projecting wire teeth, with which it was apt to tear the filaments into a short nap; it was thereafter mounted with circular plates of iron serrated at the edges. These serve to pull the filaments through a wire grating, the divisions of which are too narrow to permit the seeds to pass. Though very expeditious in its performance, and not essentially injurious to ordinary cotton staple, it would be apt to tear the long and delicate filaments of Sea-island cotton. One saw-gin can clean about three hundred weight of cotton in a day. The common roller-gin has been occasionally made to clean the Upland Georgian, but it does not answer so well as the saw-gin in clearing away the seeds and opening up the wool. The staple of Surat corresponds in some degree to that of the Upland Georgian, and should be cleaned with a similar machine, whereby it would fetch a better price in the market.

Description of the Saw-gin of Whitney.

The principal parts of the saw-gin are two cylinders of different diameters (see F,H, figs. 11 and 12) mounted

in a strong wooden frame, A, which are turned by means either of a handle or of a pulley and belt, acting upon the axis of a fly wheel attached to the end of the shaft opposite to that seen in the section, fig. 11. Its endless band turns a large pulley on the end D of the saw cylinder F, and a smaller pulley upon the end E of the brush cylinder H, fig. 12, so as to make the latter revolve with the greater rapidity. Upon the wooden cylinder F, ten inches in diameter, are mounted, three quarters of an inch apart, fifty, sixty, or even eighty circular saws, edged as at I, fig. 11, of one foot diameter, which fit very exactly into grooves cut one inch deep into the cylinder. Each saw consists of two segments of a circle, and is preferably made of hammered (not rolled) sheet iron; the teeth must be kept very sharp. Opposite to the interstices of the saws are flat bars of iron, which form a parallel grid of such a curvature that the shoulder of the slanting saw-tooth passes first and then the point. By this means, when a tooth gets bent by the seeds, it resets itself by rubbing against the grid bars instead of being torn off, as would happen did the apex of the saw-tooth enter first. Care must be taken that the saws revolve in the middle of their respective grid intervals, for if they rubbed against the bars they would tear the cotton filaments to pieces. The hollow cylinder H, is mounted with the brushes *c, c, c,* the tips of whose bristles ought to touch the saw-teeth, as at *d, d,* fig. 12, and thus sweep off the adhering cotton wool. The cylinder H, revolves in an opposite direction to the cylinder F, as is indicated by the arrows in fig. 11.

The seed cotton, as picked from the pods, is thrown into the hopper L, fig. 11; the disc-saws, I, in turning

round, encounter the cotton filaments resting against the grid, catch them with their sharp teeth, and drag them inwards and upwards, while the stripped seeds, too large to pass between the bars, fall through the bottom, N, of the hopper upon the inclined board M. The size of the aperture N is regulated at pleasure by an adjusting screw to suit the size of the particular species of seeds. The saw-teeth, filled with cotton wool, after returning through the grid, meet the brushes *c, c, c,* of the cylinder H, and deliver it up to them;

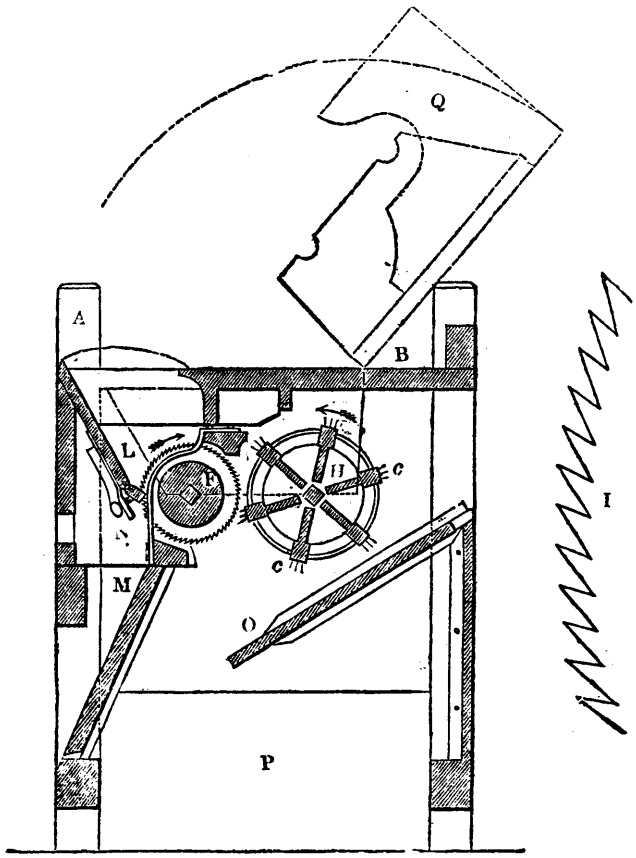

Fig. 11.—Section of Whitney's Saw-gin.

the cotton is thereafter whisked down upon the sloping table O, and thence falls into the receptacle P. A cover, Q, fig. 11, encloses both the cylinders and the hopper; this cover is turned up round its hinges, (as shown in fig. 11,) in order to introduce the charge of seed cotton into the machine, and is then let down before setting the wheels in geer with the driving power. The axes *e*, *e*, *f*, *f*, of these cylinders (fig. 12) should be well fitted into their plummer box-bearings, so as to prevent any lateral swagging, which would greatly injure their operation. The raised position of the cover is obvious in fig. 11, the hinge being placed at B. By means of the saw-gin one man, with the aid of a water-wheel possessing a two-horse power, can clean 5,000 pounds of seed cotton in a day, eighty saws being mounted upon his machine. The cleaned wool forms generally one-fourth of the weight of the seed cotton, and sometimes so much as twenty-seven per

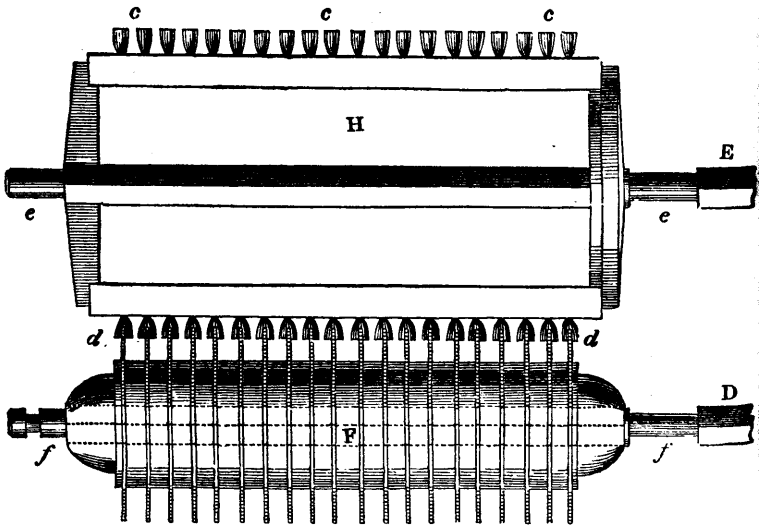

Fig. 12.—Plan of the Saw and Brush Cylinders of Whitney's Saw-gin.

cent. The ginners are usually a distinct body from the planters, and they receive for their work one-eighth or one-tenth of the net weight of the cleaned cotton, under an obligation to supply all the seed required by the planter. The owner furnishes the bags in which the cotton wool is packed at the mill.

Joseph Eubank, of Kentucky, has proposed to make the saw-gin still more automatic in its performance, by supplying the seed cotton not by hand, but by a feeding-apron, similar to what is employed in the cotton carding-machines. This apron is destined to carry forward the cotton at the proper rate towards the saw-teeth, where a roller set with iron wire fangs seizes the cotton, and throws it briskly against the saw-gin cylinder.

Cotton wool is now generally condensed into compact bales for facility of transport, by the aid of the hydraulic press; for which purpose a wooden case is built up, consisting of several square frames piled over each other, and then fastened together at the corners by moveable bolts. This chest frame has the same dimensions in its area as the base of the bale, but is of a height about four times greater than the bale, to admit a sufficient bulk of uncompressed cotton wool. The bottom is the sill-plate or board of the hydraulic press, and has grooves cut in it, into which the cords are laid; the top of the case touches the top plate of the press, and whenever that top plate enters a certain way into the case by the ascent of the hydraulic piston, the upper horizontal layer of the frame is removed by taking out its corner bolts. Presently another is withdrawn, and so on, till the desired condensation has been given to the cotton; the bale is now bound hard

by the cords, and then put into its bag. By this contrivance the cotton suffers such a degree of compression, that from five to six hundred weight of it may be packed into a bulk of twelve or thirteen cubic feet. This great condensability of cotton is very favourable to the manufacturers of Europe, rendering it transportable from America or India, at an expense too inconsiderable to affect the price of the finer cotton fabrics. The average gross weight of a bag of cotton from the United States varies from 330 to 350 pounds, of which seven pounds belong to the bag.

The freight in general of cotton wool from Georgia or Carolina to Liverpool varies from one halfpenny to seven eighths of one penny per pound; the freight of cotton from Madras to England is, upon an average, about 1*d.* per pound; for the freight of a ton, equivalent to four and a half bales, or to 50 cubic feet, is about £6, and the weight of the Madras bale is from two hundred and ninety-five pounds to three hundred. The freight of Egyptian cotton in a bale compressed by power is three farthings per pound, and seven eighths of a penny when the bale has been packed by manual labour; the weights of the Egyptian packages are very irregular, varying from 200 to 400 pounds.

There is no manufacturing district in Europe into which cotton wool can be imported from the several parts of the world where it is grown, at an easier rate than into Lancashire, Lanarkshire, and Renfrewshire.

Almost all the cotton wool consumed in the British manufactures was obtained from the West Indies and Guiana prior to the year 1794, with the exception of

a little from India and the Levant for the fustian trade, and a still smaller quantity from the Brazils and the Isle of Bourbon for the finer muslin yarns. The state of our cotton-wool markets in 1787 was the following:—

British West-Indian Cotton . .	6,800,000 lbs.
French and Spanish Colonial . .	6,000,000
Dutch ditto . .	1,700,000
Portuguese ditto . .	2,500,000
Isle of Bourbon	100,000
Smyrna and Turkey	5,700,000
	22,800,000

Messrs. George Holt and Co., the eminent cotton-brokers of Liverpool, give, in their printed statement, 25,600,000 pounds as the quantity annually imported into Great Britain from the years 1786 to 1790.

The American wool was at first ill cleaned, and was therefore deemed applicable only to the coarser fabrics; but a few skilful spinners soon recognised the excellence of the long-stapled Georgian wool, and eventually gave it a rank above that of the highly-prized Bourbon cotton. As the Upland cotton wool was much more difficult to clean from its seeds, it arrived in Great Britain in a still dirtier state than the other, and was therefore regarded for some time with distrust. But it also, at no distant date, surmounted every prejudice, and now constitutes the material of a large proportion of all the cotton goods manufactured in Europe. In 1832 the cotton wool of the United States imported into Europe was 880,000 bales, and that imported from all other quarters was under 450,000; since which time the production of the States has been increased, while that of the other cotton

districts has been diminished. So long ago as the year 1807, considerably more than 55,000,000 pounds of cotton must have been raised in the interior of Georgia, for Upland wool to that amount was at that time exported from the United States.

During the war the rate of freight was 3½*d.* to 4*d.* a pound; from Amelia Island and other places it is now from a halfpenny to five-eighths of a penny, and sometimes a farthing, according to the greater or less distance of the port from whence imported. By the improved system of ship-building the ship-owners are making money at those rates. An American ship was thought formerly to be a very superior vessel as to model if she carried 900 pounds to the ton of register, but they have so far improved within the last twelve years as to be able to store 2,000 pounds of cotton to a ton of register, owing partly to the compression of the bags, but chiefly to improvements in the model of the vessels. The above rate would not pay British ships upon the old form of ship-building, which is deep and very short, whereas the new ones are long as well as deep. The Liverpool ships of the new construction, however, can compete with the American. The risk, and consequently the insurance, is less on American ships manned with Temperance crews, than on British. More than half the whole import for the States comes now from the Gulf of Mexico, and it is on the increase.

According to Mr. Bates, the cost of transport of cotton from New Orleans to Boston, Providence, New York, and Philadelphia, is about half what it is to Liverpool. Also, in the building, equipment, and navigation, the American ships are more economically conducted than the English.

The Increase in the Growth of Cotton in the United States.

COTTON EXPORTED.

Years.	Bales of 300 lbs.	
1794	5,340	Nearly all the crops were exported in this period. In 1795 and 1796, some foreign cotton was included in the returns of exports.
1795	20,901	
1796	20,355	
1797	12,628	
1798	31,200	
1799	31,774	
1800	59,299	Slave population in 1790 . 697,000 1800 . 896,000
1801	67,700	
1802	91,670	
1803	137,018	
1804	127,060	
1805	127,966	These are the quantities exported, and probably include nearly the whole growth, except during the years 1812 and 1814, the period of war between Great Britain and the United States.
1806	122,225	
1807	213,148	
1808	35,434	
1809	169,934	
1810	310,871	
1811	206,860	
1812	96,291	
1813	62,030	Slave population in 1810, 1,191,000
1814	59,094	
1815		These are accurate, and represent the entire crops.
1816		
1817		
1818		
1819	303,589	
1820	369,800	Slave population in 1820, 1,538,061
1821	539,038	
1822	588,139	
1823	509,600	
1824	560,000	
1825	710,000	Entire crop.
1826	937,000	
1827	712,000	
1828	857,000	
1829	976,845	
1830-1	1,038,847	Slave population in 1830, 2,010,436
1831-2	987,477	
1832-3	1,070,438	
1833-4	1,205,394	
1834-5	1,254,328	

[Given by Joshua Bates, Esq., to the Committee on Manufactures.]

The fall in the price of cotton wool has been owing to the extension of the growth of the cotton plant in the southern States of the Union, where the lands are more fit for it, and where it may be produced more cheaply. Hence the exports from New Orleans bear a much greater proportion to the exports from Charlestown and Carolina than they used to do. The freight of cotton from the southern States of the Union to the eastern or manufacturing States may be reckoned at five-eighths of a cent, including the insurance and other charges, as from New Orleans, or Mobile, to Boston. The saving in this particular to the American spinner is no less than a halfpenny per lb., which, on cotton worth sevenpence, is equivalent to seven per cent. upon its cost. The American manufacturer also saves the average profits paid by the British manufacturer to the class of middle-men, commonly called the "cotton importers." The duty in this country of five-sixteenths of a penny per lb. of cotton wool, becomes, under such circumstances, an oppressive impost upon its coarse goods.

