COTTON.

COTTON, in *Commerce*, the ſoft and beautiful vegetable down which forms the covering or envelope of the ſeeds of the goſſypium or cotton plant. It is the ſpontaneous production of three parts of the earth, and is found growing naturally in all the tropical regions of Aſia, Africa, and America, whence it has been tranſplanted and become an object of cultivation in the ſouthern parts of Europe.

It is brought to us from the Weſt India iſlands, the Spaniſh, Dutch, and Portugueſe ſettlements on the coaſt of South America, and the iſles of Bourbon and Mauritius in the Eaſt Indies. Georgia, and the ſouthern ſtates of North America, alſo annually produce great and increaſing quantities. The iſlands and ſhores of the Mediterranean have long ſupplied Europe, and within theſe few years, the privileged merchants of India have brought hither conſiderable quantities from Surat, Madras, and Bengal.

The cotton from theſe different quarters of the globe varies conſiderably in the colour, length, fineneſs, and ſtrength of its fibre. It is the produce of ſeveral ſpecies and varieties of the goſſypium, and without wholly adopting the hypotheſis of Quatremere Diſjouval, we may admit, that difference of climate has conſiderable influence on the texture and quality of the cotton.

According to the obſervations of that gentleman, crowned by the Academy of Sciences of Paris, the produce of the countries immediately under, or neareſt the equator, is to be conſidered as the type of excellence, and is diſtinguiſhed by its fine ſilky fibre, the depth and peculiarity of its colour, and the height and permanency of the plant. In proportion as we recede from the equator, ſays our author, theſe ſtrong marked characters diſappear, the fibre becomes coarſe, its colour perfect white, and on the ſhores of the Mediterranean, we behold the lofty and flouriſhing tree of Hindooſtan, dwindled down into a ſtunted annual ſhrub.

The exceptions to this ſyſtem, from a compariſon of the cotton of South America and the Weſt Indies, with that of India and the Levant, are repelled by M. Quatremere Diſjouval with ſome ingenuity, but his obſervations and reaſonings are too general; and we ſhall preſently ſee that this ſyſtem of gradation in ſize, colour, and fineneſs, from the equator to the poles, has no exiſtence in nature, and is diſproved by the characters we ſhall adduce of the principal varieties of cotton at preſent known in commerce.

It is true, that the fineſt cotton we have any knowledge of, is the produce of the tropical countries, as well as the deepeſt coloured. The delicate and unrivalled fabrics of the Eaſt, and the genuine nankeens of India and China, afford a proof of this. Yet the cotton from which they are produced, is retained at home to ſupply the native manufactures of the country, and is wholly unknown in commerce. The cotton of Bengal, Madras, and Surat, ſuch as is brought in quantities to Europe, is ſcarcely tinged with yellow; and Siam, famous for its nankeen, is equally ſo for its fine white cotton, which has long been tranſplanted to the Weſt Indies. The ſea-coaſt of Georgia, and its dependant iſles, though ſituated in latitude 33° north, ten degrees beyond the tropic, produces cotton ſuperior in quality to the colonies of Guiana directly under the equator, whilſt the inland diſtricts of that province, and the country ſouth of it, down to the mouth of the Miſſiſſippi, produce a cotton of greater whiteneſs, and far inferior in ſtrength and fineneſs.

Cotton is diſtinguiſhed in commerce by its colour, the length of its fibre, and its ſtrength and fineneſs.

White is in general conſidered as characteriſtic of ſecondary quality,

quality. The cotton of Smyrna, Cyprus, Salonica, and all parts of the Levant, is diſtinguiſhed by its want of colour. The chief part of that from North America is alſo white, *viz.* New Orleans, Tenneſſee, and Upland Georgia.

Yellow, when not the effect of accidental wetting, or inclement ſeaſon, is indicative of greater fineneſs. The cotton of the Weſt Indies and of South America is called yellow, but the colour inclines more or leſs to cream colour. That from India has a ſlight tinge of Aurora. The fine Sea Iſland Georgia, though not properly a yellow cotton, has a faint but decided tinge, which diſtinguiſhes it from the white cotton of the ſame country.

In the following liſt are enumerated the chief, and nearly all the varieties of cotton uſed in this kingdom, with ſhort notices of their quality and value.

North American Cotton.

Sea Iſland Georgia—is the produce of the coaſt of Georgia, and the ſmall iſlands contiguous and belonging to it. It has a long and fine ſtaple, but more or leſs ſilky, ſtained or dirty, on which account no other cotton varies ſo much in price. The beſt is preferred now to every other kind, and is often ſold at very high prices to the manufacturers of lace.

Upland, or *Bowed Georgia*—is the produce of the inland diſtricts, and either from the nature of the ſoil, or defective cultivation, is much inferior to the preceding. It is a light flimſy cotton, of weak, and very unequal ſtaple, having long and ſhort fibres intermixed. It is uſed chiefly for inferior goods. It derives its name of Bowed Georgia from an inſtrument like a bow, which the planters uſe in cleaning it.

Tenneſſee—much like Bowed Georgia, but in general cleaner, and ſometimes better ſtaple.

New Orleans—this alſo reſembles Bowed Georgia, but it is generally preferred both to that and Tenneſſee. The fibre of theſe three kinds is weak, compared with that of Weſt India, or Sea Iſland, and goods manufactured from it, are unable to endure the ſame hardſhip.

