Cotton, (*kŏt'tn,*) *n.* [Fr. *coton;* It. *cotone;* Ar. *kotn, koton;* Hind. *gootn, ruhi;* Ger. *baumwolle;* Du. *katoen, boomwol;* Sp. *algodon;* Por. *algodas;* Swed. *bomull;* Russ. *chlobtschataja bumaja;* Pol. *bawelna;* Sansk. *kapasa;* Malay, *kapas;* Lat. *gossypium.*] (*Bot.*) The hair covering the seeds in all the species of the genus *Gossypium,* or cotton-plant, order *Malvaceæ.* These hairs upon the seeds, and the occurrence of three leafy bracts, united at their base outside the flower, constitute the distinctive characters of the genus. From the importance of *C.* as a raw material, the genus *Gossypium* must be regarded as one of the most valuable to man in the whole vegetable kingdom. There appear to be four distinct species. Many other so-called species have been described, but they are probably mere varieties. The first *C.* fabrics were manufactured from the hairs of the species *G. herbaceum* (see fig. 188), the common cotton-plant of India. The stems are less woody than in other species; hence its specific name, which signifies herbaceous. It is a pretty plant, and rises from 18 inches to 2 feet in height during the first year of growth. It is usually cut down annually; but if allowed to grow, it will attain a height of 5 or 6 feet, and its branches will become rather woody. All the younger parts of the stem are covered with short hairs, and marked with black spots. The flowers are bright yellow, each petal being marked with a purple spot near the base. The flower is succeeded by a fruit, which gradually becomes dry, and then bursts into 3 or 4 valves, when the cotton-wool is seen issuing from it in all directions. This is the Surat *C.* of commerce. The *C.* is generally white; but much of that produced in China is of the yellow or tawny color, peculiar to the fabric called "Nankeen." *G. arboreum,* the tree-cotton, is another Indian species, but, unlike the last, it assumes the aspect and dimensions of a small tree, from 15 to 20 feet in height. The flowers are of a bright-red color. The *C.* hairs are remarkably soft and silky, and are woven by the natives into a very fine muslin, used for turbans by the privileged religious classes only. *G. barbadense* is the species which yields all our best *C.* It is called the *Barbadoes,* or *Bourbon C.,* but does not appear to have been originally a native of the New World. It is a perennial plant, and has a shrubby stem, from six to fifteen ft. in height. The flowers are yellow, like those of *G. herbaceum,* and have a dark spot at the base of each petal. The fruit is capsular, and contains in its interior from 8 to 12 black seeds, which, on being freed from the cotton-wool, are found to be destitute of down, unlike those of the preceding species, which are covered with firmly adhering short hairs. The plant was introduced into Georgia from the Bahama Islands, where it had been grown from seed obtained in the West Indies. In the small American islands which fringe the coast of Georgia, this plant has produced the celebrated *Sea-Island C.,* which is unrivalled for the length of its staple, its strength, and its silkiness. This variety is restricted to the islands and a narrow belt of mainland on the immediate coast of the Atlantic, extending from the Great Pedee River, in N. Carolina, to Cape Canaveral, in Florida. The same plant, when cultivated in the cooler and drier climates of the hill-country of Georgia, is inferior in quality, and shorter in staple. This fact shows how great is the influence of external circumstances on the growth of the cotton-plant. The species *G. peruvianum,* or *acuminatum,* is supposed to be indigenous to America. Like the Bourbon *C.,* it has black seeds and yellow flowers. The seeds adhere together, however, in a peculiar way, forming a kidney-shaped mass. This plant furnishes the S. American varieties of *C.,* as *Pernambuco, Peruvian, Maranham,* and *Brazilian.* After the Sea-Island and Egyptian, these S. American *C.* obtain the highest price in the market. *C.* is now extensively cultivated in Egypt, in S. Africa, in India, and in Australia; but it will be long before the supplies from these parts can compete with those from the U. States. If examined under the microscope, the *C.*-hair will be found apparently to consist of two delicate transparent tubes, the one twisted round the other. If, however, the hair be examined in its young state, it will be found to be an untwisted cylindrical tube. Its changed appearance when it reaches its maturity can be accounted for by the circumstances under which it is developed. As the seeds and hairs grow, the capsules do not appear to expand with equal rapidity; and, consequently, the hair is exposed to pressure on all sides. The result of this is, that the hair collapses in the middle, leaving a hair-formed tube on each side. These uncollapsed portions of the hair give it the appearance of a flat ribbon, with a hem or border at each edge. The hair does not, however, grow out straight, but, coming in contact with other hairs and the sides of the capsular fruit, it becomes twisted. This twisting is undoubtedly the great fact that makes the *C.*-hair of value to man. There are many hairs, such as those of the *cotton-grass* and the *Bombax,* which are as long and apparently as strong as those of the *G.,* but which, failing in this irregularity of surface, are utterly incapable of being twisted into a thread or yarn. The twisting gives the *C.*-hair the power of uniting with its fellows, and forming with them a cord strong enough to be woven.