It is greatly to be lamented that the parent soil of the cotton plant and of the cotton manufacture should have been suffered by its British masters to remain so long without improvement, or rather to become deteriorated in reference to this valuable article; and that, while the inhabitants of Georgia and Louisiana are deriving enormous benefits from this productive agriculture, the humble ryots of India should be kept in a state of poverty, to the reproach and loss of our nation, for want of suitable education and encouragement. Were the docile peasantry of Hindostan aided in their rural labours by British enterprise and intelligence, they might ere long create for themselves and for this

country an inexhaustible source of comfort and independence. How grossly mismanaged the cotton husbandry was by the residents of the East-India Company will appear from the fact that they made by order of Government a trial of the American saw-gin, the instrument best adapted to their short-stapled cotton, but without success. *The machinery ground up the seed with the cotton.** The Surat wool, upon which this awkward experiment was made, resembles very closely the Upland Georgian, and may undoubtedly be ginned by that machine, *rationally* applied. Mr. Ritchie stated, in his evidence before the Committee of the House of Commons, that the natives have no prejudice against any such machinery. Their own roller-gin costs 6*d.*; it is turned by hand, cleans the cotton very rudely and with great waste of labour; it takes little strength, indeed, but occupies the whole time of one person. The cotton must also be subsequently cleaned by a bowstring, which breaks it to pieces. "The attempts to improve the cotton have not succeeded. In some of the experiments the cotton deteriorated very much; in others the seeds did not come up well. There has been no improvement in cotton since the introduction of the free trade. It was better in 1818 and 1819 than it is now. The Company have taken very trifling measures, not worth mentioning, to improve it. There is no doubt that it would be improved by greater skill being employed in its cultivation. There is no reason in the world to suppose that the cultivation of India might not be improved."† In

* Ritchie—Commons' Report on Indian Affairs, 1830–31.

† Appendix to Report from Select Committee on E. I. Company, 1832. p. 468.

May, 1830, the Government published regulations to prevent the adulteration of cotton wool, and it has become comparatively clean, though there is no improvement in the cotton itself.* India is capable of producing cotton for the European market, provided there is a proper application of skill and capital to the production of the article, in the same manner as in other countries; but the unaided skill of the natives is incapable of doing it.

The portion of the cotton crop destined for the Company,† as the rent of land, is delivered by the planter to the collector in the state of seed cotton, being merely picked out of the pod. Surely this portion, amounting, on an average, to one-half of the whole crop, might be ginned by Whitney's machine if the business were administered with the most ordinary discretion, particularly as all the damaged and foul cotton is rejected. The commercial resident bargained usually for the remainder of the crop, and therefore, had he not been placed above the necessity of effort and ingenuity, he might have organized a system of saw-gin mills similar to the American.

When the rent of lands became payable in money in the other presidencies as it had been in that of Bengal, the cotton husbandry was expected spontaneously to improve. We wonder only how, under the exaction and insolence of the fiscal system of seizing the produce for rent, Guzzerat could export 100,000 heavy bales per annum. We hope such a liberal policy will be pursued towards the ryots of Bengal as will enable

* Appendix to Report from Select Committee on E. I. Company, 1832, p. 468.

† Ibid.

them to improve their cotton husbandry, as also towards the planters of Bombay, whose abject wretchedness and ignorance are a disgrace to the British administration in that district of India.

Though the general use of cotton garments in ancient Egypt has been fully disproved by an examination of the mummy clothes, the successful cultivation of the plant in modern Egypt has been realized by its enterprising ruler, Mahmoud Pacha. The peculiar fitness of the soil and climate for rearing the *gossypium* had no sooner occurred to his mind than he commenced operations with equal vigour and sagacity, and, in the course of a couple of years from undertaking this new species of husbandry, he exported no less than 5,623 bales of cotton to England. The wool sent to this country is of superior quality, is all long-stapled, the growth of well-selected seed; one species being called Makò by the Egyptians, and common Egyptian by the English; another is named Sennaar in Egypt, and Sea-island Egyptian in England, as grown from Georgian Sea-island seed. The average export of cotton from Egypt may be estimated at from fifty to sixty thousand bales per annum. The best of it ranks in value next to the American Sea-island, and in general quality it is fully equal to the Guyana wool.

A few plants discovered accidentally in a garden of Makò-bey, at Cairo, suggested this profitable branch of agriculture, and gave the name of Makò cotton to the samples first sent to England in 1822. During every subsequent year it has formed an article of importation into this country, and has now acquired considerable importance in Europe.

Imports of Egyptian Cotton Wool.

	London.	Liverpool.	Glasgow.	Total in Great Britain.	Sale Price, 31st Dec.
	Bales.	Bales.	Bales.	Bales.	*d.*
In 1823	1,277	1,173	—	2,450	11¼ per lb.
1824	10,645	22,622	580	33,807	10⅜
1825	21,831	80,736	631	103,198	10½
1826	8,115	38,218	—	46,333	8
1827	4,988	14,420	2,310	21,728	8
1828	3,820	24,702	2,616	31,138	7⅜
1829	1,980	22,425	—	24,405	6⅞
1830	700	11,019	1,865	13,584	9
1831	8,540	26,487	1,050	36,077	8½
1832	2,837	32,271	5,109	40,217	8¾

The freight from Alexandria to this country is about three farthings per pound. The Makò is a cotton compared by some spinners to the Brazil.

It appears, from the narratives of Clapperton and Landers, that cotton is grown very extensively all over Africa, and especially along the course of the Niger, for the purpose of forming articles of clothing to the natives. No details have yet been obtained concerning the husbandry of the plant, or the manipulations by which its wool is manufactured. The people of Eboe, and other districts near the mouths of the Niger, are clothed in Manchester cottons, which they get in barter for palm oil, ivory, and other native products. What a vast area exists in this quarter of the globe for reciprocity of trade to Great Britain, whence it may receive the raw materials, cotton, and dye drugs, in exchange for their multiform and many-coloured fabrics!

M. Dortoc, a few years ago, made experiments during several seasons upon the cultivation of the cotton plant in the department of the Gironde; but the Government of France, after laying out considerable sums of

money on the project, abandoned it as hopeless, according to the decision of the Committee of Agriculture of the Société d'Encouragement, to which it was referred.

For the following general abstract of the cotton wool trade in 1834-5, I am indebted to James Cook, Esq.—

40, *Mincing Lane, February* 6, 1835.

My Dear Sir,—I herewith forward a table of the imports of cotton into the continent for 1834, and the consumption of the United States is 200,000 bales. I reckon the consumption of all countries to be as follows, and in this I am confirmed by the opinion of a friend of mine well capable of judging. You are at liberty to give my name as the authority for this statement, if it answers your purpose to do so.

Great Britain	940,000 bales
France	270,000
Continent	220,000
	1,430,000
America	225,000
	1,655,000
China* (Exports from India)	200,000
Total	1,855,000

I am, my dear Sir, yours very faithfully,

To Dr. Ure. James Cook.

Estimate of the probable Growth of Cotton in the World, (exclusive of China,) from the principal Cotton Countries, for 1835-1836.

	Bags and bales of 340 lbs.
India	400,000
Brazils and the West Indies	200,000
America	1,300,000
Egypt	50,000
Levant	70,000
	2,020,000

* The consumption of cotton in China far exceeds this estimate; for their own growth, which is almost entirely manufactured by themselves into cotton fabrics, is of considerable importance.

Cotton—Great Britain and the Continent.

	IMPORTS.		STOCKS.	
	1833.	1834.	1833.	1834.
Great Britain ..	930,270	949,020	215,130	185,560
Hamburgh	22,700	45,188	1,985	4,500
Bremen	3,530	6,814	345	1,406
Amsterdam	7,915	13,532	1,290	1,418
Rotterdam	13,862	43,785	1,504	200
Antwerp	24,120	24,124	4,500	2,480
Havre.....	210,600	201,600	33,920	22,000
Bordeaux.....	3,944	6,682	81	95
Marseilles	74,544	48,938	12,780	1,063
Genoa	13,960	15,900	2,077	1,467
Leghorn.....	1,200	1,950	None	None
Trieste	61,847	53,193	12,538	6,375
	1,368,492	1,410,726	286,150	226,564

	Bags.
On the 1st of January, 1835, the Stock of Cotton Wool, in the hands of Dealers and Spinners, was .	63,672
Taken out of the Ports for Consumption in the course of that year	937,616
Supply to the Trade during the year, 1835 . . .	1,001,288
Stock in the hands of Spinners and Dealers, 1st January, 1836	308,301
Actual Consumption during the year 1835	923,000*

* Burn's Commercial Glance.

Quantity of Cotton Wool imported into England and Scotland in the following Years.

	America.	Brazil, &c.	East Indies.	West Indies.	Other Parts.	Total.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
1827	216,924,812	20,176,162	20,930,542	7,165,881	6,711,512	272,448,909
1828	151,752,289	29,143,279	32,187,901	5,893,800	8,783,373	227,760,642
1829	157,187,396	28,878,386	24,857,800	4,640,454	7,203,365	222,767,411
1830	210,885,358	33,092,070	12,481,761	3,429,247	4,073,016	263,961,452
1831	219,333,628	31,763,412	25,805,153	2,652,864	9,119,796	288,674,853
1832	219,756,753	20,114,483	35,178,625	2,099,841	9,682,823	286,832,526
1833	237,506,758	28,464,199	32,755,164	2,474,653	2,456,063	303,656,837
1834	269,203,075	19,370,708	32,920,865	2,519,529	2,861,248	326,875,425

Bags and Weight of Cotton Wool grown and manufactured in the United States.

	Number of Bags.	Average Weight of Bags.	Total Weight.	Cotton consumed.
		lbs.	lbs.	lbs.
1826 to 1827	937,000	336	314,832,000	34,770,288
1827 to 1828	712,000	335¼	238,520,000	40,448,803
1828 to 1829	857,744	342¼	301,991,756	40,736,850
1829 to 1830	976,845	340¼	332,371,511	42,845,708
1830 to 1831	1,038,848	342	368,089,796	62,292,564
1831 to 1832	987,477	350¼	345,863,819	60,873,450
1832 to 1833	1,070,438	350	374,653,300	68,044,550
1833 to 1834	1,205,294	363¾	438,425,692	71,445,228
1834 to 1835	1,254,328	370	464,100,360	80,248,560

By the George Washington, which arrived at Liverpool on the 10th of February, 1836, advices from New York were received to the 10th of January, from which it appears that the quantity of cotton wool exported during the year 1835 amounted to 370,194,184 lbs., valued at the places of exportation at 61,435,746 dollars. Since 1792 the increase in the exportation from the United States has been nearly two thousand fold. In 1792 there were exported 138,138 lbs., the value of which was 32,000 dollars.

General Import of Cotton into Great Britain, from 1824 *to* 1835 *inclusive; the Quantities taken for Export and Home Consumption, and the Stock remaining at the close of each Year, with the Prices Current of the principal Descriptions on the* 1*st of December.*

IMPORT.	1824.	1825.	1826.	1827.	1828.	1829.	1830.	1831.	1832.	1833.	1834.	1835.
Of American	282,773	424,688	395,116	646,982	444,581	461,569	618,185	608,768	627,703	656,764	731,680	763,050
Brazil	142,559	198,031	55,742	120,056	165,240	159,838	192,267	170,234	114,665	164,537	103,570	143,580
West India	31,837	34,614	18,582	29,953	22,117	20,808	12,648	11,815	9,264	15,046	18,250	22,490
East India	50,846	60,502	64,698	73,546	84,795	80,522	35,212	76,654	109,086	95,058	88,490	118,680
Egyptian	33,745	103,112	47,362	21,998	32,855	24,712	13,596	37,719	40,320	2,569	7,030	42,370
Total No. of Packages.	541,760	821,250	581,500	892,535	749,588	747,449	871,908	905,190	901,033	933,974	949,020	1,090,170
Exported	53,100	75,520	95,000	75,300	64,900	109,300	35,450	82,800	65,100	65,700	85,850	104,400
Taken for Home Consumption	639,100	565,430	559,660	707,500	731,030	754,660	805,580	867,850	865,990	897,600	892,740	941,320
Stock at the close of each year	235,360	415,660	342,500	452,250	405,900	289,390	320,260	274,800	245,120	215,870	185,560	230,010
CURRENT PRICES.	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*
Bowed Georgia (duty paid)..	8¾ a 10¼	6¼ a 9½	6¼ a 7¾	5 a 6¼	5¾ a 7	5¾ a 7	6 a 7¼	4¾ a 6¼	6¼ 7¾	7¼ 9½	9½ 11	7⅛ 11¼
New Orleans.. „ ...	10 12¼	7¼ 11	7 8½	5¼ 8¼	6 8	6 7¾	6½ 8	5¼ 7¼	6¼ 8¼	8 10¼	9½ 11¼	7⅛ 12
Maranham.... „ ...	10¼ 11¼	10¼ 11¼	9 9¼	7¼ 8¼	7¼ 7¾	6⅜ 7	7 7¾	6¼ 7¼	7¼ 9	8¼ 10¼	12 13¼	10 12¼
Pernambuco .. „ ...	10¼ 13	11¼ 12¾	11 11¼	8¼ 9	7¼ 8¼	7⅜ 8	7⅜ 8¼	7 8¼	8¼ 9¾	9¾ 11¼	12¼ 14½	10¾ 13½
Egyptian ..... „ ...	10¾ 12	9½ 11	7¼ 8¾	7 9	7 8¼	6¾ 8¼	8 9½	7 8½	8 9¼	12 12	15 16½	11½ 14¾
Surat..... „ ...	5¾ 7½	5¼ 7	5 6	3¾ 5¼	3⅜ 5	3½ 5	4¼ 5¾	3¾ 5	4¼ 6	5¼ 7¼	6¾ 8⅜	6⅛ 8
Bengal ..... „ ...	5¼ 6¼	5¼ 6¼	5 5¼	4 5	3¼ 5	3¼ 4½	4¼ 5⅛	4 4⅜	4¾ 5¼	5¼ 6¼	7¼ 7¾	5¼ 6¼

1.—*Statement of the Extreme Prices in each Year, from* 1806 *to* 1835.