South American Cotton.

Pernambuca—fine, long ſtaple; clean and pretty uniform in quality; much eſteemed; principally uſed by the hoſiers.

Maranham—rather inferior to Pernambuca; not ſo even in quality, nor ſo clean; much like good Demarara, and uſed for the ſame purpoſes.

Bahia—much like Maranham; ſometimes it has the advantage.

Rio—a very inferior cotton; very brown; much ſhell in it; uſed generally for the ſame purpoſes as low Weſt India.

Surinam—has a long ſtaple; clean; yellow; it is a fine cotton, and much uſed for making ſtockings.

Cayenne—a fine good clean ſtaple, preferable to Surinam.

Demarara—the quality of this cotton has fallen off ſince the colony has been in poſſeſſion of the Engliſh. The beſt has a fine ſilky ſtrong ſtaple, much eſteemed. The inferior ſorts are rather brown, dirty, coarſe, and much mixed.

Berbice—the quality of this has of late years fallen off. The beſt has a good ſtaple, fine, ſilky, and clean; but latterly it is brown, dirty, and mixed.

Carthagena—has a very long ſtaple, but weak; it is very ſtringy, and rather dirty.

Giron—a brown coloured cotton, fair ſtaple, and generally pretty clean.

Cumena—inferior to Giron, and not ſo clean.

Carraccas—inferior to Giron; ſtill more dirty.

Laguira—inferior to Cumena, but preferable to Carracca; not ſo dirty.

Weſt India Cotton.

Bahama—Cotton from the Bahama iſlands is of various qualities. The beſt is grown from Bourbon ſeed, but is much inferior to that kind. The ſtaple is pretty good, fine and ſilky, but it is often dirty. The inferior Bahamas are very brown and dirty. The ſtaple rather ſhort but ſtrong.

Barbadoes—is of fair middle quality, the ſtaple not very long, but generally ſilky, and pretty ſtrong; often a good deal of the ſhell of the ſeed in it, which is a great objection.

Jamaica—very little cotton grown here, and that of very inferior quality; there is the long ſtaple, which is very weak, and often very dirty, and the ſhort, which is alſo very poor and dirty.

St. Kitt's—very little grown; it is in general very brown, dirty, but of fair ſtaple.

St. Lucia—the ſame.

St. Thomas—the ſame.

St. Domingo—ſometimes very clean good cotton, and likewiſe very inferior; not much comes here.

Carriacou—rather a coarſe grain, but in general clean, fair, ſtrong ſtaple, uſed by the hoſiers to mix with fine cotton, ſuch as Pernambuca.

Grenada—a good deal like Carriacou, but not always ſo clean.

St. Vincent's—rather high-coloured; clean, good ſtaple, but not very fine; a good deal cultivated for the ſize of the iſland.

Antigua—very little grown, much like St. Kitt's.

Tortola, Montſerrat, Dominica—the ſame.

Martinique—very little comes here. It is a fair middle quality.

Guadaloupe—much the ſame, ſometimes very good cotton.

Tobago—little grown, ſometimes very fair good cotton.

Trinidad—rather ſhort ſtaple, and in general very dirty.

Eaſt India Cotton.

Bourbon—the moſt even and uniform in quality of any other. It is a fine ſilky ſtaple, and very clean. It is the moſt valuable cotton brought hither, except the beſt Sea Iſland.

Surat—has a fine, but exceedingly ſhort fibre, in general dirty, containing leaf and ſand. It is the loweſt priced cotton in the market, and uſed in the manufacture of low coarſe goods.

Bengal—much like Surat, but ſtill ſhorter ſtaple, in general cleaner, and much about the ſame value.

Madras—not much brought hither. It is moſtly from Bourbon ſeed, and ſometimes not unlike in ſtaple, but in general dirty, and contains much ſhell, which renders it leſs valuable; worth little more than Surat; ſome very good will fetch the price of Weſt India.

Turkey.

Smyrna, &c.—a ſhort moſſy kind, and rather dirty, uſed for making candlewicks; has more ſubſtance than Bowed Georgia.

The preceding obſervations are intended to give general ideas of the comparative value and qualities of the different kinds enumerated, rather than preciſe and accurate deſcriptions, which, from various cauſes, ſuch as unfavourable

ſeaſons, exhauſted ſoil, defective management and culture, cannot, as may readily be ſuppoſed, conſtantly and invariably apply.

In eſtimating their commercial value, we may place them in the following order, which compared with the gradation of M. Quatremere Disjonval's ſyſtem, preſents a curious contraſt.

Sea Iſland Georgia, Bourbon—Pernambuca—Cayenne, Bahia, Maranham, Surinam—Demarara, Berbice—Bahama, Grenada, Carriacou, Barbadoes and beſt Weſt India—Giron, and beſt Spaniſh, New Orleans, Smyrna—Jamaica, St. Kitt's, &c. &c., and inferior Weſt India—Bowed Georgia, Carthagena, Carraccas, and inferior Spaniſh—Madras, Bengal, Surat.

The relative value of the cotton in the firſt half of this ſeries, is tolerably permanent, and is here pretty accurately expreſſed. The varieties in the other half vary conſiderably. It is deduced from the average prices of the different kinds, during a period of ſeveral months.