Fig. 702. — BARBADOES COTTON.
(*Gossypium barbadense.*)

Production. Columbus found the cotton-plant growing wild in Hispaniola, and later explorers recognized it as far N. as the country bordering the *Meschacebe,* or Mississippi. In the U. States, cotton-seeds were first planted, as an experiment in 1621, (*Purchas's Pilgrims,*) and in a paper of the date of 1666, preserved in Carroll's *Historical Collections of S. Carolina,* the growth of the cotton-plant is noticed in the province of Carolina. It was, however, little known except as a garden-plant, until after the Revolutionary war. The first successful crop in S. Carolina was that of W. Elliott, in 1790. His success caused many to engage in the cultivation of *C.,* and some of the largest fortunes in S. Carolina were thus accumulated. But the region adapted to the production of the sea-island *C.* was limited, and the amount of 8,000,000 lbs. raised in 1805 was not exceeded by the subsequent crops. The culture of the other varieties, distinguished by the green instead of the black seed of the sea-island, was rapidly extended from the last years of the 18th century throughout the Southern States. The production of the U. States, from 1830 down to the present day, is exhibited in the following data:

Account of the Produce of the U. States Cotton Crops from 1830–31 *down to* 1867–8.

Year.	*Total Crop. Bales.*	*Year.*	*Total Crop. Bales.*	*Year.*	*Total Crop. Bales.*
1830–31	1,038,848	1845–46	2,100,537	1856–57	2,939,519
1834–35	1,254,328	1846–47	1,778,651	1857–58	3,113,962
1835–36	1,360,725	1847–48	2,347,634	1859–60	4,669,770
1836–37	1,822,930	1848–49	2,728,596	1860–61	3,656,086
1837–38	1,801,497	1849–50	2,096,706	*1861–62	4,800,000
1838–39	1,360,552	1850–51	2,355,257	*1862–63	1,500,000
1839–40	2,177,835	1851–52	3,015,029	*1863–64	500,000
1840–41	1,634,945	1852–53	3,262,882	*1864–65	300,000
1841–42	1,683,574	1853–54	2,930,027	1865–66	2,154,476
1842–43	2,378,875	1854–55	2,847,393	1866–67	1,951,988
1843–44	2,030,409	1855–56	3,527,845	1867–68	2,430,893

The years marked with asterisks, as above, were those in which the cotton-growing regions of this country were suffering in the convulsions of the late civil war; consequently little *C.* was planted, in comparison with that which suffered destruction by the contending armies. The total market receipts of the article are therefore computed upon close estimate. During the continuance of that war the manufacturing countries of Europe suffered severely, as is well known, from the almost absolute stoppage of their usual *C.* supplies from the U. States; and, in this emergency, turned their attention towards encouraging the growth of the staple in other countries, as Brazil, Venezuela, Egypt, India, &c. This experiment was attended with successful results, in so far as concerned the obtaining of a sufficient quantity of the article to keep the spinners going; but it was also found that the *C.* of the countries named being of short staple, and of inferior quality, generally, to the American, could not compete with the long-stapled varieties grown in this country—more especially the "sea-islands," which always carry the top-prices in foreign markets. The qualities from the above-mentioned countries were found to run pretty much as follows:—Egyptian, *good; fair to middling:* Brazilian, *good; middling — fair to middling:* Venezuelan, *middling; middling fair to poor:* East India (Surat), *barely middling; poor, often dirty.* It was at one time anticipated that negro emancipation in the S. States would seriously, if not disastrously, check the future growth of the staple in those countries. This prophecy has now been happily proved erroneous, as has been indicated by the steady revival of cultivation in the South during the years 1868–9; the crop turned out during the latter year approximating in quantity to the heavy yields obtained in the years immediately preceding the war, while the quality itself has never been surpassed. American *C.* has, consequently, recovered its old status in European markets, and, with it, a near approach to its old marketable price in foreign centres of manufacturing industry. We may conclude by quoting from an excellent article on the subject that appeared in the *New York Nation,* (Oct., 1869,) as follows: — "The results of the last ten years' experience seem to show that the South really has a monopoly of a certain class of cotton at all events, and almost a monopoly of the article itself, for the supply from other countries, even under the stimulus of the war, seems to have produced little or no effect on the markets."