	1806. Good.		1807. Good.		1808. Good.		1809. Good.		1810. Good.		1811. Good.		1812. Good.		1813. Good.		1814. Good.		1815. Good.		1816.				1817.				1818.			
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.		d.	d.	d.		d.	d.	d.		d.	d.
Upland.....	15	21½	15½	19	15½	36	14	34	14½	22½	12½	16	13	23½	21	30	23	37	18	25½	15	a 17		19½	a 21	16½	a 20		19½	a 23½	16½	a 19½	20½	a 22
New Orleans	17	24	18	21	17½	37	17	36	16½	23½	13½	17½	14	26	23	31	29	39	21	31	15	19½		20	24	18	20		23	25½	16½	20½	21	25
Sea-island..	30	37	28	30	28	58	28	69	26	33	22	30	25	40	37	48	42	72	33	57	22	28½		26	39	22	30		25	36	25	36	33	54
Pernambuco.	23½	29	24½	26½	25	42	22½	38	23	29	18	23½	19	27½	24	34	28½	41	25½	37	23	24		29	30	22½	24		26½	27½	22	23	26	27
Maranham..	21½	26	22½	24½	22	38	19½	36	20	27	14½	20½	16	26	22	33	23½	39	26½	33	22	22½		27½	28	22	23		25½	26	20	20½	24½	.
Surat	.	17	.	.	14	25½	11	26	12½	19	10½	13	12	16	15½	20	18	25	14½	21	14	15		17	18½	14½	17½		16	20	7	14	15½	20½
Demerara ..	22	26½	23	40	23	40	20	40	21½	28	17	21½	17½	27½	24	33	27½	39½	24	35	20	23½		26	29½	19	23½		23	26½	19	24	23	30

	1819.				1820.				1821.				1822.				1823.				1824.				1825.				1826.			
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Upland	10	a 12½	17	a 19½	8	a 11	12½	a 13½	7	a 10	9½	a 11½	5½	a 8½	7½	a 11	6½	a 8½	8½	a 10½	7	a 8½	9	a 10	6	a 9½	16½	a 19½	5½	a 6½	6	a 8½
New Orleans	10½	15½	16½	21	8½	14	12½	17	7½	12½	9	14	6	10½	8½	12½	7	11	8½	13	7½	11	9	13	8	12	17½	22	5½	8	7	11½
Sea-island..	21	36	29	48	15	28	22	36	12½	26	14	30	10	24	12½	28	11½	22	13	24	11½	22	15	27	15	27	33	42	10	20	17	30
Pernambuco.	16	18	22½	23½	11½	13	17	18½	11½	12½	13½	14½	9½	10½	11½	12½	10½	11½	13	14½	10	11½	11½	13	11½	12½	22½	23½	9½	10½	11	12
Maranham..	15	16	20½	21	11	11½	16	16½	10½	11½	12½	13½	8½	9½	10½	11½	9½	10½	12½	13½	9½	10½	10½	11⅜	10⅜	11½	21½	22½	8½	9½	10	10½
Egyptian ...	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	9½	11	11	12½	10⅜	12	21	24	6½	8½	9½	11
Surat	5½	10½	8½	14½	6¾	9½	7½	12	6½	8½	7	9½	5½	7½	6½	8½	5½	7½	6½	8½	5½	7	5½	8	5½	7⅜	12	16	4½	6	5½	7
Demerara ..	12½	18	19	24	11	14	14	19	9	13	11	14	7½	10½	9½	13	8½	11½	12	14	10	12	10	13	10	12½	19	24	7½	10½	9½	12½

	1827				1828.				1829.				1830.				1831.				1832.				1833.				1834.				1835.			
	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.	d.
Upland.....	4½	a 6¼	6¼	a 7⅜	5	a 6⅜	6¼	a 7⅜	4⅜	a 6¼	5¼	a 7	5⅜	a 7	6¼	a 7⅜	4¼	a 6⅜	5¼	a 7¼	5	a 7	6¼	a 8	6¼	a 7⅜	9¼	a 12¼	7¼	a 8⅜	9¼	a 11	6¼	10¾	9⅜	13½
New Orleans	5¼	8¼	7	9¼	5¼	8	6¼	9	4¼	7⅛	6	9	5⅞	8	6¼	9	5	7¼	6¼	8	5¼	8	6¼	9	6½	9	9¼	14	7¼	10	9½	12¼	6¼	12	9¼	14½
Sea-island..	9⅜	18	11½	20	10	18	12¼	22	9	18	12	21	11¼	20	12	20	9¼	18	10¼	18	9¼	18	11	18	10½	18	14	22	13½	20	18	26	7	30	10	33
Pernambuco	8	9	10	11	7¼	8¼	8¼	9½	6⅜	7¼	7¼	8¼	6⅜	7	8¼	9½	6¼	8¼	7⅜	8¾	7⅜	8¾	9¼	10½	8¼	9¾	12½	14½	9⅜	11	12¾	14½	10	13	16	18
Maranham..	7¼	8	8¼	9⅜	7¼	7¼	7¼	8¼	5⅜	6½	7¼	7¼	6⅜	7	7¼	8⅜	6⅜	7¼	7	7¼	6	7¼	8	9⅜	7⅜	9½	11¼	13⅜	8⅜	10¼	12	13½	10	12	14	16½
Egyptian ...	6¼	8	7	8¼	6¼	8¼	7¼	9	5⅜	7½	7	8¼	6¼	8½	8¼	10	7	8¼	8	9¼	7	9	8¼	9¼	.	.	.	.	12	12½	15¼	16½	10⅜	13	20	21
Surat.....	3¼	5¼	5	6¼	3¼	5	3¼	5½	2⅞	4½	3¼	5¼	3	5½	4¼	6	3¼	4¼	4¼	5¼	3¼	4¼	4¼	5¼	4¼	6¾	7	8¼	5	7½	6¾	8¾	6	8	7	9
Demerara ..	6¾	9¼	8	11	6¾	9	6¾	9½	5¼	8	6¼	9	5½	8	7	10	6	9	6½	10	6	9¼	7	10	7¼	10½	10¼	13	8	11	11½	15¼	10	14	12	17

2.—*Statement of the Quotations of Cotton Wool in Liverpool, at the Close of each Week in the Year* 1835; *also of the Weekly Amount of Sales, and Proportion on Speculation.*

	JANUARY.				FEBRUARY.				MARCH.			
	9th.	16th.	23d.	30th.	6th.	13th.	20th.	27th.	6th.	13th.	20th.	27th.
	d. *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*
Upland	8⅜a10¼	8⅜a10⅝	8¼a10⅝	8¼a10⅝	8⅜a11	8⅜a11	8⅜a11¼	8⅜a11¼	8⅜a11¼	8⅜a11¼	8⅜a11¼	9a11⅜
New Orleans	8⅜ 12	8½ 12	8½ 12	8½ 12	8¾ 12½	8⅝ 12½	8¾ 12½	8¾ 12½	8¾ 12½	8¾ 12½	8⅞ 13	9 13
Sea-island	9 30	9 30	9 30	9 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30	10 30
Pernambuco	12½ 14	12½ 14	12½ 14	12½ 14	12¾ 14	13 14	13½ 14½	13½ 14½	13½ 14½	13½ 14½	13½ 14½	13¾ 15
Maranham	11½ 13	11½ 13	11½ 13	11½ 13	11¾ 13½	12 14	12 14½	12 14½	12 14½	12 14½	12 14½	12 14½
Egyptian	16 17½	15 17½	15 17½	15½ 17½	16½ 18	16½ 18	16 18	16 18	16 18	16 18	16 18	16 18
Surat	6⅝ 8	6½ 8	6½ 8	6½ 8	6⅝ 8	6⅝ 8	6⅝ 8½	6⅝ 8¼	6⅝ 8¼	6⅝ 8¼	6⅝ 8¼	6⅝ 8⅝
Demerara	11 15	11 15	11 15	11 15	12 16½	12 16½	12 16½	12 16½	12 16½	12 16½	12 16½	12 16½
Amount of Sales ..	16760	13625	18628	27730	43826	16080	23230	15500	16470	23170	29450	35290
Proportion on Spec.	1500	500	1500	1000	8500	1100	2500	1100	2500	2820	5850	10700

	APRIL.				MAY.					JUNE.			
	3d.	10th.	17th.	24th.	1st.	8th.	15th.	22d.	29th.	5th.	12th.	19th.	26th.
	d. *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*	*d.* *d.*
Upland	9 a 11½	9¼a11¾	9⅜a12	9⅜a12¼	9⅜a12⅝	9⅜a12⅝	9¼a13	9¼a13	9⅜a13¼	9⅜a13¼	9⅜a13¼	9⅜a13¼	9⅜a13¼
New Orleans.....	9 13	9¼ 14	9⅜ 14¼	9¼ 14¼	9⅜ 14½	9⅜ 14½	9⅜ 14½	9⅜ 14½	9⅜ 14½	9⅜ 14½	9⅜ 14½	9⅜ 14½	9⅜ 14½
Sea-island	10 30	10 30	10 30	10 30	10 30	10 30	10 32	10 33	10 33	10 33	10 33	10 33	10 33
Pernambuco.....	13¾ 15	13¾ 15	14 15½	14½ 16	14½ 16	15 17½	15½ 17½	16 18	16 18	15½ 17½	15½ 17½	15½ 17½	15½ 17½
Maranham	12 14½	12 14½	13 14⅞	13½ 15½	13½ 15½	14 16	14 16	14 16½	14 16½	14 16½	13½ 16	13½ 16	13½ 16
Egyptian	16 18	16 18	*none*	19 20½	19 20½	19 21	20 21	20 21	20 21	19½ 21	19½ 21	19 21	19 21
Surat	6⅝ 8⅝	6⅝ 8⅝	7½ 8½	7 8⅝	7 8¾	7 9	7 9	7 9	7 9	7 9	7 9	7 8¾	7 8¾
Demerara.....	12 16½	12 16½	12 17	12 17	12 17	12 17	12 17	12 17	12 17	12 17	12 17	12 17	12 17
Amount of Sales ..	12477	26180	35160	33570	16080	34950	20010	23910	12738	12330	9950	16040	18237
Proportion on Spec.	1150	7800	12350	11000	2500	9200	3000	3600	1750	2200	1500	1500	1500

Statement, &c.—continued.

	JULY.					AUGUST.				SEPTEMBER.			
	3d.	10th.	20th.	24th.	31st.	7th.	14th.	21st.	28th.	4th.	11th.	18th.	25th.
	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.
Upland	9⅜a13	9⅜a13	9⅜a13	9¼a13	9¼a13	9¼a13	9¼a13	9¼a12¾	8¾a12¼	8¾a12¼	8¾a12¼	8¼a12¼	8 a12¼
New Orleans	9⅜ 14¼	9⅜ 14¼	9⅜ 14¼	9¼ 14¼	9¼ 14¼	9¼ 14¼	9¼ 14¼	9¼ 14¼	8¼ 14¼	8⅜ 14¼	8 14	8 14	7⅞ 14
Sea-island	10 33	10 33	10 33	10 33	10 33	10 33	10 33	10 33	10 33	10 33	10 33	10 33	9 33
Pernambuco	14¾ 16¼	14¼ 16	14 16	13¾ 15¾	13¼ 15½	14 16	13¾ 16	13¾ 16	13¼ 15¼	13 15½	13 14¼	12⅞ 15	12¼ 15
Maranham	13¼ 16	13¼ 15¼	13¼ 15¼	13¼ 15	13 15	13 15	13 15	13 15	13 14¾	12¾ 14¾	12¼ 14¼	12¼ 14¼	11⅝ 14
Egyptian	17¼ 19	17¼ 19	17 19	16 18	16 17¼	16¼ 17¼	16¼ 17¼	16¼ 17¼	16 17¼	15 17¼	15 17¼	15 17	15 17
Surat	7 8¾	7 8¾	7 8¾	7 8¼	7 8¼	7 8¼	6⅞ 8¼	6⅞ 8¼	6⅞ 8¼	6¾ 8¼	6¾ 8⅜	6½ 8¼	6¼ 8¼
Demerara	11¼ 16	11¼ 16	11¼ 16	11¼ 16	11¼ 16	11¼ 16	11¼ 16	11¼ 16	11 16	11 16	10¼ 15¼	10¼ 15½	10¼ 15¼
Amount of Sales	13101	11520	16170	11909	10859	24370	16080	7210	9770	18996	11520	12336	19640
Proportion on Spec.	500	550	450	200	500	4000	750	..	1000	1500	200	500	1500

	OCTOBER.					NOVEMBER.				DECEMBER.				
	2d.	9th.	16th.	23d.	30th.	6th.	13th.	20th.	27th.	4th.	11th.	18th.	24th.	31st.
	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.	d. d.
Upland	7 a12	7¼a12	7⅜a12	7⅜a11⅞	7¼a11½	7¼a11¼	7¼a11¼	7¼a11¼	7¼a11½	6⅞a10¾	6⅞a10½	6¾a10¼	6¾a10½	7 a10¼
New Orleans	7¼ 14	7¼ 13½	7¼ 13½	7¼ 13½	7 13	7 13	7¼ 13½	7¼ 13½	7¼ 13½	6⅝ 13½	6⅝ 13	6⅝ 12	6⅞ 12	6⅞ 12
Sea-island	9 33	9 32	9 32	9 32	9 32	7 30	7 30	7 30	7 30	7 30	7 30	7 30	7 30	7 30
Pernambuco	11⅛ 14¼	11¼ 14¼	11¼ 14¼	11¼ 14	11¼ 14	10¾ 13½	10¾ 13¾	10¾ 13¼	10¾ 13¼	10¼ 13¾	10¼ 13¾	10 13	10 13	10 13
Maranham	11¼ 13½	11¼ 13¾	11 13	10¾ 13	10¼ 13	10¾ 13	10 13	10 13	10 12¾	10 12½	10 12½	10 12¼	10 12	10 12
Egyptian	14 16½	14 16	13 15½	12½ 14¼	12 14¼	11 15	11¼ 15	11¼ 15	11¼ 14¼	11¼ 14	10⅞ 13	10⅞ 13	10⅞ 14	11¼ 14
Surat	6¼ 8¼	6¼ 8¼	6¼ 8¼	6¼ 8¼	6¼ 8¼	6¼ 8⅜	6¼ 8⅜	6¼ 8⅜	6¼ 8	6¼ 8	6 8	6 8	6 8	6 8
Demerara	10 15	10 15	10 14¼	10 14	10 14	10 14	10 14	10 14	10 14	10 14	10 14	10 14	10 14	10 14
Amount of Sales	16809	22885	26088	19370	16050	27260	24260	25400	10430	17070	22467	21220	24040	28061
Proportion on Spec.	..	2500	6600	700	1000	4600	4100	1550	500	2100	1250	800	3500	5600

3.—*Import of Cotton Wool into Great Britain, in the Year* 1835.