It muſt be obſerved, however, that the low value of Eaſt India cotton from Surat, Bengal, and Madras, ariſes chiefly from the exceſſive ſhortneſs of its fibre, which, though fine and ſilky, unfits it for the manufacture of a fine thread by our mode of ſpinning, though we are aſſured the natives of Hindooſtan employ it in the manufacture of their fineſt muſlins.

The importation of cotton into Great Britain has progreſſively and rapidly increaſed during the laſt twenty-five years, as will appear from the following ſtatements, from which ſome idea may be formed of the aſtoniſhing and unexampled increaſe and proſperity of our cotton manufactures during that period.

Importation of Cotton into Great Britain.

In the year	1781	5,101,920 lbs.
	1782	11,206,810
	1783	9,546,179
	1784	11,280,238
	1785	17,992,888
	1786	19,151,867
	1787	22,600,000
From 1786 to	1790	23,443,670 per an.
In the year	1799	46,000,000
	1800	56,010,732
	1802	65,850,395
	1806	75,000,000 *

* This year's importation is not given from official documents, and is not therefore to be relied on as ſtrictly accurate.

London and Liverpool are the great marts for cotton, the chief part of which was for a long time imported into London, but the ſituation of Liverpool, in the very heart of the cotton manufactures of the north, has rendered it the principal market in the kingdom, and great part of the cotton belonging to the merchants of London is now conſigned there.

The following is the number of bags, of about 300 lbs. each, imported into London and Liverpool in four different years, from which may be derived a tolerably accurate idea of the relative quantities of different kinds of cotton brought into this kingdom, and of the increaſed cultivation of ſome particular ſorts.

Importation of Cotton into London.

	1798.	1799.	1805.	1806.
Hamburgh, Tonningen, &c.	7327	11208	514	137
Liſbon	5661	17818	3020	7281
Oporto	1095	2583	1373	1095
Gibraltar and Mediterranean	2748	752	1234	218
Charleſtown and South Carolina	3079	3981	2113	3911
Philadelphia, Maryland, New York, &c.	2084	5172	469	1035
New Providence	1489	1911	1712	
Savannah	1221	1514		40
Smyrna	600	1208	54	1360
Guernſey	531		162	5
Jamaica	612	5003	366	639
Montſerrat, St. Kitt's	729	838	1735	2325
Bahama	405			
Grenada	2122	846	1577	2632
St. Domingo	690			
Barbadoes	1911	686	1362	792
Antigua, St. Vincent's, and Tobago,	526	381		
Demarara	2581	3540	5294	4920
Martinique and Tortola	652	802		
Dominica	783			
Surinam	72	448	5040	3758
Copenhagen and Baltic		2020	601	
Berbice		192	2467	1458
	36918	60903	29093	31606

Importation of Cotton into Liverpool.

	1805.	1806.	1791.	1799.
America	100,148	100,142	64	13,236
Liſbon	36,739	33,646	34,500	25,362
Oporto	1958	1647		
Demarara	9495	10981		8102
Berbice	6715	5784		
Surinam	3072	1139		
Barbadoes	7995	5495		
Bahamas	1634	1980		
Dominica	775	1491		
St. Thomas	1170	1743		
Antigua	83	278		
Tortola	1221	1325		
St. Lucia	1288	1389		
St. Kitt's	260	224	25,777	28,394
St. Vincent's	183	189		
Nevis	29	72		
Grenada	200	384		
Trinidad	125	287		
Cuba	175			
Montſerrat	24	10		
Jamaica	2483	4011		
Bourbon	588			
Spain	608			
Ireland	450	546	3871	1690
Tobago		5		
Teneriffe		306		
Holland			1950	
Turkey			2242	
	177,418	173,074	68,404	86,784

From

From theſe ſtatements it appears, that in 1791, ſixty four bags of cotton only were brought into the port of Liverpool from North America; 25,814 into London and Liverpool in 1799, and in 1806, upwards of one hundred thouſand bags into Liverpool alone; nearly half the quantity imported into the whole kingdom of every deſcription whatever.

The cultivation of cotton is become an object of principal concern, and is rapidly increaſing in the ſouthern ſtates of North America. The produce of ſome parts of Georgia, as we have before obſerved, is of very ſuperior quality; and there is every reaſon to believe, that in a few years, it will rival in quantity, as well as quality, the fine cottons of Brazil and Guiana.

It may not, perhaps, be irrelevant to our ſubject, to remark here, that the colonization of Georgia formed the ſubject of a memorial preſented to the duke of Newcaſtle, then ſecretary of ſtate in the reign of George I., by colonel John Purry, a native of Switzerland. In this memorial, which was afterwards publiſhed, he ſets out with this poſtulate, that "there is a certain latitude on our globe, ſo happily tempered between the extremes of heat and cold, as to be more peculiarly adapted than any other for certain rich productions of the earth," amongſt which he enumerates ſilk, cotton, indigo, &c.; and he fixes on the latitude of 33°, whether north or ſouth, as the identical one for that peculiar character. He ſettled ſome years afterwards, with a colony of his countrymen, on the river Savannah, which parts Carolina from Georgia, where he perpetuated his name by founding the town of Purryſburg; and proved, in ſome degree, the truth of his ſyſtem, by the introduction of thoſe objects of cultivation, which have ſince become ſtaple articles of the country.