(*Cultivation.*) The upland varieties have been cultivated nearly as far N. as Lat. 40°, but only under favorable circumstances. Cotton-patches are to be seen in S. Illinois and S. Missouri, where the plant is grown for domestic use; and in many families the hand-loom is yet in vogue. "As a great commercial staple, however, its culture embraces a belt of country 100 m. or more in width — underlaid by the Cretaceous formation — which starts near the N. line of the State of Mississippi, and, sweeping round the base of the Alleghanies through Alabama, Georgia, S. Carolina, and N. Carolina, extends as far N. as Raleigh, and even Richmond, Va. The S. limit of this belt is where it comes in contact with the region of 'Pine-Barrens,' whose soil consists of Pliocene-Tertiary sands. Its culture extends up the Mississippi Valley to Memphis, and up the lower valleys of the White, Arkansas, and Red rivers. The cotton soils are of moderate fertility, and when stripped of timber, are exceedingly liable to wash into gullies and ravines. After a few croppings, they are very difficult to renovate, since they do not admit of a rotation of crops. The climate is unfit for the growth of the nutritious grasses, and hence, where the ground lies fallow for a few years to recover its productive powers, it ceases to be profitable. The grasses which spring up are coarse, and afford little nutriment to cattle. The forage of the planter is derived from corn-stalks, cut before maturity; and hence, throughout the region, we find no herds of cattle or swine; nor can any course of industry render stock-raising profitable. (Mr. Foster's *Mississippi Valley,* 1869.)" *C.,* when raised within the frost-line, must always be planted, if possible, after the last frost in spring, as it is more easily killed by cold than any other plant; and when once bitten by frost it cannot recover, like corn, but must be re-planted. Before planting, the ground must be broken deeply and thoroughly. This should be done in February or March, for plantations in the Carolinas, Georgia, Alabama, Tennessee, or Arkansas; in January, for plantations in Florida, Mississippi, Louisiana, or Texas. We can, of course, only generalize in an article so brief as this must be; but it will be readily seen, by any one possessed of only a little knowledge of geography, that S. Georgia and S. Alabama have seasons like those of S. Mississippi, Louisiana, Texas, &c. The next step in the process, after having broken the ground well, and permitted it to lie thus for a few weeks, is to "*bed up*" the ground, as the planters phrase it, for putting in the seed. The rows are laid off from 3 to 4 feet apart in the thinner lands, from three to seven feet in the rich lands of Louisiana and Texas — with a narrow-bladed plough — generally with a scooter. The fertilizer is now dropped in this furrow, and a ridge, or bed, made upon it with a turning-plough. One furrow on each side of the fertilized ridge is sufficient. Now the preparation for planting has been handsomely made; the next, and last step in the process is to open the ridge with a scooter, drop in the seeds, and cover them. The covering is rapidly and well effected by a board screwed to the helve of a scooter. The board should be long enough to extend across the cotton-row, and have a scoop, or groove, cut in the centre of it, corresponding to the width of the furrow in which the seeds have been dropped. The seeds should be rubbed or rolled in wet ashes just previous to planting, to destroy the adhesion of the cotton fibres that will remain with the seeds of *upland C.* after the very best ginning now known to planters. The Sea-Island *C.,* or, as it is often called, "black-seed," and "long-staple," may be dropped without this rolling in ashes; as, when it is ginned, or picked from the seeds by hand, very little lint is left on the seeds. After it shall have sprung from the ground to the height of abt. two inches, it is "chopped out" with a hoe. Two or 3 stalks are all that should be left in one spot to grow; and these spots, or hills, should be 8 to 18 inches apart, according to the strength of the soil. Of course the grass, the great enemy of all plants, and specially of *C.,* must be cut out when this chopping is performed. In 8 to 10 days after the chopping the plant must be hoed, or have dirt thrown gently around the tender stalk, with a small plough. In two weeks more the *C.* should be again ploughed, and carefully cleaned of all grass by a hoe-hand. In 2 to 3 weeks more another ploughing must be given, and you have little else to do with it save to keep the grass out, specially now from the middles; for if weeds and grass grow there, they will give to the pickers a very troublesome crop of seeds and dry leaves in the fall and winter. *C.