	LIVERPOOL.												Total in 1835.	Total in 1834.	LONDON.		GLASGOW.		Total Import into Great Britain in	
	Jan.	Feb.	Mar.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.			Total 1835.	Total 1834.	Total 1835.	Total 1834.	1835.	1834.
Growth of U.S. from New Orleans ...	34853	34222	17786	31681	34702	18277	16373	41038	11572	5433	1576	12002	259515	275718	6230	5185	49949	55241	763199	733528
Growth of Savannah.	17059	11700	14318	17390	15658	11374	13526	7763	3029	.	1000	5824	118641	123391						
„ Charleston	645	12124	6729	8277	8875	11235	11910	3889	9043	1707	5956	12451	98653	108805						
„ OtherPorts	17344	20261	18202	23242	30913	20011	28878	26262	14120	13442	10752	6784	230211	165188						
Total American..	75713	78307	57035	80590	90148	60897	70687	78952	37764	20582	19284	37061	707020	673102	6230	5185	49949	55241	763199	733528
Brazil and Portugal..	16462	8350	7959	10921	9601	9524	13179	14640	11958	13207	11165	15336	142302	100451	1270	3195	.	.	143572	103646
Mediterranean.....	459	733	.	2070	1745	741	2943	1198	10519	8485	4865	3525	37281	6235	1420	982	5020	60	43721	7277
East Indies.....	7094	3710	.	5244	4798	3234	885	4821	12278	2853	4856	13783	63556	47005	37816	29751	16593	12342	117965	89098
Demerara, West Indies, &c.....	2759	836	197	1249	748	1279	1307	4168	5707	1220	758	330	20558	14681	620	1279	1618	1525	22796	17485
Total packages ..	102487	91936	65191	100074	107038	75675	89001	103779	78226	46347	40928	70035	970717	841474	47356	40392	73180	69168	1091253	951034
Increase of Import in 1835 140219																				

4.—*Import of Cotton Wool into Liverpool, from the Year* 1791, *in Packages.*

In 1791..68,404	1796..63,526	1801.. 98,752	1806..173,074	1811..174,132	1816..276,715	1821..413,182	1826..489,204	1831..791,582
1792..72,364	1797..58,258	1802..135,192	1807..196,407	1812..171,551	1817..314,181	1822..453,732	1827..756,296	1832..779,071
1793..24,971	1798..66,934	1803..140,291	1808.. 66,215	1813..141,188	1818..425,344	1823..578,303	1828..630,245	1833..840,953
1794..38,022	1799..89,784	1804..153,126	1809..267,283	1814..182,626	1819..365,365	1824..447,083	1829..640,998	1834..841.474
1795..54,841	1800..92,580	1805..177,508	1810..320,594	1815..270,635	1820..458,736	1825..706,316	1830..793,605	1835..970,717

5.—*An Account of the Quantity of Pounds net (in millions and tenths) of Cotton Wool imported into Great Britain from the Year* 1801, *and at different Intervals prior to that Time.*

1701 a	1705	av. of 5 yrs.	1·2	1786 a	1790	av. of 5 yrs.	25·4	1805..	59·7	1810..	136·5	1815..	99·3	1820..	143·9	1825..	222·4	1830..	261·2
1716	1720	,,	2·2	1791	1795	,,	26·7	1806..	58·2	1811..	91·6	1816..	93·9	1821..	129·	1826..	171·5	1831..	280·5
1771	1775	,,	4·8	1796	1800	,,	37·3	1807..	74·9	1812..	63·	1817..	124·9	1822..	142·2	1827..	271·1	1832..	287·8
1776	1780	,,	6·7	1801..	56·	1803..	53·8	1808..	43·6	1813..	51·	1818..	177·3	1823..	188·1	1828..	219·8	1833..	304·2
1781	1785	,,	10·9	1802..	60·3	1804..	61·9	1809..	92·8	1814..	60·1	1819..	149·7	1824..	143·7	1829..	221·8	1834..	320·6
																		1835..	361·7

6.—*Import into Great Britain from the Year* 1806, *distinguishing the Growth.*

	1806.	1807.	1808.	1809.	1810.	1811.	1812.	1813.	1814.	1815.	1816.	1817.	1818.	1819.	1820.
American...	124,939	171,267	37,672	160.180	246,759	128,192	95,331	37,720	48,853	203,051	166,077	199,669	207,580	205,161	302,395
Brazil.....	51,034	18,981	50,442	140,927	142,846	118,514	98,704	137,168	150,930	91,055	123,450	114,518	162,499	125,415	180,086
East India..	7,787	11,409	12,512	35,764	79,382	14,646	2,607	1,429	13,048	22,357	30,670	120,202	247,659	184,259	57,923
Other sorts..	77,978	81,010	67,512	103,511	92,186	64,879	64,563	73,219	74,800	52,840	49,235	44,872	50,991	31,300	31,247
Packages..	261,738	282,667	168,138	440,382	561,173	326,231	261,205	249,536	287,631	369,303	369,432	479,261	668,729	546,135	571,651

	1821.	1822.	1823.	1824.	1825.	1826.	1827.	1828.	1829.	1830.	1831.	1832.	1833.	1834.	1835.
American...	300,070	329,906	452,538	282,371	423,446	395,852	646,776	444,390	463,076	618,527	608,887	628,766	654,786	733,528	763,199
Brazil.....	—	143,505	144,611	143,310	193,942	55,590	120,111	167,362	159,536	191,468	168,288	114,585	163,193	103,646	143,572
Egyptian ...	121,085	—	5,623	38,022	111,023	47,621	22,450	32,889	24,739	14,752	38,124	41,183	3,893	7,277	43,721
East India .	30,095	19,263	38,393	50,852	60,484	64,699	73,738	84,855	80,489	35,019	76,764	109,298	94,698	89,098	117,965
W. India, &c.	40,428	40,770	27,632	25,537	31,988	18,188	30,988	20,056	18,867	11,721	11,304	8,490	13,646	17,485	22,796
Packages ..	491,678	533,444	668,797	540,092	820,883	581,950	894,063	749,552	746,707	871,487	903,367	902,322	930,216	951,034	1,091,253

7.—*Comparisons of the Stocks at the Close of the Years* 1834 *and* 1835.

	Liverpool.		London.		Glasgow.		Total in Ports.		Dealers and Spinners.		Total unconsumed.	
	1835.	1834.	1835.	1834.	1835.	1834.	1835.	1834.	1835.	1834.	1835.	1834.
Upland	37,890	46,970			7,420	6,553						
Orleans	17,160	35,460										
Alabama	37,990	22,830	1,390	630	3,306	4,581	109,300	118,000	35,000	41,500	144,300	159,500
Sea island	1,800	290			243	106						
Stained ditto	1,500	340			564	163						
Pernambuco	10,070	3,470			80	388						
Maranham	10,160	3,110										
Bahia	12,640	3,010	560	1,369	201	292	33,800	11,800	8,000	10,000	41,800	21,800
Other Brazils	100	130			..	..						
Egyptian	18,280	1,120	180	76	1,945	..	20,500	1,700	1,500	500	22,000	2,200
Smyrna	80	160	..	280								
Surat and Madras	27,360	23,460	18,650	20,824	6,391	1,518						
Bengal, &c.	4,910	50	3,230	2,998	..	..	60,500	48,800	4,000	6,000	64,500	54,800
Bourbon	..	..	..	..	..	..						
Dem., Surinam, &c.	230	240	460	123	570	171	5,900	5,300	1,500	2,000	7,400	7,300
West India, &c.	4,530	4,620			123	181						
Total	184,700	145,310	24,470	26,300	20,843	13,953	230,000	185,600	50,000	60,000	280,000	245,600

Total unconsumed, 1st January, 1835, 82,320,000lbs. weight, average about 335lbs. per bag.
Ditto ditto, 1st January, 1836, 89,633,000lbs. weight, average about 320lbs. per bag.

8.—*General Statement of the Import, Export, and Consumption of Great Britain, in the Year* 1835.

(EXTRACTED FROM TABLES 3, 7, 10, 11.)

Stock in the Ports, 1st Jan., 1835		185,600
Ditto in Dealers' and Spinners' hands:		
England	52,000	
Scotland	8,000	
		60,000
Import in 1835		1,091,300
		1,336,900

Export to the Continent and Ireland:		
American	46,700	
Brazil and West India	2,800	
East India	52,600	
Egyptian	700	
		102,800
Taken for Consumption of England and Scotland from the Ports	944,100	
Decrease of Stock in hands of Dealers and Spinners	10,000	
Consumed in England, 861,500, or 16,567 bags per week; in Scotland, 92,600, or 1,781 bags per week		954,100
Remaining on hand in the Ports, 1st January, 1836		230,000
In Dealers' and Spinners' hands:		
England	45,000	
Scotland	5,000	
		50,000
		1,336,900

9.—*Summary Statement of the Consumption, Export, Import, &c., of Great Britain, for the last 20 Years.*

	1816.	1817.	1818.	1819.	1820.	1821.	1822.	1823.	1824.	1825.
Average Weekly Consumption—Upland....	..	..	2,179	2,380	2,918	3,292	3,839	3,890	4,212	3,713
Orleans and Alabama	990	669	875	1,284	1,192	1,389	1,552	2,169	2,298	2,442
Sea-island	..	..	289	329	409	604	652	629	754	360
Total American	4,036	3,509	3,343	3,993	4,519	5,285	6,043	6,688	7,264	6,515
Brazil.....	1,589	2,075	2,459	2,456	2,408	2,509	2,646	2,577	2,890	2,502
Egyptian, &c.	..	..	..	..	..	..	..	..	362	891
East India	207	1,192	1,581	1,190	1,518	1,019	953	852	644	1,096
Demerara, West India, &c...	656	1,050	746	713	534	785	835	654	473	527
Total	6,488	7,826	8,129	8,352	8,979	9,598	10,477	10,771	11,633	11,531
Consumption of England.....	5,744	6,911	7,227	7,387	8,035	8,573	9,411	9,686	10,581	10,435
Consumption of Scotland.....	744	915	902	965	944	1,025	1,066	1,085	1,052	1,096
Taken for Consumption from Liverpool	5,514	5,914	6,609	7,064	7,987	7,855	8,789	8,900	10,917	9,313
Sold to Speculators in Liverpool	28,700	33,700	26,600	46,800	36,000	32,000	23,000	160,000	81,000	458,000
Export.....	29,300	26,700	55,500	66,800	28,400	52,600	59,300	35,400	53,600	72,800
Consumption.....	337,400	407,000	422,700	434,300	466,900	499,100	544,800	560,100	604,900	599,600
Average Weight of Packages consumed ...	263	263	260	252	258	258	267	275	273	278
Weekly Consumption in Pkgs. av. 333lbs...	5,122	6,181	6,346	6,323	6,945	7,451	8,402	8,900	9,537	9,634
Average Weight of Import.....	256	266	263	264	249	262	267	281	266	270
Lbs. weight imported, in Millions and Tenths	93·9	124·9	177·3	149·7	143 9	129·0	142·2	182·1	143·7	222·4
consumed ditto	88·7	107	109·9	109·5	120·3	129·0	145·5	154·1	165·2	166·8
in Ports, 31st Dec. ditto.....	19·2	28·9	78·2	99·5	110·5	101·7	79·4	109·6	64·0	107·0
in Great Britain, ditto, ditto	..	.	93·3	111·8	127·0	113·9	93·7	117·3	80·3	115·5
Packages in ditto, ditto	115,800	161,300	351,800	396,800	473,100	413,100	342,500	415,800	297,400	445,900
Increase } of ditto, in ditto, compared {	..	45,500	190,500	45,000	76,300	..	..	73,300	..	148,500
Decrease } with the preceding year {	..	..	..	..	..	60,000	70,600	..	118,400	..
Packages in Great Britain, 31st Dec., equal to week's consumption at the then average rate..... — American	8	11	19	13	24	23	20	32	13	23
Brazil	27	24	29	18	37	28	27	30	22	45
Egyptian.....	..	..	..	..	..	..	..	..	60	96
East India	10	52	121	241	169	197	142	131	167	77
West India	26	10	31	23	36	22	16	15	20	24
Ditto of all kinds	18	21	43	47	53	43	33	30	26	38
Lbs. wt. of Yarn exported, in Mills. & Tenths	..	..	16·1	16·7	23·9	23·2	28·0	27·4	33.6	32·6
Average Quotation of Uplands in Liverpool.	18¼*d*	20½*d*	20*d*	13½*d*	11½*d*	9½*d*	8½*d*	8½*d*	8½*d*	11½*d*
Pernams ditto	26*d*	25*d*	25*d*	18½*d*	15½*d*	12⅝*d*	11½*d*	12*d*	11½*d*	15½*d*
Surats ditto	15½*d*	17*d*	15½*d*	9½*d*	8½	7⅞*d*	6½*d*	6½*d*	6½*d*	8½*d*

Summary Statement, &c.—continued.

	1826.	1827.	1828.	1829.	1830.	1831.	1832.	1833.	1834.	1835.
Average Weekly Consumption—Upland....	3,783	4,241	4,990	5,304	5,452	5,241	6,219	5,421	5,742	5,896
Orleans and Alabama	2,713	3,940	4,210	3,788	4,756	5,800	5,321	6,442	7,352	7,823
Sea-island	369	673	635	539	460	517	519	665	498	354
Total American	6,865	8,854	9,835	9,631	10,668	11,558	12,059	12,528	13,592	14,073
Brazil.....	1,188	1,815	2,456	3,094	3,602	3,294	2,843	2,683	2,665	2,339
Egyptian, &c.....	975	1,142	671	485	508	619	881	279	131	446
East India	489	664	738	658	940	765	1,161	1,210	1,033	1,069
Demerara, West India, &c...	308	502	380	463	284	260	196	223	246	421
Total.....	9,825	12,977	14,080	14,331	16,002	16,496	17,140	16,923	17,667	18,348
Consumption of England.....	8,792	11,677	12,655	12,729	14,392	14,881	15,427	15,248	15,831	16,567
Consumption of Scotland.....	1,033	1,300	1,425	1,602	1,610	1,615	1,713	1,675	1,836	1,781
Taken for Consumption from Liverpool.....	10,180	12,164	12,714	13,089	14,127	15,346	14,906	15,710	15,848	16,806
Sold to Speculators in Liverpool.....	71,000	67,000	96,000	41,500	65,000	35,500	90,600	268,000	222,300	145,100
Export.....	95,000	69,100	63,700	118,100	33,400	74,600	67,100	67,800	86,800	102,800
Consumption.....	510,900	674,800	732,200	745,200	832,100	857,800	891,300	880,000	918,700	954,100
Average Weight of Packages consumed	294	297	297	294	298	306	311	326	330	333
Weekly Consumption in Pkgs. av. 333 lbs...	8,675	11,391	12,581	12,655	14,320	15,157	16,007	16,567	17,508	18,348
Average Weight of Import	295	303	293	297	300	310	319	327	337	331
Lbs. weight imported, in Millions and Tenths	171·5	271·1	219·8	221·8	261·2	280·5	287·8	304·2	320·6	361·7
consumed ditto	150·2	197·2	217·9	219·2	247·6	262.7	276·9	287·	303·4	318·1
in Ports, 31st Dec. ditto	89·0	129·2	112·7	80·8	91·4	81·3	76·5	66.9	63·2	73·3
in Great Britain, ditto, ditto.....	110·9	164·8	147·0	115·5	118·8	114·4	103·7	94·4	82·3	89·6
Packages ditto ditto	422,000	572,000	525,900	409,300	415,300	386,300	330,200	300,100	245,600	280,000
Increase } of ditto, in ditto, compared {	..	150,200	..	..	6,000	..	..	..	..	34,400
Decrease } with the preceding year	23,900	..	46.300	116,600	..	29,000	56,100	30,100	54,500	..
Packages in Great Britain, 31st Dec. equal to week's consumption at the then average rate..... American.....	24	38	25	19	22	19	17	14	12	10
Brazil	69	53	53	35	29	26	17	24	8	18
Egyptian	84	39	64	60	31	33	16	8	17	49
East India	169	120	120	115	47	61	51	46	53	60
West India.....	42	35	44	25	29	24	20	17	30	18
Ditto of all kinds	43	44	37	29	26	23	19	18	14	15
Lbs. wt. of Yarn exported, in Mills. & Tenths	42·2	44·9	50·5	57·3	62·7	58·8	71·7	67·8	78·7	..
Average Quotation of Uplands in Liverpool.	6¼*d*	6¼*d*	6⅜*d*	5⅜*d*	6⅜*d*	6*d*	6⅜*d*	8⅛*d*	8⅜*d*	10⅛*d*
Pernams ditto ...	10⅛*d*	9⅜*d*	8⅜*d*	7⅛*d*	8⅛*d*	7⅞*d*	9*d*	10⅜*d*	11⅛*d*	14⅛*d*
Surats ditto ...	5⅛*d*	5⅛*d*	4⅜*d*	4*d*	5*d*	4⅜*d*	5*d*	6⅛*d*	6⅜*d*	7⅛*d*

10.—LIVERPOOL.