The firſt importation of cotton from the Eaſt Indies took place in the year 1798. This cotton is not imported by the India company, but by the privileged merchants; and the firſt cargo brought by the Fame, and valued at 10,000 *l.*, cleared the enormous ſum of 50,000 *l.* The cotton at that time ſold at *2s. 2d.* per pound, the following year it fell to *10d.*, and is now the loweſt priced cotton in the market.

The following is the amount of importations ſince that time.

Importation of Eaſt India Cotton.

1798	4637	Bales of about 350 lbs.
1799	19714	
1800	19820	
1801	12111	
1802	8900	
1803	10476	
1804	3546	
1805	1842	
1806	8422	

All cotton whatever is ſubject to a duty of *2d.* per pound, and alſo of $1\frac{1}{4}$ per cent. on that amount. Calculated at the prices of that article in 1803. The amount of the duty on each particular kind is as follows.

Sea Iſland Georgia	4 per cent. ad valorem
Fine Brazil	8
Britiſh Weſt India	$8\frac{1}{2}$
Foreign Weſt India	10
Inferior Brazil	12
Turkey	12
Bowed Georgia	$12\frac{1}{2}$
Spaniſh Cotton	15 to $23\frac{1}{2}$

Cotton, as a vegetable ſubſtance, approaches in its nature nearly to the ligneous matter, or woody fibre, and affords, by deſtructive diſtillation, the ſame products, and nearly in the ſame proportions as the hard and heavy woods. It is diſtinguiſhed by its great affinity for earths and metallic oxydes, but more eſpecially for alumine and iron, on which is founded the theory and practice of calico-printing.

It is little alterable, inſoluble in water, and the chief part of the weaker reagents. Nitric acid converts it into various vegetable acids. Vitriolic acid acts upon it as on ligneous fibre, both are decompoſed, charcoal developed, and ſulphureous acid given out. It is alſo diſtinguiſhed by the beauty and permanency of the white which it acquires by alternate expoſure to the action of alkalies and atmoſpheric air, or oxygenated muriatic acid.

The ſtructure of the fibres of cotton has not been well aſcertained. Lewenhoeck, by microſcopical examination, found them to have two ſharp ſides, and it ſeems to be owing to this circumſtance, and to their poſſeſſing ſome aſperities like the filaments of wool, that cotton greatly irritates and inflames wounds and ulcers, if applied to them inſtead of lint.

COTTON, in *Ancient Geography*, a town of Aſia Minor.

COTTON-*graſs*, in *Botany*. See ERIOPHORUM.

COTTON *Manufacture*, in *Commerce*, one of the leading and moſt important branches of our national induſtry and commerce.

The hiſtory of its progreſs during the laſt century, affords a ſplendid inſtance of the ſucceſsful application of induſtry and talent to a branch of manufacture, unparalleled in the annals of commerce.

Scarcely fifty years have elapſed ſince it was amongſt the humbleſt of our domeſtic arts, and was confined chiefly to the fire ſide and cottage of the labouring poor of Lancaſhire. Its products were few, and moſtly for home conſumption, though ſome articles from Mancheſter were exported above a century ago. Its proceſſes were ſimple, and the contrivances for accelerating labour, ſuch as had been handed down for ages paſt with little alteration. The population engaged in this manufacture about the year 1750, is ſuppoſed not to have exceeded 20,000, and was little more than doubled in the ſucceeding twenty years.

From this ſtate of comparative inſignificance, it burſt forth at once with a vigour and activity which has no parallel, and from cauſes which we ſhall ſtate hereafter, became in the ſhort period of thirty years, one of the moſt flouriſhing and important branches of our national induſtry.

For our internal conſumption, it affords a variety of fabrics, ſuited not only to the ordinary wants and comforts, but alſo to the elegancies of life; and for exportation, ſuch now is our ſuperiority, that there is ſcarcely a civilized nation on the earth, that is not indebted to us for ſome article of this manufacture, and well authenticated accounts have been publiſhed of their having been found as articles of dreſs amongſt the diſtant tribes of Tartars.

In the following article we ſhall endeavour to trace the progreſs of this manufacture from its origin down to the preſent time, and the cauſes which have contributed ſo powerfully to raiſe it in a few years to a ſtate of importance, little ſhort of that which the great ſtaple manufacture of this country, that of wool, has acquired during the five laſt centuries.

The period of its firſt introduction into this country is not clearly aſcertained, and there are few authentic documents of earlier date than the middle of the ſeventeenth century,

century, before which time, it is probable that the manufacture of cotton was too inconſiderable to deſerve much notice.

The firſt hiſtorical notice we meet with is in the Itinerary of Leland, who viſited Lancaſhire in the reign of Henry VIII. "Bolton-upon-Moore market," ſays he, "ſtondith moſt by *cottons*, divers villages in the moores about Bolton do make cottons." From this an inference has been drawn in favour of the exiſtence of the manufacture of cotton in Lancaſhire at this early period, a ſuppoſition which is however completely overturned by an act paſſed the 5th and 6th of Edward VI. 1552; entitled "for the true making of *woollen* cloth," in which it is ordered "that all the cottons, called Manchester, Lancaſhire, and Cheſhire cottons, full wrought to the ſale, ſhall be in length twenty-two yards, and contain in breadth three quarters of a yard in the water, and ſhall weigh *thirty pounds* in the piece at leaſt. Alſo that all other cloths called Manchester rugs, otherwiſe named Manchester frizes, full wrought for ſale, ſhall contain in length 36 yards, and in breadth three quarters of a yard, coming out of the water, and ſhall not be ſtretched on the tenter, or otherwiſe, above a nail of a yard in breadth, and being ſo fully wrought and well dried, ſhall weigh every piece 48 lbs. at the leaſt." However paradoxical it may appear, it is nevertheleſs clear from this paſſage of the act, that the Manchester cottons of that day were a ſpecies of woollen cloth, and that of the coarſeſt and ſtrongeſt kind, as is ſufficiently proved by the weight required by the ſtatute. The teſtimony of Camden alſo to this point is deciſive: when ſpeaking of Manchester in 1590, he ſays, "this town excels the towns immediately around it in handſomeneſs, populouſneſs, *woollen manufacture*, market place, church and college, but did much more excel them in the laſt age, as well by the glory of its *woollen* cloths, which they call Manchester *cottons*, as by the privilege of ſanctuary, which the authority of parliament under Henry VIII. transferred to Cheſter."