* must not be ploughed when the ground is very wet. — The *picking* is generally done by hand, and should be commenced in July or August, as soon as the matured *C.* is well open. One hand can pick from 100 to 200, and even 300 lbs. per day, under very favorable circumstances. But it is to be hoped that "Howe's cotton-picker," or some other ingenious machine, is destined speedily to lighten this most tiresome and troublesome of all the labor-processes by which *C.* is prepared for market. The *C.* first picked, before the autumnal rains have dirtied it, and the October frosts turned it yellow, is the best; and must be ginned and packed by itself, to command the best price in market. If the "storm-cotton," or the frosted cotton, be mixed with it, the price of the whole lot will be depreciated in consequence. — After having been picked, *C.* is spread out and dried, and then separated from the seeds. The latter process was formerly performed by hand — a tedious operation, by which one hand could clean only a pound or so a day; — but since the invention of the sawgin, by Eli Whitney, in 1793, the process of cleaning has been both rapid and effectual. This machine is composed of a hopper, having one side formed of strong parallel wires, placed so close together as to exclude the passage of the seeds from within. The wool is dragged through the apertures by means of circular saws attached to a large roller, and made to revolve between the wires, the seeds sinking to the bottom of the hopper. This process is adopted only in cleaning the short-sta-

pled varieties of American *C.*, the seeds of which adhere so firmly to the wool as to require a considerable amount of force to separate them. The Sea-Island variety is cleaned by being passed through two small rollers, which revolve in opposite directions, and easily throw off the hard, smooth seeds. In India, though the saw-gin has been introduced in some districts, the wool is mostly cleaned by means of the primitive roller. Both descriptions of gins are used in Egypt and the Brazils. The *C.* cleaned by the roller-gin, being uninjured thereby in staple, realizes the better price; but the deterioration caused by the saw-gin is compensated for by the greatly increased quantity cleaned; the latter turning out four or five times as much work as the former, in an equal space of time, and thereby considerably reducing the expense of cleaning. — After the worms (see *Noctuidæ*), which destroy the pod, or the cotton-plant itself, and against which we have, as yet, no means of defence, the chief enemy of *C.* is *rust*. Against this something can be done. "The cause of rust," says Mr. D. Dickson, of Hancock county, Georgia, in a valuable article published in the *Southern Cultivator*, "is plainly marked, and the indications readily understood. There is a weed, (I call it *rust-weed*), that marks all land that will rust *C.* This weed is now green, (Feb. 8th,) but in a few weeks it will be very rusty. Lands that will certainly rust *C.* are such as are not properly drained; low, sandy lands; land under bluffs, that is sandy, and inclined to be springy; poor land that is sandy and porous, having the clay a good way below the surface, and also resting on pipe-clay; and sandy land that gets grassy in July to September. Rust is caused also by very heavy rains; by guano alone, which causes a very heavy crop of bolls; and, lastly, by poverty and bad work. The remedy is: To drain the land well; rest it, to accumulate humus; haul red-clay on the sandy land; plough deep, and subsoil before planting. The land should be well mixed throughout with clay and vegetable mould, at least 9 inches deep. The best manure to prevent rust, is 200 lbs. of dissolved bones, 100 lbs. Peruvian guano, 200 to 300 lbs. of salt, and 100 lbs. of land-plaster (plaster of Paris), per acre. The above remedies will return one hundred per cent. interest to the owner. All lands may be made good cotton-lands by the use of the spade, clay-humus (or vegetable matter), and the above manures. Lands that will produce 100 lbs. of lint *C.* without manure, if level, are worth $10 per acre; and level land that will produce 400 lbs. of lint *C.* per acre, with manure, is worth $100 per acre. Here is a margin of $90 to pay for improving an acre of land. It can be done, and 50 per cent. made on the manures purchased every year; always returning the cotton-seed back to the land, when in *C.*, or its share of stable-manure, when in corn."