Stock, 1st January, 1835		145,300
Import in 1835		970,000
Ditto from Gloucester		3,200
		1,118,500
Total quantity sold in 1835, as per weekly returns	1,036,200	
Deduct proportion sold to speculators for re-sale	145,100	
	891,100	
Forwarded to Country Importers, and Dealers importing coastwise, &c.	43,400	
		934,500
Stock remaining 1st Jan. 1836		184,000
Taken for Consumption and Export in 1835	934,500, or 17,971 per wk.	
(In 1834, 982,000, or 16,961 bags per wk.)		
Deduct Export to Continent 51,900	60,600	
Ditto, Ireland 8,700		
Taken for Consumption	873,900, or 16,806 per wk.	
Ditto, Glasgow Market	25,800	
Do. for Consump. in England,	848,100, or 16,309 per wk.	
In 1834	789,000, or 15,173	

11.—LONDON.

Stock, 1st January, 1835		26,300
Import in 1835		47,400
		73,700
Stock, 1st January, 1836	24,500	
Exported to the Continent	40,600	67,300
Ditto Glasgow	2,200	
Taken for Consumption in England		6,400
or 123 bags per week.		
(In 1834, 9,200, or 177 bags per week.)		

12.—GLASGOW.

Stock, 1st January, 1835		14,000
Import in 1835		73,200
Ditto from London		2,200
Ditto from Liverpool		25,800
		115,200
Stock, 1st January, 1836	20,800	
Export to Liverpool	3,200	25,600
Ditto Ireland	1,600	
Taken for Consumption in Scotland		89,600
or 1,723 bags per week.		
(In 1834, 95,000, or 1,836 bags per week.)		

13.—*Growth of America.*

Crop of	bags.	Crop of	bags.
1820–1	430,000	1828–9	870,415
1821–2	455,000	1829–30	976,845
1822–3	495,000	1830–1	1,038,847
1823–4	560,000	1831–2	987,477
1824–5	569,259	1832–3	1,070,438
1825–6	720,027	1833–4	1,205,394
1826–7	957,281	1834–5	1,254,328
1827–8	720,593		

(In 1785, the Import into Liverpool from America was only 5 bags; in 1786, 6 bags; in 1787, 108 bags.)

Remarks.

The Tables of *Import* into the kingdom, compared with the preceding year, show an increase of 29,671 American, 39,926 Brazil, 36,444 Egyptian, &c., 28,867 East India, and 5,311 West India,—total, 140,219 bags.

The average weekly *consumption* of Great Britain we estimate at 18,348 bags, consisting of 5,896 Upland, 7,823 Orleans and Alabama, 354 Sea-island, total 14,073 American, 2,339 Brazil, 446 Egyptian, &c., 1,069 East India, and 421 West India, &c., being an increase upon the consumption of last year of 781 bags per week; but in packages of the average weight of the consumption of that year 870 bags per week, or for the whole year an increase of 14½ millions of lbs. weight.

The average weekly quantity taken by the *trade* from the *ports* is 5,781 Upland, 7,823 Orleans and Alabama, 344 Sea-islands,—total 13,948 American, 2,300 Brazil, 465 Egyptian, &c., 1,031 East India, and 411 West India, &c.,—total 18,155 bags.

The average *weight* of the import we calculate at 321 lbs. per bag for Upland, 402 Orleans and Alabama, 322 Sea-island, 173 Brazil, 218 Egyptian, &c., 360 East India, and 230 West India, &c., making the total import in lbs. weight 361,685,000, being an increase upon last year of 41,105,000 lbs.

We commenced the present year with the price of fair Uplands at 9½*d.* Under the influence of a good trade, and with the most confident statements of its continuation daily repeated by those most interested therein, our market gradually rose in price until June, when fair Uplands readily commanded 11*d.*

Here the market rested for some time.

During the first quarter of the year long-stapled cotton of all de-

scriptions became very low in stock; so much so, that, at about the beginning of May, some fear of an absolute scarcity was gravely spoken of. The consequence was comparatively high prices, (Pernams were then quoted at 16*d.* to 18*d.*, and Maranhams 14*d.* to 16½*d.*,) and that again naturally tended to throw them out of consumption, by diverting the demand in a still greater degree upon the better qualities of Mobiles and Orleans, as substitutes.

At these raised prices the market continued for about three months, consumers abstaining from buying to the utmost of their power, and the importers and holders daily hoping for a renewal of the demand. In the mean time orders were sent abroad under the promise of high prices, and our market soon became heavily stocked with high-charged cotton, leaving an immense loss on all imports, whether from the United States, Brazil, India, or Egypt.

The market, however, sustained itself pretty firmly until the close of August, when the accumulated weight gradually broke down prices, until they finally settled at the present rates, being ¾*d.* lower for fair Uplands than at the close of last year, and 1½*d.* for inferior. The good quality of the new crop is at about the same rate—rather lower.

It may be noticed that the state of the market before adverted to, with regard to long-stapled cotton, brought about its own remedy,—reduced consumption, and increased import, until Brazils, Egyptians, &c., have settled at comparatively very moderate rates.

We have thus endeavoured briefly to sketch the changes in the market of this great staple, referring with much satisfaction to the subjoined tables for a proof of the continued progress and steady increase of the manufacture of this article.

We made a short remark on this subject in our printed circular of 24th July, stating the probable increased consumption at 1,000 bags per week. With every desire to estimate the increase at as low a rate as we can, conformably with the stocks, imports, &c., we now find we cannot rate the increased consumption at less than 870 bags per week, of the average weight of last year.

With respect to the raw material, the great objects to be desired are, that the prices on the one hand should be sustained at such a rate as to continue an abundant supply, and, on the other, that they should not rise to such a pitch as to repress consumption.

Speculators have not taken any great interest in our market during this year.

GEORGE HOLT & CO., *Brokers.*

Liverpool, 31*st December*, 1835.

BOOK III.

ORIGIN, PROGRESS, AND PRESENT STATE OF THE MANUFACTURE OF COTTON BY MECHANICAL POWER.

CHAPTER I.

Early History of the Factory System.

THE general survey of the cotton manufacture portrayed in Book I. exhibits no systematic character, but betrays the tottering and wayward steps of infant industry. The labours of artisans were insulated or partial efforts prompted by immediate necessity, and liable at every instant to be arrested or turned into a new direction by belligerent rulers, regardless of the wishes and interests of the community. But Providence, meanwhile, had been preparing a great revolution in the social frame, which has become mature only in these latter days; teaching mankind by a series of severe lessons, that poverty and wretchedness were the inevitable results of military pride and glory; and that national dignity and happiness were to be found only in the friendly concurrence of many different kingdoms towards the creation, interchange, and distribution of the various objects, material and intellectual, which conduce to the well-being of our race.

In reference to this devout consummation, the annals of humanity are divisible into four eras, each of them characterized by peculiar attributes. The *first* epoch was marked by the development of the beautiful in

form, sentiment, and expression. From the liberal encouragement given to men of genius in Greece, while Pericles administered the Athenian state, this brilliant period of history is deservedly designated by his name. Models of architecture, statuary, poetry, and popular eloquence of such perfection then appeared, as have never been rivalled since, and will probably remain inimitable studies to every coming age. The intolerance of party spirit in Greece, miscalled patriotism, while it bent the faculties of its citizens to their utmost strain, and drew forth those masterpieces of invention, encouraged at the same time, pride, envy, hatred, and licentiousness to a pitch incompatible with peace or stability, and ere long involved their country in a ruin which centuries have shown to be irretrievable.

There was in truth an efflorescence of glory upon the summits of society in Athens, while a canker worm was gnawing the roots. Idleness and insolence were the badges of its citizenship. Attica was peopled with 400,000 slaves, but recognised only 20,000 freemen entitled to bear arms. The slaves cultivated the land, exercised the mechanical arts, worked in the mines, dug in the quarries, and performed every kind of menial drudgery. Petty rival communities so constituted could neither accumulate capital, nor secure for a series of years, the means of independent livelihood. Their most considerable citizens were for the most part worse clothed, worse fed, and less comfortably lodged than the tradesmen of England at the present day.

The *second* great epoch of civilization commenced when the Roman arms, by framing the discordant nations round the Mediterranean shores into one

submissive empire, prepared a highway for the missionaries of Galilee to propagate with miraculous powers the philanthropic system of their divine Master, and to substitute for the reckless virtue deified by the Stoics the evangelical doctrine, that all must seek their own well-being by promoting the well-being of others, because mankind are one brotherhood of immortal spirits, precious in the sight of their heavenly Parent, and candidates of a common salvation. The perfect equality in social rights of men of every rank and of every nation was now publicly declared upon infallible authority; and though this principle has had to contend at every period, and in every state, with the prerogatives of pride and the follies of prejudice under a thousand different forms, yet ever since its evangelic promulgation, it has been steadily gaining ground, and widening its benign influence throughout the world. In the course of a few generations it destroyed the distinction between the master and the slave, which had disfigured every ancient commonwealth, and thereby proved that productive industry was the duty of all men without exception.

The leading features of the *third* epoch are the wide diffusion of knowledge among all classes of society, by the invention of the printing press, and the free intercourse of nations from the general use of the mariner's compass in navigation. The stores of learning, hitherto accessible to a favoured few, were now laid open to the many, rich as well as poor, with unsparing distribution. Distant communities, strangers to those petty jealousies which usually lead neighbouring people to hate and harass each other, were brought into friendly relations by the directive polarity of the mystic needle.

The commodities of one country were prized in another in proportion to their rarity as well as usefulness; whence home manufactures and foreign traffic were mutually promoted. Now Venice, Genoa, Florence, and Pisa, emerging first from the miseries of Vandalism, became emporia of great wealth and consideration; by the accumulation of capitals unparalleled in ancient times, they could command the industry of remote nations, and the homage of absolute kings. From this period, commercial expeditions began to be fitted up at great expense for the most distant parts of the globe, and their profitable returns were waited for with confidence from one season to another.

The influence of freedom in favouring the development of productive industry was likewise wonderfully exemplified in the rapid aggrandisement of Lubeck and the other towns of the Hanseatic League, at a period when the great monarchies of Europe, patrons of the restrictive and monopolist system of trade, could not find funds to equip a small armament for a brief campaign, except by placing the crown jewels in pledge with money lenders.

The *fourth* era, or that of consummation, began when the operative classes, having become the disciples of science, and studious of the laws by which creative wisdom regulates the material system, resolved to enlist the latent powers of nature in their service. Many of these marvellous powers had been for years familiar to the philosophers of the school of Newton; but they were not diligently pondered by practical men for the purpose of applying them to the business of life till the middle of the last century. No experiment ever contributed so much to popularize natural

knowledge, or ever shed so bright a halo round its author's head, as that of the electrical kite, when Benjamin Franklin, by no random hit, but in consequence of a most sagacious and elaborate train of researches, dared to interrogate the thunder-cloud as to its awe-inspiring essence, to draw down its terrific bolt in a stream of lambent fire, and to make it the subject of sportive shocks and illuminations. The oriental fabulists in their wildest luxuriance of fiction never matched the real exploit of the sage of Philadelphia —stealing lightning from the heavens, and imprisoning it—in a phial. As the feeblest flame may kindle the mightiest conflagration, so these few sparks of celestial fire were ordained to be the means of lighting up the hallowed flame of freedom in the most corrupt monarchy of Europe, and of inducing multitudes of votaries to do homage in the temple of science, who would otherwise have never entered her gates. The noble discovery of the identity of lightning and common electricity, surmised by many minds before, but first intrepidly proved by Franklin, gave him, when ambassador for his mother country, an influence in the despotic court of France most propitious to the establishment of the American Republic.

Franklin was not, however, the sole agent then employed by Providence to inspire the man of business with the love of philosophical research. He indeed led the van of the illustrious train who were devoting themselves with generous assiduity to explore the dark recesses of nature, in order to extort her secrets, to obtain the mastery of her powers, and to make them minister to the weakness and the wants of their fellow creatures.

Three individuals were then maturing in the city of Glasgow faculties destined not only to open up inexhaustible resources to their own country, but to add indefinitely to the wealth and comfort of the whole family of man. These were Joseph Black, James Watt, and Adam Smith. The first of these philosophers had, within a few years after Franklin's grand experiment, made his important discovery of the existence of a fixed air in marbles and other calcareous stones, which came forth in an elastic state when they were calcined into quicklime. This was one of the early blossoms of that pneumatic chemistry, which has yielded since so rich a harvest of truths in every district of the animal, vegetable, and mineral kingdoms. Continuing to pursue the links of that hidden chain which binds together the apparently incoherent events of the physical world, Black next proceeded to search out the laws of latent heat.

When we now look back into these inquiries, so simple in statement, so conclusive in proof, and so vast in consequence, we cannot help feeling astonished at the carelessness with which the congelation of water and the melting of ice, as well as the generation and condensation of steam, had been regarded by all preceding observers, whether learned or unlearned. It was reserved for the sagacious hand of Black to seize the mystic links of the phenomena, to place them for ever within the reach of man, and to enable him to dispose of them at pleasure, in modifying matter for the uses of art, or in exploring still further her multiform transmutations. His first achievement was to make us familiar with one invisible spirit—a specific kind of aerial substance; his second was to disclose the constitu-

tion of aerial being in general, and its relations with the solid and liquid forms of existence.

James Watt had a kindred mind, and was pursuing independently a kindred train of research on the mysterious powers of heat, though with less general, or rather with more directly practical, views. He had turned his attention minutely to the steam engine, which for nearly sixty years before his time had essentially remained the same rude and unwieldy prodigy which Newcomen had conjured up, though it had been often modified in outward appearance. Towards the general enlargement of his mind, Watt had undoubtedly derived profit from the public lectures of Black, which he occasionally attended, though he was by no means a regular student; but he was not indebted to the professor of chemistry for his ideas on the latent heat of steam, as has been sometimes said. This statement I make on the authority of a conversation I had with Mr. Watt himself, a few years before his death. Benjamin Franklin made use of a phial to receive the fire of lightning, and to verify its analogies with the common electricity of the charged Leyden jar. James Watt also made use of a phial to demonstrate both the latent heat and the expansible tension of the vapour of water.* If we call to mind the sorry plight in which this great mechanician found the steam-engine, and the condition to which in a few years he brought it, both as to principle and execution, ready to drain the deepest mine, to animate the greatest factory, to fly along the railway, or to march with giant strides over the crested billows, we must regard

* Communicated to me in the conversation alluded to above.

the author of this application of science as no secondary star in the constellation then ascendant.

In reviewing the golden dawn of modern civilization, we must not however fail to mention with due reverence the name of Adam Smith, that master-spirit who first expounded with systematic perspicuity the science of social comfort,—the art of turning the industry of nations to the best account, or, in other words, the principles of the production, the distribution, and the consumption of wealth.