The manufacture of theſe cottons was known alſo in Wales, as appears from the 8th of Elizabeth, 1566; in which we have the following hiſtorical fact. "In the town of Shrewſbury there hath been, time out of mind of man, and yet is, a company, fraternity, or guild, of the art and myſtery of drapers, which ſaid fraternity hath by reaſon of a certain trade and occupation, of buying and ſelling of Welſh cloth and linen, commonly called *Welſh cottons*, frizes and plains, which they have had and uſed amongſt them, been able not only to live thereby, but alſo have, at their common coſt, provided houſes and other neceſſaries for poor people within the ſaid town of Shrewſbury." The diſtinction of the Welſh cottons here into frizes and plains, is another proof of their being made of wool.

It is certainly ſingular, that the term cotton ſhould be applied to goods manufactured wholly of wool, and which from their weight and ſubſtance could not poſſibly be intended as imitations of, or ſubſtitutes for, the cotton goods of any other country.

The fact is however ſufficiently evident from the preceding quotations, and ſtill further from the conſideration that at the preſent day the *Kendal cottons*, a manufacture which has ſubſiſted now near five centuries, are made entirely of wool, and that of the coarſeſt kind.

Like the Welſh cottons they are manufactured both frized and plain; and are uſed chiefly for negro cloathing in America and the Weſt Indies, though ſome are worn at home by the poor or labouring huſbandmen. Various conjectures have been offered reſpecting the origin of the name, but the moſt probable is, that it is a corruption of the word *coating*. However this may be, it is very certain that the Manchester, Cheſhire, and Welſh cottons, which in all probability were derived from thoſe of Kendal, were made entirely of wool, and that it is to theſe goods the obſervation of Leland applies in the quotation we have before given.

To whatever purpoſe cotton was applied, it is certain that long before we have any mention of the manufacture the raw material was imported into this kingdom. The earlieſt record we have met with, in a haſty and not very extenſive ſearch, is preſerved by the accurate and indefatigable Hackluyt in the firſt volume of his Collection of Voyages, and is contained in a little work entitled the "Proceſs of Engliſh Policy." The intent of the whole poem (for ſuch it is) is to inculcate the abſolute neceſſity to our commerce and exiſtence as a free ſtate, of England keeping the dominion of the ſeas; but it is chiefly valuable for the liſt which it contains of the different natural productions, as well as manufactures, which were at that time the objects of commercial intercourſe between the European ſtates. After enumerating the various articles which conſtitute the trade of Spain, Flanders, Portugal, Britain, Scotland, Ireland, Pruſſia, Germany, Venice, Florence, Brabant, Holland, &c., he tells us, that "Genoa reſorts to England in her huge ſhips, named Carracks, bringing many commodities, as cloth of gold, ſilk, paper, much woad, wool, oil, cotton, roach alum, and gold coin; and they bring back from us wool and woollen cloth made with our own wool." It is evident from the preceding quotation, that at leaſt as early as 1430, about which time this little work was firſt printed, and probably alſo much earlier, this country was ſupplied by the Genoeſe with cotton from the Levant. The Genoeſe poſſeſſed this trade till the year 1511, when, according to Hackluyt, from that time to 1534, "divers tall ſhips of London and Briſtol had an unuſual trade to Sicily, Candia, and Chios, and ſometimes to Cyprus and to Tripoli, and Baruth in Syria. They exported thither ſundry ſorts of woollen cloths, calf-ſkins, &c., and imported from thence ſilks, camblets, rhubarb, malmſey, muſcadel, and other wines, oils, cotton-wool, Turkey carpets, galls, and India ſpices. The Levant trade was ſoon after engroſſed by the merchants of Antwerp, and till 1575 entirely abandoned by the Engliſh. Wheeler, who wrote in 1601, ſays, that "a little before the troubles in the Low Countries, the Antwerpians were become the greateſt dealers to Italy, in Engliſh and other foreign merchandize, and alſo to Alexandria, Cyprus, and Tripoli in Syria, beating the Italians, Engliſh, and Germans entirely out of the trade, as they alſo ſoon did the Germans at the fairs and marts of their own country." Accordingly we find from the ſame author, that cotton was one of the many articles with which they ſupplied this country at that period, which they brought chiefly from Sicily and the Levant, and ſometimes from Liſbon, along with many other precious articles which the Portugueſe derived at that time from India. After the ſacking of Antwerp the Engliſh trade to the Levant revived, and in 1621 was in a flouriſhing ſtate, as appears from the teſtimony of Mr. Munn, in his treatiſe on the trade of India, in which cotton is enumerated as one of the many articles brought by our merchants from the Mediterranean.