Cotton Manufacture. This important branch of textile fabrics has its origin in India and China, in which countries it was known and operated in many centuries before being understood by the moderns. Among ancient writers Herodotus is the first who mentions this staple; called by him *tree-wool*. Both the Greeks and Romans imported their raw material from India. About the 10th century, this manufacture was introduced by the Moors into Spain, where its products flourished principally in the form of coarse cloths, canvas, &c. In Italy, cotton fabrics began to be manipulated at about much the same period. The Netherlands was the next country to adopt the art, which from thence was transplanted into England by the Protestant refugees from Flanders, after the capture of Antwerp by the Duke of Parma in 1585. In 1641, Manchester is recorded as receiving cotton-wool from Smyrna and Cyprus, and manufacturing it into various stuffs. In 1660 all colonial cotton was ordered to be sent to England for manufacture, and in 1760 the annual value of the trade was estimated at only $1,000,000. From the first introduction of the *C. M.* into Great Britain down to 1773, the *weft* or transverse threads of the web only, were of cotton; the *warp*, or longitudinal threads, consisting wholly of linen yarn. In the first stage of the manufacture the weavers, dispersed in cottages throughout the country, furnished themselves as well as they could with the warp and weft for their webs, and carried them to market when they were finished; but the impossibility of making any considerable division among the different branches of a manufacture so conducted, or of prosecuting them on a large scale, added to the interruption given to the proper business of the weavers by the necessity of attending to the cultivation of the patches of ground which they generally occupied, opposed great obstacles to its progress. In 1767, however, James Hargreaves (*q. v.*) invented the *spinning-jenny*. At first this admirable machine enabled 16 to 30 threads to be spun with the same facility as 1; and it was subsequently brought to such perfection, that a little girl was enabled to work no fewer than from 80 to 120 spindles. The jenny was applicable only to the spinning of cotton for weft, being unable to give to the yarn that degree of firmness and hardness which is required for the longitudinal threads or warp; but this deficiency was soon after supplied by the introduction of the *spinning-frame* (1769–1775) — that wonderful piece of machinery which spins a vast number of threads of any degree of fineness and hardness, leaving to man merely to feed the machine with cotton, and to join the threads when they happen to break. It is not difficult to understand the principle on which this machine is constructed, and the mode of its operation. It consists of two pairs of rollers, turned by means of machinery. The lower roller of each pair is furrowed or fluted longitudinally, and the upper one is covered with leather, to make them take a hold of the cotton. If there were only one pair of rollers, it is clear that a carding of cotton passed between would be drawn forward by the revolution of the rollers, but it would merely undergo a certain degree of compression from their action. No sooner, however, has the carding, or *roving* as it is technically termed, begun to pass through the first pair of rollers, than it is received by the second pair, which are made to revolve with (as the case may be) 3, 4, or 5 times the velocity of the first pair. By this admirable contrivance the roving is drawn out into a thread of the desired degree of tenuity; a twist being given to it by the adaptation of the spindle and fly of the common flax-wheel to the machinery. Sir Richard Arkwright (*q. v.*) gave his machine the name of the *water-frame*; but it has since become better known as the *spinning-frame*. Nearly at the same time that the spinning department was thus wonderfully improved, Dr. Cartwright, a clergyman of Kent, invented the *power-loom* (in 1787), a machine which has already gone far to supersede weaving by the hand. While these extraordinary inventions were being made, Watt was perfecting the steam-engine, and was thus not only supplying the manufacturers with a new power applicable to every purpose, and easy of control, but with one that might be placed in the most convenient situations, and in the midst of a population trained to industrious habits. Still something remained to complete this astonishing career of discovery. Without a vastly increased supply of the raw material at a lower price than it had previously brought, the inventions of Hargreaves, Arkwright, and Watt would have been of comparatively little value. Luckily, what they did for the manufacturers, Mr. Eli Whitney, originally of Massachusetts, and afterwards a citizen of New Haven, Connecticut, did for the