To the same brightening era the mode of finding the longitude of a ship at sea may be justly referred. The mariner's compass, which on its first introduction was hailed by the navigator as an unerring guide in the trackless deep, had, in the course of the distant voyages to which it led, betrayed many strange aberrations. "True as the needle to the pole" still continues with the multitude a favourite illustration of constancy, though the needle has been proved by old experience to be as fickle and faithless in its attachment to that point in the heavens as the living objects it has been compared to are to theirs. Upon a few favoured spots indeed of the terraqueous surface the needle does traverse due north and south, but everywhere else it deviates from that direction by angular quantities which differ not only in different parts, but in the same part in different years.

Science had not been an inattentive spectator of the embarrassments caused to the navigator by these variations of the compass. Astronomy had long ago taught him to determine the latitude of the ship, or its distance counted in a line due north or south from the equator, whereby he could deduce from time to time

the declination of his needle; but she reserved her chief gift to crown the period under review.

The great problem of the longitude was now practically solved, first by means of chronometric mechanism, and afterwards by lunar observation. Each method has been eventually brought to a pitch of perfection highly honourable to our age and nation, and both together give a security and promptitude to naval enterprise, which even the confident spirit of Columbus would have deemed unattainable.

The same age in which the union of science and art was thus happily consummated fortunately found society, in Great Britain at least, prepared, by the accumulation of capitals during a long period of peace and security, to cherish their prolific offspring, and to rear them up to a productive maturity.

I shall now draw the attention of my readers to a few events contemporary with the above, which mark the rising spirits of the time—the harbingers of the great factory system of Lancashire—the main subject of the present work.

In the year 1753 Parliament originated the British Museum by the purchase, 1st, of Sir Hans Sloane's cabinet of natural history, &c., for £20,000; 2dly, of the Cottonian library for £10,000; and, 3dly, of Montague house, for the reception of these and such other collections as might be added. The money required for these excellent purposes was raised, however, by the mean and immoral expedient of a lottery of £300,000 in one hundred thousand tickets of £3 each. £200,000 were given in prizes, and £100,000, after deducting the expenses of the lottery, were reserved for the Museum. Such was the beginning

of the only scientific establishment erected by the government of Great Britain. Fortunately the better spirit which animates the Administration and Parliament of modern times, promises ere long to make the mean origin of the Museum be forgotten in the magnificence of its completion.

The British Linen Company, incorporated at Edinburgh by Act of Parliament in the year 1746, was greatly instrumental in the extension of that and the other manufactures of Scotland. They advanced ready money to diligent trades-people for their goods, and thus enabled them to carry on their useful toils. In the course of twenty years that manufacture increased from the annual value of £166,000 to £334,000, a prodigious amount of business for that poor country at that time.

The linen trade of Ireland assumed an equally flourishing state. At the accession of William III., Ireland did not export to the value of £6,000, whereas in 1741 it exported annually £600,000 worth of linen goods. "No women," says Sir William Temple, "are apter to spin linen thread well than the Irish, who, labouring little in any kind with their hands, have their fingers more supple and soft than other women of the poor condition among us." We shall find in this circumstance one of the causes of the development of the cotton trade of Lancashire. The flax machinery of Leeds has now nearly supplanted the apt spinsters of Ireland, but it has in return supplied them with abundance of good and cheap linen yarn to weave in their domestic looms. In 1759, Ireland exported £939,562 sterling worth of linen; and Scotland stamped to the value of £451,390.

The canal of the Duke of Bridgewater is a splendid achievement of this period. This nobleman had the honour of rendering inland navigation an object of universal interest, and of inducing capitalists to cultivate this ample field of private revenue and public improvement. The enterprise was eminently successful, the Duke having wisely entrusted its execution to a man of remarkable genius for canals, James Brindley. The scoffers of that time, who nick-named his lofty aqueduct over the Irwell, *a castle in the air*, had reason ere long to be ashamed of their narrow-minded sarcasms; for a boat passed along it, sailing over the river at an elevation of thirty-eight feet, in July, 1761. This is the most magnificent work of public utility ever executed by an individual, one which has proved an inestimable benefit to the industry of England, more especially to the counties of Lancashire and Cheshire, which it traverses. The cotton trade of England is under peculiar obligations to this truly patriotic capitalist. His liquid highway sends arched ramifications of considerable length even under the town of Manchester; from one of which coals are hoisted by a coal-gin, through a shaft, out of the boats below, into a large store-yard in the main street. At this place the successors of the Duke were by Act of Parliament bound to supply the inhabitants of Manchester with coals at only 4*d.* per cwt. of 140 lbs.; a circumstance which must have had an immense influence in expanding their industry during the last seventy-five years. The canal contains seventy miles of level, many extensive tunnels, several noble aqueducts, and cost little less than half a million of money. Thus Lancashire was providentially sup-

plied, at a most critical period, with a great arterial trunk and numerous branches, to supply its industry with vital warmth and circulation, as also to open up channels of commercial intercourse with the eastern and western seas.

The decriers of the Duke (for eminent virtue is sure to breed envy in sordid minds) had the folly to object to his scheme, that canal navigation would greatly diminish the numbers of the useful and noble breed of draught horses. What, however, has been the result? The breeding of tens of thousands more to meet the demand for them created by the vast improvements in the husbandry, manufactures, and commerce of the canal districts of Lancashire and Cheshire—not to mention the numbers employed in dragging the boats which soon after its completion began to cover its surface. It was also objected that inland navigation would lessen the coasting trade, injure this nursery of seamen, and thus impair the navy. How has experience put the croakers to scorn! In the year 1760, just before the Bridgewater canal was completed, the shipping cleared out of the English ports amounted to 471,241 tons. In 1790, when a great part of England was intersected by canals, after the example of the Bridgewater enterprise, the tonnage had become 1,379,329, being very nearly trebled. Canals are in fact a contrivance to enable one horse to transport as great a lot of merchandise as thirty could do on a good road, or fifty on an indifferent one. And how expensive are roads to maintain in comparison of canals! Brindley's thoughts were so engrossed with the value of canals, that he said the main use of rivers was to supply them with water. Mrs. Barbauld has alluded to this idea

in the following couplet of her beautiful poem on canal navigation:

> The ductile streams obey the guiding hand,
> And social plenty circles round the land.

The water-ways of England now radiate from six central points—Manchester, Liverpool, Birmingham, Hull, London, and Bristol, furnishing such easy commercial transport that each of these emporia of trade participates in the ingenuity and opulence, not only of the other five, but of all the interjacent counties. Their produce, however ponderous or unwieldy, is circulated through these numberless artificial channels with economy, security, and promptitude.

The railways now constructing in so many directions throughout Great Britain, will form an invaluable complement to canal navigation, and render the whole island one compact and continuous mart of industry.

In 1762, Mr. Harrison received from the Board of Longitude a further sum of £1,500, and next year from Parliament £5,000, on condition that he should disclose the principle on which his time-keeper was constructed. The government promised to pay him the remainder of the great reward of £20,000 if on further trials in the course of four years his chronometer should still be found capable of ascertaining the longitude within the required limits of exactness. Never was national munificence more wisely bestowed, for it excited an ardour of improvement in mechanics, in practical astronomy, and in navigation which soon brought the solution of the grand problem of the longitude to a state of simplicity and precision greater than Newton

himself could have anticipated. Harrison received eventually the whole of the £20,000.

If we consider the contemporaneous dawn of chemical art then enlightened by scientific principles, we shall find here also a most auspicious omen of the new age f industry. In 1763, Josiah Wedgwood produced the first fine specimens of his pottery, a production destined very soon to give a fresh impulsion to the national resources, and add fresh laurels to the fame of England. Prior to his time, our stoneware manufacture had moved round in a vulgar routine, estranged alike from philosophy and the fine arts. Wedgwood first procured it this noble alliance, whereby he raised it in a few years to supreme estimation, not only among his countrymen, but among all people who could appreciate taste and excellence. In spite of the heavy duties imposed upon his goods by foreign governments jealous of our rivalry in trade, no less than five-sixths of the English pottery made with these improvements were exported. The distinguished French traveller and *savant* Faujas Saint-Fond, thus speaks of Wedgwood's manufacture. "Its excellent workmanship, its solidity, the advantage which it possesses of standing the action of fire, its fine hard glaze impenetrable by strong acids, the beauty, convenience, and variety of its forms, and its moderate price, have created a commerce so active and so universal that in travelling from Paris to Petersburgh, from Amsterdam to the furthest point of Sweden, and from Dunkirk to the southern extremity of France, one is served at every inn upon English stone-ware. The same fine article adorns the tables of Spain, Portugal, and Italy; it provides cargoes for ships in the East Indies, the West Indies, and America."

He properly ascribes that excellence and economy, which rendered these manufactured objects the desire of all civilized countries, to the chemical and classical genius of Wedgwood. What a contrast does the traveller from Dunkirk to Marseilles now find in the wretched quality of the stoneware placed before him at the inns, in consequence of the French government continuing to act upon the barbarian polity of Bonaparte, which renounces all the comforts derived to their people from commercial interchange with their neighbours, in order to discourage, and, as far as possible, to destroy, the productive industry of every non-tributary nation!

The relative influences of internal peace and internal war on the credit of nations, were strongly contrasted in the comparative soundness of the English capitalists, and unsoundness of the continental, at the termination of the seven years' contest of 1763; nor can there be a doubt, that our stability at this crisis proved most propitious to the rapid growth of the new modes of cotton spinning then coming into play. The failures which happened at this period in Holland, Hamburgh, and Berlin, spread dismay through every commercial town on the continent, and called forth most despondent letters on the subject from the bankers of Amsterdam to those of London. A noble opportunity now occurred to British merchants of manifesting the extent of their capitals, the solidity of their credit, and the generosity of their spirit. They remitted loans without security to their foreign correspondents, whose condition was deemed precarious by the rest of the commercial world, to a very great amount; and by this means happily allayed the panic which had begun to paralyze

many houses well known for integrity in their transactions. Vast remittances were made to the commercial cities where the deepest distress was found to prevail by many of the leading firms of London, and they were liberally seconded by the Bank of England discounting an immense number of bills of exchange. "If the resources of Britain," says Chalmers, "arise chiefly from the labour of Britain, it may be easily shown, that there had never existed in this island so many industrious people as after the return of the peace in 1763."*

The institution of the Society, in the Adelphi, for the Encouragement of Arts and Manufactures, ought, perhaps, to have had an earlier notice in tracing out the foundations of the new system of automatic industry, but this patriotic body, though it was incorporated in 1754, in imitation of similar societies previously organized in Dublin and Edinburgh, exercised but a feeble influence upon public improvement till several years after its origin. In fact, such powerful pecuniary means were not placed at its disposal by the government, as were possessed respectively by the Irish and Scotch societies for promoting their great indigenous occupations of the linen trade and the fisheries.

We may also mention here a circumstance which operated very strongly to throw the balance of industry at this time in favour of Great Britain, against the rival pretensions of France. The French government, by reducing, in the year 1770, the interest on its national debt to one-half of the stipulated rate, and also by depriving the holders of its stock of the

* Chalmers's Estimate of the Commercial Power, &c., p. 136.

benefits of survivorship, brought great distress upon their whole country. This arbitrary act of public plunder not only ruined many thousands of private individuals, but gave such a vital blow to general credit, as to cause an immense number of bankruptcies, disorganizing trade and manufactures with wide-spread misery. One house at Marseilles became insolvent for 20,000,000 livres.*

Many causes concurred to prevent the formation in the several states of Germany of any great factory system. Under the influence of jealousies and enmities each of them imposed fiscal restrictions on the sale of his neighbours' goods in the interior, and also obstructed their transit in search of foreign markets. Mining was the only department of industry which was permitted to assume a manufacturing extent, because it supplied the governments with resources in the sale of metals to the circumjacent people for making implements of husbandry and of the arts; yet even *it* was embarrassed by frivolous regulations. Germany has besides had the misfortune for ages to be the battle-field on which the sovereigns of Europe chose to settle the quarrels of their animosity and ambition; and could not therefore present to capital the security and repose essential to the development of industrious combinations.

Great Britain, on the other hand, has enjoyed admirable opportunities for cultivating productive industry and traffic on the greatest scale; perfect security from external invasion and from internal misrule, during more than a century; free intercourse between its several provinces

* Macpherson, vol. iii. p. 497.

at home facilitated by fine roads and canals; and with its colonies abroad and other distant nations by myriads of merchants' ships sailing every sea under the protection of a triumphant navy. Thus the productions of every clime were abundantly supplied either to gratify taste and encourage consumption, or to furnish raw materials to the mechanical and chemical arts. Nor ought we to place in the back ground of the picture its inexhaustible mines of the useful metals, most advantageously worked by its fire instinct steam-engines, and cheaply smelted by its boundless stores of pit-coal. But, certainly, nothing has so directly contributed to the pre-eminence of Great Britain in manufactures as her race of laborious, skilful, and inventive artisans, cherished as they have been by the institutions of a free country, which opened to the possessors of talents and knowledge, in however humble a station, the amplest career of honour and fortune to stimulate effort and dignify success. The reformation of religion, in spreading knowledge through the middle and lower classes of society, has distinguished the Protestant population even in Catholic countries for their superior skill in the useful arts; a fact illustrated in a remarkable manner at the revocation of the edict of Nantes, when Protestantism, being banished from France, drew away manufactures in its train, and enriched all those neighbouring states which gave the conscientious exiles shelter and protection. The number of holidays in Catholic countries has always proved a great obstacle to factory labour, which more than any other form of industry cannot brook interruption or suspension without serious injury to the machines, and to the quality of the workmanship.

In many districts of England a most laudable zeal to encourage the arts prevailed at an early period of their growth. Thus the warden and fellows of Manchester College, in order to lead ingenious strangers to settle in their town, granted them, nearly two centuries ago, the benefit of their extensive woods to cut timber for constructing their looms, as well as for fuel, at the trifling annual charge of 4*d.* each. The pre-eminence of Lancashire in manufactures soon after Elizabeth's accession is well marked, by an Act of Parliament in the eighth year of her reign, for regulating the *aulneger*, or cloth-measurer, an officer originally created by Richard I. The aulneger is here empowered to appoint and have his lawful deputy within every of the several towns of Manchester, Rochdale, Blackburn, and Bury in the said county. How completely these marts of industry are the offspring of nature may be inferred from the circumstance, that they continue to maintain at the present day nearly the scale of importance indicated by the above order of enumeration.

Whether the fustians mentioned by Guicciardini were a pure cotton fabric or a mixture of cotton with wool or linen is now very uncertain, but it was most probably an Italian or Spanish invention, introduced into Antwerp in the course of trade, and thence made known to the industrious weavers of Ghent, by whom it was extensively manufactured. From the Netherlands it was brought over into England by the religious refugees, who were mostly artisans; several of whom settled at Bolton and Manchester. This important branch of business cannot be traced farther back than the conclusion of the sixteenth century. There can be little doubt that the warp of fustians was

generally linen yarn; a circumstance accordant with the testimony of Roberts in his Treasure of Traffic, already referred to.