From theſe quotations it is evident, that previous to the diſcovery of America and the Weſt Indies, and for ſome time afterwards, this country, and probably all Europe, was ſupplied with cotton from the Levant.

How far, from this early importation of the raw material, we have a right to infer the exiſtence of a cotton manufacture in this kingdom, may perhaps admit of ſome diſpute,

yet it is certainly very probable that, acquainted as we muſt have been in ſome degree with the cotton cloths of the Eaſt, and other countries, and furniſhed with the material for their fabrication, ſome attempts would be made to imitate them. One great uſe of cotton no doubt, at theſe early periods, was for candlewicks; and to whatever purpoſe elſe it was applied, the manufacture had made no great progreſs in this country till the beginning of the ſeventeenth century, nor does it appear that on the continent, from whence, till within theſe few years, almoſt all our manufactures of cloth have been derived, the manufacture of cotton had made any progreſs before the middle of the ſixteenth century.

Fuſtians were firſt made in Flanders, if we may credit Guicciardini, in his hiſtory of the Netherlands, who however aſſigns no date to their firſt introduction. In the little work we have before alluded to, anno 1430, preſerved in "Hackluyt's Collection of Voyages," they are mentioned not only as an article of export from Flanders to Spain, but of import alſo from the Eaſterlings, Pruſſia, and Germany. We are diſpoſed to believe they were firſt manufactured in Italy, where, from its proximity to the countries affording cotton, as well as its earlier communication with thoſe nations which ſupplied Europe with cotton cloths, it was more likely to originate, than in the more remote and northern ſtates of the continent: and we learn alſo from Guicciardini, in another part of his work, that in 1560, Antwerp annually imported from Milan "great quantities of gold and ſilver thread, various wrought ſilks, gold ſtuffs, fuſtians and dimities of many fine ſorts, ſcarlets, tammies, and other fine and curious draperies."

That the manufacture of fuſtian came originally to this country from the Netherlands is highly probable, and it is ſaid to have been eſtabliſhed in the towns of Bolton and Manchester by Proteſtant refugees. Fuſtians were manufactured there in the beginning of the ſeventeenth century, and it is probable their firſt introduction was not much earlier. Had the Flemiſh carried this manufacture to any great extent, it would have found its way to this country much earlier, from the vaſt number of weavers and manufacturers of every deſcription that emigrated to England, from the time of Edw. III. down to the troubles in the Low Countries during the reign of Philip II. of Spain.

In one of the ſumptuary laws of James I., paſſed in the parliament of Scotland in 1621, it is enacted, "that ſervants ſhall have no ſilk on their cloaths, except buttons and garters, and ſhall wear only cloth, fuſtians, and canvas of Scotch manufacture." This prohibition would ſeem to imply a very advanced ſtate of the manufacture of theſe articles in Scotland.

The firſt authentic document concerning the cotton manufacture of this kingdom, is contained in Lewis Roberts "Treaſure of Traffic," publiſhed in the year 1641, and is as follows. "The town of Mancheſter buys the linen yarn of the Iriſh in great quantity, and weaving it, returns the ſame again in linen into Ireland to ſell. Neither does her induſtry reſt here, for they buy cotton wool in London that comes from Cyprus and Smyrna, and work the ſame into fuſtians, vermilions, and dimities, which they return to London, where they are ſold, and from thence, not ſeldom, are ſent into ſuch foreign parts where the firſt materials may be more eaſily had for that manufacture."

The manufacture of linen cloth, properly ſo called, never we believe, conſtituted any great part of the trade of Mancheſter, but the fuſtians, and indeed all the cotton goods of that period, were made of linen warp, compoſed of Hamburgh or Iriſh yarn, but chiefly of the latter, and theſe probably formed great part of the linen goods which Mr. Roberts ſays were returned to Ireland.

Soon after this period, fuſtians were manufactured in quantities at Bolton, Leigh, and the places adjacent; but Bolton was the principal market for them where they were bought in the grey by the Mancheſter dealers, who finiſhed and ſold them in the country. The Mancheſter traders went regularly on market days to buy fuſtians of the weavers, each weaver then procuring his own yarn and cotton as he could, which ſubjected the trade to great inconvenience. To remedy this, the chapmen themſelves furniſhed warps and cotton to the weavers, and employed perſons in all the little villages and places adjacent, to deliver out materials, and receive back the manufactured goods when finiſhed. Each weaver's cottage formed at that time a ſeparate and independent little factory, in which the raw material was prepared, carded, and ſpun, by the female part of the family, and ſupplied woof, or weft, for the goods which were wove by the father and his ſons.

The kinds of fuſtian then made were herring-bones, pillows for pockets and outſide wear, ſtrong cotton ribs and barragon, broad-raced linen thickſets and tufts, with whitened diaper, ſtriped dimities and jeans. Theſe were ſucceeded by cotton thickſets, goods figured in the loom, draw boys, and at later periods by cotton velvets, quiltings, counterpanes, corded dimities, velvets, velvetteens, and ſtrong and fancy cords. It is ſcarcely poſſible to convey any adequate idea of the varieties of cotton goods that have iſſued from the loom, ſince the firſt dawn of this manufacture to the preſent time. The pattern cards of Mancheſter goods ſent out to the continent by the leading houſes engaged in the foreign trade, have preſented ſpecimens of near two thouſand different kinds, varying in ſtrength and fineneſs, from the coarſe and heavy fabrics to the fineſt and moſt delicate muſlins, and in colour from the richeſt chintz to plain and ſelf-coloured grounds; ſome figured in the loom, ſome checked and others plain, yet all, or the greateſt part of them, compoſed entirely of cotton.