American cotton-growers. He invented a machine by which cotton-wool is separated from the seed with the utmost facility and expedition. Previously to 1790 the U. States did not export a single pound-weight of raw cotton. In 1792 they exported the trifling quantity of 138,328 lbs. Whitney's invention came into operation in 1793; and in 1794, 1,601,760 lbs., and in 1795, 5,276,306 lbs. were exported! And so astonishing has been the growth of cotton in the interval, that in 1860 the exports from the United States alone amounted to the prodigious quantity of 1,767,6-6,338 lbs. The first machines set up in the U. States were at East Bridgewater, Mass., in 1786, by two Scotchmen, employed by Mr. Orr of that place. The manufacture, however, languished for want of competent machinery until 1790, when a person named Slater, who had been employed in the English cotton-mills in Derbyshire, and had there acquired a knowledge of the Arkwright processes, established himself, in conjunction with partners, at Providence, R. I. In 1806, Slater's brother came over from England, and joined him; when they at once started business at the village of Slatersville in the same State, and gave an extraordinary impetus to the manufacture, which, by 1816, had increased to the consumption of about 100,000 bales of the raw article, turning out 81,000,000 yards of cloth, employing 100,000 operatives, and engaging a working capital of $40,000,000. The invention of the power-loom, in England, still, however, checked the progress of the American manufacture, by enabling the former country to import into the U. States vast importations of the fabricated article at a far lower rate of productive cost than could be attained to by American spinners. In 1824, 1828, and 1832, however, the U. States govt. somewhat counteracted the influx of English cottons upon this market, by the imposition of an *ad valorem* duty of 25 per cent. upon the foreign commodity. In 1812, Mr. Francis C. Lowell of Boston, who had in Great Britain acquired some knowledge of Mr. Cartwright's power-loom, returned to this country, and immediately set about introducing its operations, on an extensive scale, at Lowell, Mass. The first cotton-mill on the power-loom principle was established there in 1822; the nucleus of a system of manufacturing operations, which, in 1852, had accumulated to 51 mills, giving employment to 12,633 hands. The most recent improvement in the process of spinning is that perfected by the *self-acting mule* of Sharp, Roberts & Co., of Manchester, England. These machines do not require the manual aid of a spinner, but can be attended to by a boy or girl, whose duty it is to join the threads which break during the spinning. The ordinary process of cotton manufacture is as follows: — The raw material, when it arrives at the cotton-mill, is first taken to the mixing-room. The contents of each bag are spread out in a horizontal layer of uniform thickness, the contents of the several bags forming separate layers. The heap is then trampled or pressed together. The cotton of which this *bing*, as it is called, is composed is then torn down by a rake from top to bottom, and a portion of each layer is thus obtained. If the layers consist of different qualities of cotton, a uniform mixture is thus obtained. The quantity raked down is then conveyed to the *scutching* or *willowing machine*, where it is dragged through two rollers, transferred to two beaters, which thresh out all sand, seeds, and other impurities; after which it is passed through two more rollers and a second set of beaters. The cleansed cotton is then passed through the *spreading-machine*, and afterwards wound in a fleecy state upon a large wooden roller. In this state it is conveyed to the *carding-machine* (q. v.), where it is drawn out into parallel layers. Each of these layers is made to undergo compression in its way to a roller, from which it is given off in the form of a thick, soft thread, into a tin can. This thread is called a *sliver*. The next stage is termed *drawing*, and the machine employed is called a *drawing-frame*. The sliver is passed through the drawing-frame, which completes the process begun by the carding-machine, the fibres of the cotton being arranged longitudinally in a uniform and parallel direction. This drawing operation is repeated several times, in order to correct all inequalities. The next process is *roving*, — a continuation of the drawing. The cord, which is now called a *rove*, being much thinner, has a slight twist given to it by passing through a can, which is made to revolve with great velocity while receiving it. It is then wound upon bobbins, and is ready for the spinning-frame. As the spinning and weaving of cotton differ very slightly from that of silk, linen, woollen, &c., they will be found described under the articles SPINNING and WEAVING. See also SUPPLEMENT.