This compound manufacture continued to flourish in Bolton, Leigh, and other small towns in Lancashire; the fabrics being sold chiefly at Bolton in an unbleached state to the Manchester dealers, who got them finished before they sent them into the general market. Curious names, more or less characteristic of the aspect or texture of the stuffs, were given to them by the weavers; such as herring-bones, pillows for pockets, and outside wear, strong cotton ribs and barragon, broad-raced linen thicksets and tufts, with whitened diapers, dimities, and jeans. At an after period, another style of goods became popular under the more appropriate titles of cotton thicksets, goods figured in the loom or draw-boys, (named from the draw-boys by whose assistance they were woven,) cottons, velvets, quiltings, velveteens, strong or fancy cords, and counterpanes. This business derived its raw material chiefly from the Levant and from Ireland; the former supplying cotton and also some cotton yarn for wefts, the latter linen yarn for warps.

In the early part of the eighteenth century, Dr. Stukely describes the trade of Manchester as incredibly large, consisting greatly in fustians, girth-webs, tuckings, tapes, &c., which were dispersed all over the kingdom and to foreign parts.*

The imports of cotton wool from the end of the seventeenth century till the middle of the eighteenth seem, however, to have remained in a stationary con-

* Itinerarium Curiosum.

dition. In fact, the quantity was only 24,000 or 25,000 pounds less than 2,000,000 in each of the years 1697, 1701, and 1720. But in 1730 it had fallen down to little more than 1,500,000, and in 1740 it was only one million and two-thirds. In 1750 it rose to about 3,000,000, and in 1764 it amounted to nearly 4,000,000, betokening the auspicious noon-day of the cotton-trade of England. The importation of cotton wool was greatly kept in check by the large importation of East Indian cotton goods, which continued with fluctuations during the whole of the eighteenth century, with the exception of a short period towards its close, after the application of the machinery of Arkwright to spin warp, and that of Crompton to spin weft for muslin yarn in general.*

Since the average annual import of cotton wool was considerably under 2,000,000 pounds during the first half of that century, and since a good deal of it was spun into candlewicks, the spinning of cotton yarn would seem to have remained almost stationary during that long period, in consequence of the quantities of Indian yarn sold by the East India Company and of cottons introduced by contraband.

It is not, however, fair to place to the credit of cotton alone the main value of the fustians, and the other so called cotton-stuffs then manufactured in Lancashire, since the warp, which is the more valuable portion of the web, was always made of linen yarn. The cotton business, therefore, of Manchester, till Arkwright furnished it with cotton water-twist for warp, in lieu of linen-yarn, was a mongrel manufacture, and should hardly be admitted to form an integral part of a history of the cotton trade; because any value assigned to it is

* See Note B at the end of the volume.

chiefly due to the flax constituent. The cotton weft was undoubtedly a yarn of a most irregular and indifferent quality, as we may infer from the urgency with which it was sought after, and the avidity with which it was bought up by the weavers from spinsters of every degree of skill.

Of the coarse quality of British cotton goods we have a remarkable evidence even so late as 1775, in a proposal then made in Scotland to enact a sumptuary law, or, failing that sapient scheme, to establish in Edinburgh a patriotic association, for the purpose of discouraging the ladies from wearing the cotton robes of India. "While the industrious inhabitants of Glasgow and Paisley were lately exerting themselves to improve, bring to perfection, and extend the manufactures of cambric and lawn, (flax fabrics,) the greater part of the women in Scotland were wearing muslin, a fabric of India; nay, so great is the influence of fashion, that the very wives and daughters of these men were wearing this exotic themselves! Surely we are void of thought!!!"* To counteract this absurdity in the Scottish ladies of wearing these foreign robes, because they were cheaper, more durable, and more becoming than their country-peoples' webs, a national society was proposed to be founded for shaming down these anti-patriotic habits in the ladies, and for black-balling all the gentlemen who should continue to keep company with the refractory fair in muslin raiment.

The first cotton goods of English make in which the warp was cotton were manufactured at Derby, in 1773, by Messrs. Strutt and Need, the partners of Arkwright, with some of his peculiar water-twist yarn.

* Gibson's History of Glasgow, p. 253.

But, after they had caused a considerable quantity of these genuine British calicoes to be woven, they discovered that an existing law, *for the encouragement of the arts,* imposed on such goods when printed double the duty of that chargeable upon mixed fabrics of linen and cotton. The same sapient law prohibited the sale of these home-made calicoes in the home market.

It required a long and expensive application to the Legislature to procure the repeal of these preposterous enactments. Such a composite web as that required by law could not take an uniform tint, on account of the unequal affinities which linen and cotton have for mordants and colouring matters, and therefore should never have been favoured with that impolitic preference, which undoubtedly obstructed the improvement of calico printing. It was probably meant to prevent the printing of Indian white goods for home consumption.

The following account of this Repeal Act, the 14 Geo. III. c. 72, will sound a little comical to English ears at the present day. "Whereas a new manufacture of stuffs made *entirely* of cotton spun in this kingdom has been lately introduced, and some doubts were expressed whether it was lawful to use it, it was declared by Parliament to be not only a lawful, but a laudable manufacture, and therefore permitted to be used, on paying 3*d.* a square yard, when printed, painted, or stained with colour."

While cottons remained a mixed fabric, the manufacture was altogether a domestic concern in this country, analogous to that of India. The workshop of the weaver was a rural cottage, from which when he was tired of sedentary labour he could sally forth into his little garden, and with the spade

or the hoe tend its culinary productions. The cotton wool which was to form his weft was picked clean by the fingers of his younger children, and was carded and spun by the older girls assisted by his wife, and the yarn was woven by himself assisted by his sons. When he could not procure within his family a supply of yarn adequate to the demands of his loom, he had recourse to the spinsters of his neighbourhood. One good weaver could keep three active women at work upon the wheel, spinning weft. It was found more easy to multiply weavers than spinsters, and hence looms were often at a stand for want of yarn.

These country weavers were sometimes put to great straits in fulfilling their contracts with the manufacturers of Bolton or Manchester, as they were usually bound under a penalty to return cloth by a stated day, commensurate with the web of linen warp which they had received. Things had continued to jog on in this precarious state for probably a century, with very little increase or amelioration of the processes, till about the year 1760. Then new marts of profitable export having presented themselves in Germany, Italy, and the North American colonies, the merchants became impatient of the delays and uncertainties in getting their orders executed. They saw and keenly felt that the only obstacle was the deficient supply of cotton weft, and they urged their weavers to greater diligence in pushing its production. At this time, says Mr. Guest, a weaver was under the necessity frequently of trudging three or four miles in a morning, and visiting many spinners before he could collect weft enough to keep his loom going during the rest of the day; and such was the competition he met with from other weavers engaged in the

same errand, that he was often obliged to treat the females with presents in order to quicken their diligence at the wheel.

A grand crisis evidently now impended over the cotton trade of Lancashire, and had it not been soon met by effectual means of multiplying the production of yarn, this district would probably have missed that tide in its affairs, " which, taken at the flood, leads on to fortune ;" for, had the demand not found a ready supply in the customary course of trade, it would have sought out new channels in other directions, and undoubtedly have caused the domestic manufacture of cottons to take root in many other countries, to the great diminution, if not extinction, of the export cotton trade of England. A mighty fermentation seems, in consequence, to have taken place at that time all over Lancashire, where the excitement was chiefly applied, where the prospects of gain were most alluring, where the habits of this in-door occupation were most matured, and where the native spring of the mind had been long intensely bent upon it. Accordingly, a great many projects were devised to remove this grand barrier to fortune, most of them being modifications of the domestic spinning-wheel.

Two kinds of household wheels have been used by spinsters, probably from time immemorial; the first is commonly called in this country the big wheel, from the magnitude of its rim, or the wool-wheel, from its being employed in the spinning of sheep's wool; it is represented in fig. 13. It was equally well adapted to spin cotton, from the analogous form of its filaments, which it did at two independent operations. At the first, the spongy cylinder turned off from the hand-

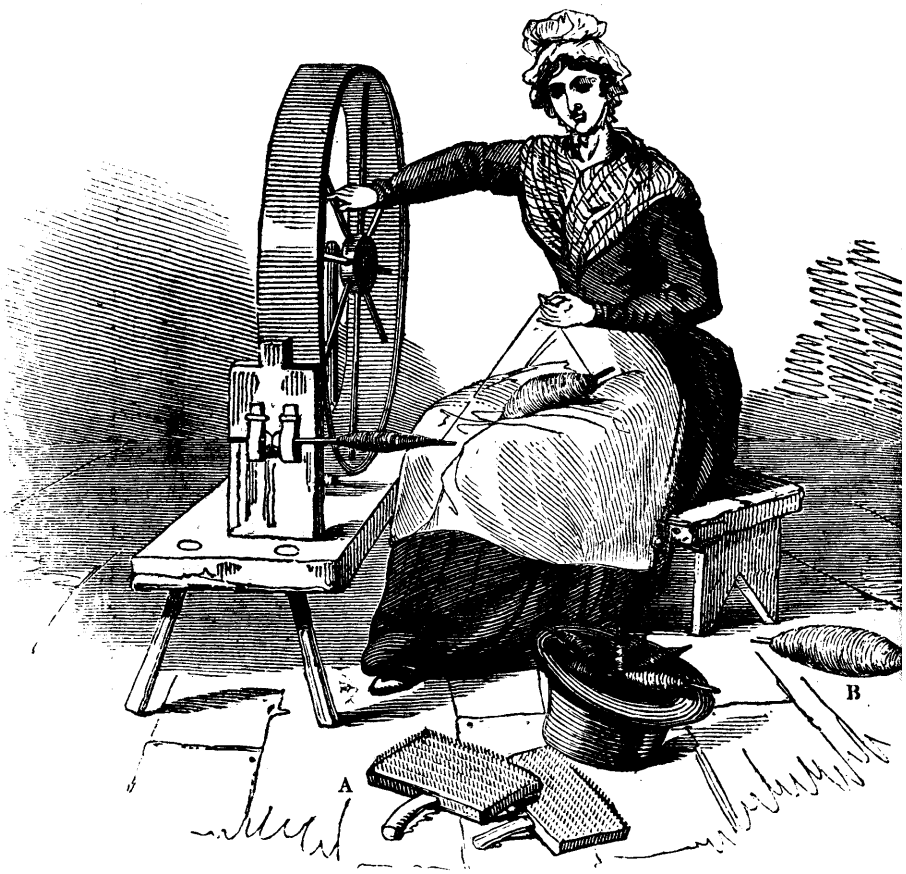

Fig. 13.—The Jersey Wheel, used for spinning cotton and wool in the older domestic economy of this country. It is probably of Indian origin—see fig. 14. A and B are the hand-cards and bobbins of rovings.

card was drawn out and slightly twisted into a porous cord, called a roving; at the second, this cord was stretched and twisted into a fine cohesive thread; in either case the spinster, having fixed round the spindle the extremity of the carding or roving, seized it a few inches from the end with the finger and thumb of the left hand, and while she turned round the wheel with the right, so as to make the spindle revolve, she pro-

gressively extended the cotton cord by drawing her hand from near the spindle to the position in which it is placed in fig. 13. She now completed the torsion by turning the wheel till the thread had acquired the desired degree of twist, and then, by a slow counter-rotation of the wheel, and proper giving-in of the left hand, she wound up the thread upon the spindle into

Fig. 14.—A Hindoo Woman spinning cotton yarn on the primitive wheel of India.

a conical shape, called a pirn or a cop. This is the ancient spinning implement of Hindostan. The first mechanical invention regularly employed with profit upon a manufacturing scale for spinning cotton in England was constructed upon this principle; several spindles, at first eight, afterwards eighty, being made to whirl by one fly-wheel, while a movable frame, representing so many fingers and thumbs as there were threads, alternately receded from the spindles

during the extension of the thread, and approached to them in its winding-on.

This multiplying wheel, called a spinning jenny, was invented by James Hargreaves, about the year 1764, at Stand-hill, near Blackburn, in Lancashire. He was by trade a weaver, and, being aware of the jealousy and ill-will likely to be directed against the author of any mechanical substitute for hand-labour by his narrow-minded neighbours, he worked in secret, without the aid of any capitalist, under the disadvantages of poverty, and a family of seven children. Before the year 1768 he had, however, mounted and sold several of his jennies. The spindle in the spinster's wheel was always horizontal, but the spindles in Hargreaves' machine were upright, or very slightly inclined from the perpendicular,—a position in fact essential to its due operation, one which was suggested to him, *it is said*, by observing a common wheel continue to revolve after it was accidentally thrown down on the floor with its spindle turned up.

Hargreaves contented himself, for some time after making the jenny, with spinning weft, with the assistance of his wife and children, for supplying his own loom, according to the custom of the weavers of that period, who received their warp from the wholesale manufacturers. The secret at length transpired, through an indiscretion of female vanity, and excited such a tumult among the spinsters, and their partisans, of the neighbourhood, that they broke into his house in a riotous manner, and destroyed the hated rival of their fingers. Finding the fruit of his ingenuity, toils, and privations blasted, and his further prosecution of the plan impossible amidst an

enraged populace, who even threatened his life, he migrated to Nottingham in 1768, where he found in Mr. Thomas James, a joiner, a partner willing and able to assist him in erecting a small spinning-mill upon the jenny plan. For this invention he obtained a patent in the year 1770, under the following title, "For a method of making a wheel or engine of an entire new construction, and never before made use of, in order for spinning, drawing, and twisting of cotton, and to be managed by one person only, and that the wheel or engine will spin, draw, and twist sixteen or more threads at one time, by a turn or motion of one hand, and a draw of the other." "One person," says he in the specification, "with his or her right hand turns the wheel, and with the left hand takes hold of the clasps, and therewith draws out the cotton from the slubbing (roving) box, and, being twisted by the turn of the wheel in the drawing out, then a piece of wood is lifted up by the toe, which lets down a presser wire, so as to press the threads so drawn out and twisted, in order to wind or put the same regularly upon bobbins which are placed upon the spindles."

Unfortunately for this inventor he had, under the pressure of poverty, mounted and sold several jennies before the date of his patent, so that when they were beginning to be rightly appreciated, and were promising to procure him a recompense somewhat proportioned to his deserts, he found, while his invention was extensively pirated by the manufacturers of Lancashire, that it could not be sustained in a court of law. In an evil hour also he refused to accept the sum of £3000 which the delegates of these manufacturers tendered to him for permission to use his machine; he demanded

a somewhat larger sum, which was refused, and eventually he got nothing, his attorney having abandoned the prosecution from a conviction that a favourable judgment would not be obtained in a court of law. Hargreaves died in 1778, a few years after this disappointment, but he did not fall a victim to poverty, as some have erroneously stated. The spinning factory of which he was a partner went on tolerably well, and enabled its author to live in humble comfort at least, and to leave a decent provision for his widow and children.