For the introduction or improvement of many of theſe branches, this country is indebted to the late Mr. Wilſon of Ainſworth, near Mancheſter, originally a manufacturer of fuſtian. He early engaged in the manufacture of cotton velvets, which, by unwearied efforts, he brought to the utmoſt degree of perfection, and conſiderably improved the mode of dreſſing, finiſhing, and more particularly of dyeing, which at that time was very imperfect. His goods, eſpecially his velvets, were finiſhed in a ſtyle that acquired a high character, both at home, and in the foreign market, and were readily diſtinguiſhed from thoſe of any other manufacturer. He cleared off the looſe and uneven fibres with razors, and burnt or ſinged them with ſpirits of wine. This mode was ſucceeded by the uſe of hot irons, in form ſomewhat reſembling the weavers' drying iron, but rounder, which were firſt employed by Mr. Witlow: and at a later period by cylinders of caſt iron heated to redneſs, over which the goods were evenly and rapidly drawn, and thus freed from that ſuperfluous down, or pile, which they had acquired in the loom, or in the various operations of waſhing, bleaching, or dyeing.

Towards the middle of the laſt century, or ſoon afterwards, the manufactures above enumerated, or ſuch of them as were then known, had become of great importance to the towns of Mancheſter and Bolton, affording various articles for home conſumption, as well as for an increaſing foreign trade, and giving employment to great part of the population of the ſurrounding country. They had arrived at that ſtate at which a pauſe muſt naturally have enſued, and

beyond

beyond which they muſt have advanced with the ſlow and gradual increaſe of population; which, aided by every advantage, as well as by emigation from other diſtricts, could never have kept pace with the demand, without the introduction of thoſe improvements to which this country owes the proſperous and unrivalled ſtate of its cotton manufactures, and of which we ſhall now proceed to give ſome account.

The mode of ſpinning in uſe in this country at that period was by the hand; on the well known domeſtic machine called a *one-thread wheel*. A ſingle ſpindle put in motion by a wheel and band turned by the right hand, whilſt the thread was managed by the left, compoſed the whole of this ſimple apparatus, on which one perſon could with difficulty produce a pound of thread, by cloſe and diligent application, the whole day. The goods then manufactured were ſtrong and coarſe, compared with thoſe of the preſent day, and little or no thread finer than from 16 to 20 hanks in the pound, each hank meaſuring 840 yards, was then ſpun. It was ſubject, as may readily be conceived, to great inequalities, its evenneſs depending greatly on the delicacy of touch, which the ſpinner by long habit had acquired, and varied with every little difference in the extenſion of the thread during twiſting, and the revolution of the ſpindle in portions of the ſame length. As the demand for cotton goods increaſed, various contrivances were thought of for expediting this part of the manufacture. A patent was obtained by a perſon named Paul, and ſome others of London, for an engine for a more eaſy and expeditious mode of ſpinning cotton, and ſeveral other attempts were made at ſubſequent periods, but all with equal want of ſucceſs, till the invention of the Jenney, by James Hargreaves, in the year 1767. Hargreaves was a weaver at Stanhill, near Church, a few miles diſtant from Blackburn, in Lancaſhire. He was a plain, induſtrious, but illiterate man, and poſſeſſed little mechanical ſkill or talent. He reſided near the print ground, the firſt and infant eſtabliſhment of the late Robert Peel, eſq. from whoſe hints and converſation he derived much important aſſiſtance, and whoſe ſtrong and active mind was at that time engaged in the promotion of every uſeful improvement connected with that branch of manufacture, in which he was afterwards ſo extenſively concerned. An anecdote is ſtill recorded in the neighbourhood, which aſcribes to accident the parent of ſo many uſeful diſcoveries, the firſt invention of the Jenney. A number of young people were one day aſſembled at play in Hargreaves' houſe, during the hour generally allotted to dinner, and the wheel at which he or ſome of his family were ſpinning, was by accident overturned. The thread ſtill remained in the hand of the ſpinner, and as the arms and periphery of the wheel were prevented by the framing from any contact with the floor, the velocity it had acquired ſtill gave motion to the ſpindle, which continued to revolve as before. Hargreaves ſurveyed this with mingled curioſity and attention. He expreſſed his ſurprize in exclamations which are ſtill remembered, and continued again and again to turn round the wheel as it lay on the floor, with an intereſt which was at that time miſtaken for mere indolence. He had before attempted to ſpin with two or three ſpindles affixed to the ordinary wheel, holding the ſeveral threads between the fingers of his left hand, but the horizontal poſition of the ſpindles rendered this attempt ineffectual; it is not therefore improbable, that he derived from the circumſtance above-mentioned the firſt idea of that machine which paved the way for ſubſequent improvement. It conſiſted at firſt of only 8 ſpindles, turned by bands from an horizontal wheel, in the centre of which was fixed a vertical ſhaft, with a handle at the top for the ſpinner. The threads paſſed between two horizontal pieces of wood, the breadth of the machine, which, when preſſed together, claſped faſt the roving like the finger and thumb of the ſpinner, and were thus extended or drawn out. He had great difficulty in putting up the thread, or winding it on the ſpindle after twiſting, which he at laſt accompliſhed by means of a treadle connected with a wire, and worked by the foot of the ſpinner. The Jenney in its original form was a rude machine. The firſt was made almoſt wholly with a pocket knife; and the claſp, by which the thread was drawn out, was the ſtalk of a briar ſplit in two. It was, as may readily be conceived, defective in the conſtruction of thoſe parts eſſential to the performance of its work, and which an ordinary mechanic would have had no difficulty in contriving; but Hargreaves was obliged to work in ſecret, and poſſeſſing little mechanical ſkill, to avail himſelf of ſuch aſſiſtance as he could procure, without making public the object he had in view.