The jenny received some slight improvements, first from Hargreaves, and afterwards from other mechanicians; but, in fact, it is too simple a scheme of spinning to afford much scope for modifications. Crompton, the celebrated inventor of the mule, learned to spin upon one of the original jennies so early as the year 1769. The following figure and description will explain the construction of the jenny in its best state, and show that it is merely a many-spindled wheel upon the ancient wool-spinning principle, in which a definite length of roving is let out and extended during the revolution of the spindle, to which its end has been previously attached.

The spindles are seen to be arranged at one end of the frame, and the clasp or clove which holds the rovings, and which is equivalent to the left hands of several spinsters, is mounted upon a carriage, which moves backwards and forwards on a railway, to represent the backward and forward motions of the left arms of these spinsters.

The steel spindles, 3, 3, 3, stand upright, about three inches apart, at one end, A A, of the machine. Their

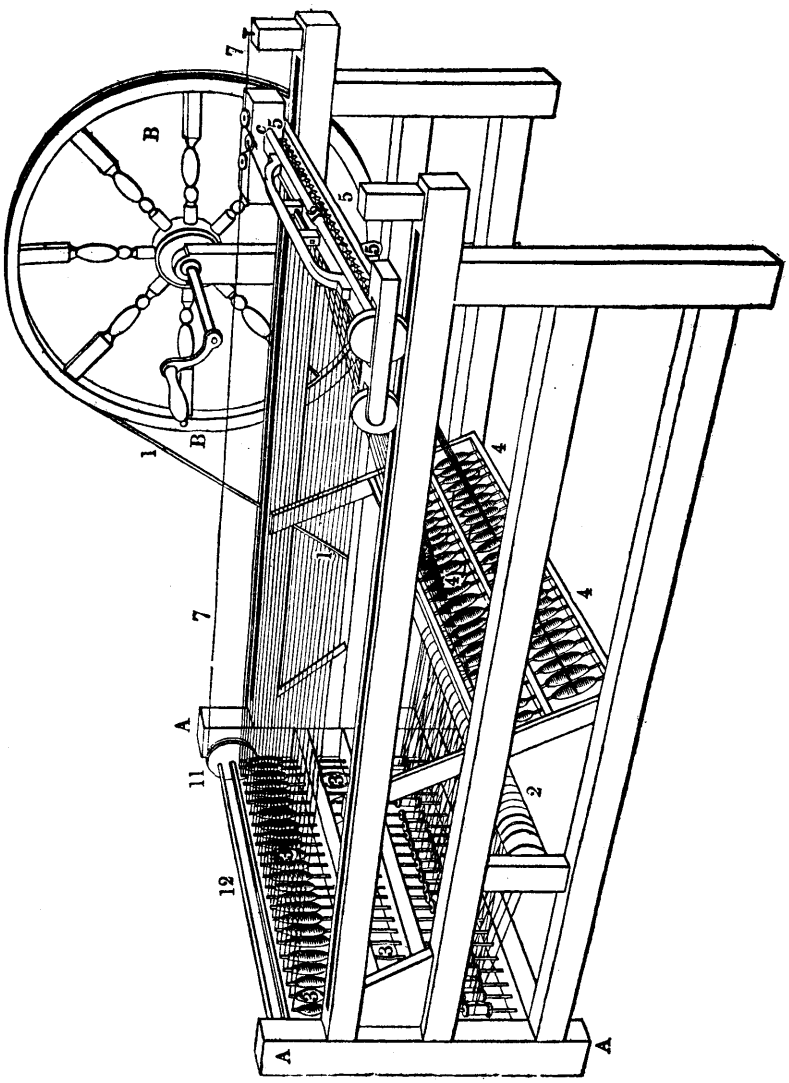

Fig. 15.—Hargreaves' Spinning Jenny in its most improved form.

lower ends are pointed and turn in hard brass steps fixed in a cross rail of the frame, and are supported near the middle of their height by passing through brass collars in another horizontal rail; a small pulley called a whorl, whirl, or wharf, is fixed on each spindle near

its bottom, to receive an endless cord, which passes round the horizontal cylinder or oblong drum, 2, of about six inches diameter; this drum is made of tin plate for lightness sake, is supported by pivots at its ends in the sides of the frame, and lies parallel to the row of spindles, so as to turn them all round together by transmitting a small band about each whorl. The drum is driven by a band, 1, 1, which passes round a pulley upon its end, and also round the great wheel B,B, fixed by means of a framing attached to the ceiling of the apartment. The wheel, B, is turned by applying the right hand of the spinner to the winch B, just as in the household wool-wheel, fig. 13.

In front of the spindles, and about a foot higher than their tips, a long horizontal cross rail, 16, is shown, supported at each of its ends in the wooden blocks, *c*, *c*, resting on friction wheels, to run on the railway, so that the rail or carriage, 16, can move horizontally forwards and backwards through a space of five, six, or seven feet, without deviating in the least to the right or left, and therefore with a precision surpassing that of the hand-spinster's left arm. The under side of the cross bar or rail, 16, is notched to let the rovings pass through, which notches may be partially filled by projecting pieces upon the lower bar of the clasp, when this is raised to pinch the rovings preparatory to their elongation into threads. When the lower bar or jaw is let down the roving cord can pass freely through the notches. The rising and falling of the under rail is effected by small cords attached to it at every yard of its length, which pass over small pulleys sunk into the substance of the upper bar, 16, and run to a handle placed over the middle of

that bar, and beneath an arched bar fastened to the top of the clasp. The spinner holds this handle in his left hand, while with the right he turns the wheel, and with the fingers of the left hand he can lift the lower rail, 5, of the clasp, and draw it close to the upper one, where it is kept by a spring catch; when this catch is pushed back, the lower rail falls by its own weight, and, releasing the rovings, lets the proper length of them easily pass through for another draught of yarn.

The cops or bobbins of rovings to be spun are supported in the inclined frame 4, 4; they are mounted upon iron wires or skewers in two rows, one above the other, the number of cops in each row corresponding to half the number of spindles.

The spun threads are guided by the wire 12, when they are to be wound upon the spindles. This wire is attached to a horizontal rail, which turns at its two ends on pivots close to the row of the spindles, and it may be lowered so as to depress the thread to any level at the pleasure of the spinner by his pulling the cord 7, and turning round the pulley 11, which depresses the wire 12.

The jenny is worked by one person, male or female, who stands within the frame, and turns the wheel B with the right hand, whilst he holds the clasp in the left, so as to be able to run it backwards and forwards along its railway at pleasure. The rovings are drawn through between the bars or jaws of the clasp 16 and 5, the end of each being attached to its particular spindle. The clasp being open, its carriage is drawn backwards from the spindles till the requisite length of rovings has run freely through or be given out,

(as it was anciently between the finger and thumbs,) by being uncoiled from the balls or bobbins at 4. This length is regulated by a mark made on the frame of the machine, to indicate when the clasp carriage has arrived at its proper position; the jaws of the clasp are then made to close by raising the handle under the catch as above described, so as to pinch all the rovings. The spindles are now caused to revolve rapidly by turning the wheel B, at the same time that the carriage is drawn regularly backwards from them; thus twisting and extension go on simultaneously and in any proportion to each other, according to the relative actions of the right and left hands of the spinners; when the threads have gained their utmost length they receive a finishing twist to strengthen them, especially for warp yarns. In order to wind up these threads they are pushed down upon their respective spindles by depressing the faller wire 12, during which movement the wheel B is made to revolve slowly, in order to wind the thread regularly upon the spindles, in proportion as the clasp-carriage is moved towards them; as soon as the carriage has got home one series of threads is finished, and another series is begun by an operation similar to the preceding.

"The wooden or tin roller or drum 2, and the vertical wheel B, were not," says Mr. Kennedy, "of Hargreaves' invention, but were introduced into the jenny by one Haley, of Houghton Tower, a few years after the invention had been made."

In Hargreaves' original jenny-frame the *presser wire* which distributes the yarn over the spindle into a shapely cop was connected by a cord going over a pulley to a piece of wood, which was lifted up by

the toe of the spinner in the act of winding on the threads.

This implement may be considered as having still a domestic character, and was in fact speedily spread as such through the houses of a great many weavers in Lancashire, supplying the long-felt deficiency of spinning hands; as a woman could with it easily spin as much as sixteen, twenty, or thirty persons with the one-thread wheel. It therefore gave a fresh impulse to the old Manchester fabrics of fustians, &c., with linen warp, for the yarn which it furnished, though somewhat more evenly, was of the usual weft quality. It was round about Blackburn, the inventor's place of residence, that the jennies were most rapidly multiplied, not altogether by his own hands, but by surreptitious imitations; which were very easy for any clever carpenter or wheelwright to make, on account of their great simplicity and analogy to the ancient spinning-wheel. The memory of Hargreaves deserves to be honoured for his multiple hand-wheel, though it realized nothing new in the principle of spinning itself.

In my late tour in Alsace, one of the most eminent and intelligent cotton-spinners of that district informed me, that he had heard that a machine called the *jeannette*, which spun a number of threads at once, had existed for a very long time among the country-people in the Lyonnois and Picardy districts. I was hence for some time under an impression that the jenny was an old French invention, of which Hargreaves had got some obscure intimation: but this supposition I now believe to be entirely groundless; for, in the great French Encyclopédie, article *Coton*, published in 1754, there is not the slightest allusion to any such machine for multi-

Fig. 16.—The Domestic Flax Wheel, an old German invention, commonly called the Saxony or Leipzig Wheel. In some instances two spindles were attached to the same wheel, enabling the spinner to form a thread with each hand.

plying production, in an elaborate article on cotton-spinning by M. Joret, of Rouen, a gentleman well acquainted with the cotton trade, who, in consequence of producing muslins rivalling those of India, was distinguished by the protection of the minister Turgot. M. Joret treats at great length of the single-thread housewife wheel, or *rouet*, but of nothing else. The word *jeannette* may be therefore regarded as a translation of the English jenny-wheel.

The flax-wheel, sometimes called the little wheel, in contradistinction to that for spinning wool, requires for the formation of its thread a different manipulation, in which the fore fingers and thumbs of both hands are from time to time employed, those of the left hand holding a parcel of the filaments, while those of the right draw them out, and equalize their attenuation. The twisting of the thread, and its winding on the bobbin, proceed simultaneously, at an uninterrupted pace, by a very ingenious mechanism, which is shown in figure 17.

There are two small heck and bobbin parts to be considered here: the spindle *b*, *a*, with its whorl *p*, and forked flyer *g*, *k*, *f*, which moves at one velocity;

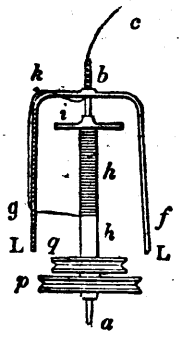

Fig. 17.—Spindle, with flyer and bobbin, of the Household Flax Wheel.

and the bobbin *h*, with its whorl *q*, which moves at a greater velocity. The whorl *q*, and the bobbin *h*, are made of wood in one piece; and they are tubular, so as to revolve easily round the spindle *b*, *a*, as an axis. The fly-wheel, which is made to revolve, like the foot lathe, by a pedal and connecting rod and crank, has two grooves in its circumference for the reception of two endless cords. One of these goes round the whorl *p* of the spindle, and the other round the whorl *q* of the bobbin. If the whorl *q* be smaller by one-fourth than the whorl *p*, it will make five revolutions in the same time that *p* makes four by the action of the fly-wheel bands. The axis or spindle *a*, *b*, is of iron or steel, and is tubular at the end *b*, having a small orifice in the side at *i*, to permit the spinning thread to pass, in its way to be wound up, by going over a tooth of the flyer's heck at *k*, and another at *g*, to regulate its distribution round the bobbin. The effect of the apparatus may be easily conceived. The rotation is imparted to the wheel by the foot acting on the pedal, which leaves both hands of the spinster free. The bands transmit the movement of the wheel to the whorls *p*, *q*, so as to make the flyer with its wire teeth revolve, round one of which the thread *g* passes. By the rotation of the axis, *a*, *b*, the thread, *b*, *c*, is twisted as it is drawn out from the distaff or rock by the spinster's hands. In proportion as the thread is thus extended and twisted, it gets also wound upon the bobbin, because the bobbin-whorl revolves faster than the spindle-pulley *p*. Every turn of the fly-wheel in fact corresponds to about six turns of the whorl *p*, and to eight turns of the whorl *q*. The tension is produced by the rotation of the axis or spindle *a*, *b*, and the

winding upon the bobbin by the difference between its velocity and that of the spindle. When the thread has been wound for some time upon the bobbin opposite to the point *g*, it is shifted to another hook or tooth on the flyer, so as to distribute it evenly along the whole barrel. When the bobbin is filled, it is replaced by an empty one. The fingers of the two hands are employed principally to equalize the distribution of the filaments, and to remove entanglements; while those of the hand next to the spindle at *b*, by holding the thread in some measure against the traction of the winding-bobbin, serve to stretch and attenuate it to the requisite degree. The skill of the spinster is estimated by the uniformity, strength, and fineness of the thread.

It is by a process similar to the above, in which textile filaments are equally extended and twisted by almost imperceptible gradations, that good thread can be formed; but to represent or realize these actions of tact and intelligence by machinery seems at first sight an impossible problem.

Inventions in the useful arts commonly spring from necessity, and advance by slow degrees from rudeness to refinement. Attempts have been recently made to prove that machine-spinning is an exception to this general conviction of mankind, that it was invented by an individual remote from the bustle of textile industry, and by him produced at once in a state of relative perfection. Mr. Guest, in his indefatigable zeal to pluck the laurels of fame from Arkwright's brow, has brought to the day an apparently startling document, long buried among the musty archives of Chancery. This is a patent *for spinning wool and cotton by rollers,*

obtained in the year 1738 by Lewis Paul, of Birmingham. This invention, however, appears from other evidence to belong principally to Mr. John Wyatt, an ingenious gentleman then residing in the same town. The following is the essential part of the specification:

"The wool or cotton being thus prepared (by carding into slivers), one end of the mass, rope, thread, or sliver, is put betwixt a pair of rowlers, cillinders, or cones, or some such movements, which being twined round by their motion, draws in the raw mass of wool or cotton to be spun in proportion to the velocity given to such rowlers, cillinders, or cones. As the prepared mass passes regularly through or betwixt these rowlers, cillinders, or cones, a *succession* of other rowlers, cillinders, or, cones moving proportionably faster than the first, draw the rope, thread, or sliver, into any degree of fineness which may be required. Sometimes these successive rowlers, cillinders, or cones (but not the first) have another rotation besides that which diminishes the thread, yarn, or worsted, viz., that they give it a small degree of twist betwixt each pair, by means of the thread itself passing through the axis and center of that rotation. In some other cases only the first pair of rowlers, cillinders, or cones, are used, and then the bobbyn, spole, or quill, upon which the thread, yarn, or worsted is spun, is so contrived as to draw faster than the first rowlers, cillinders, or cones give, and in such proportion as the first mass, rope, or sliver is proposed to be diminished."

The action of rollers in laminating, drawing, and attenuating metallic bars, rods, and plates, has long constituted a leading feature in the workshops of Bir-