Popular prejudice was ſoon excited againſt him, and the threats of his neighbours obliged him to conceal his machine for ſome time after it ſupplied the woof or weft for his own looms. It was, however, generally known that he had made a ſpinning machine, and his wife, or ſome of his family, having imprudently boaſted of having ſpun a pound of cotton during a ſhort abſence from the ſick bed of a neighbouring friend, the minds of the ignorant and miſguided multitude became alarmed, and they ſhortly after broke into his houſe, deſtroyed his machine, and alſo part of his furniture. Hargreaves ſoon after removed to Nottingham, whither he was invited by the ſtocking weavers of that place, and where he aſſiſted in the erection and management of a mill, about the time that Mr. Arkwright firſt ſettled there, after being in the ſame manner driven out, or rather deterred from ſettling in Lancaſhire, by the clamour and prejudice of the people. Hargreaves was little qualified, either by education or addreſs, for the ſphere of life into which he was removed, and after having aſſiſted various perſons in the conſtruction of machinery, and communicated to each by turns the whole of what he knew, he died in poverty, ill requited by his employers, and little known to the country, which has ſince reaped ſuch important benefits from his diſcovery. Before he quitted Lancaſhire, he had made one or two wheels of 12 or 16 ſpindles each for ſome of his relations or friends, and as the popular clamour abated, the number of theſe increaſed, till a ſecond mob ſcoured the whole country and deſtroyed every machine, they could meet with. The value of this improvement however was ſo ſtrongly felt, and the meaſures adopted againſt the ringleaders of this outrage ſo vigorous and deciſive, that new wheels were immediately conſtructed, and it was remarked that many of thoſe concerned in oppoſing their firſt introduction, were amongſt the foremoſt to avail themſelves of the advantages they now promiſed. Various alterations were made in the original machine, which from its form was inconvenient and tireſome to grown up perſons, though girls of twelve or fourteen managed it with eaſe. The vertical wheel was ſubſtituted for the horizontal one, which rendered it much eaſier to work, and the treadle, which required an aukward and conſtrained poſture, was rendered unneceſſary by a ſimple contrivance managed by the hand. They were enlarged in their dimenſions from twelve to twenty, and afterwards to thirty, fifty, and even eighty ſpindles, and their uſe rapidly extended over all the country, though their firſt introduction every where met with the moſt determined oppoſition. Even at Nottingham, if our information be correct, a ſerious affray took place on the firſt erection of the new machines, in which Hargreaves himſelf was ſeverely wounded, and a young woman, who had accompanied him from Lan-

caſhire, and had been accuſtomed to the management of his firſt Jenney, nearly loſt her life.

To Hargreaves alſo is aſcribed an improvement in the mode of carding, which, before his time, had been performed with hand cards, on the knee, a tedious and laborious operation. Theſe were ſucceeded by ſtock cards, in which the lower card was fixed immovable on a ſtool or ſtock, which left both hands at liberty to manage the upper one. Theſe were firſt uſed in the woollen manufacture, and introduced into Hargreaves' neighbourhood from Roſendale. His improvement conſiſted in applying two or three cards to the ſame ſtock, and ſuſpending the upper cards, which from their weight and ſize would otherwiſe have been unmanageable, from the ceiling of the room by a cord paſſed over a pulley, to the other end of which was affixed a weight or counterpoiſe. With theſe, one woman could perform twice as much work, and with greater eaſe than ſhe could do before in the common way.

The ſtock cards were ſucceeded ſoon after by cylinder cards, the invention of which is claimed by ſo many different perſons, that it is impoſſible now to determine to whom the merit is due. Amongſt the firſt who employed them, was the late Mr. Peel, who conſtructed a carding engine with cylinders at Blackburn, as early as the year 1762, in which he was aſſiſted by Hargreaves.

Mr. Peel's engine conſiſted of two or three cylinders, covered with cards, but had no contrivance for ſtripping, or taking off the carded cotton. This was performed by two women with hand cards, who alternately applied them to the laſt, or finiſhing cylinder, and thus took off the carding by turns. This was, in all probability, the firſt carding machine that was made; but Mr. Peel's other avocations not permitting him to purſue the ſubject at that time, it was laid aſide, and ſome years elapſed before it was improved and perfected by other hands.

Notwithſtanding the ſevere puniſhment of the ringleaders of the laſt outrage, and the friendly means adopted to convince the labouring claſs of the folly and injuſtice of oppoſing theſe improvements, by which not only the country, but themſelves, would in the end be ſo materially benefitted, conſiderable alarm and uneaſineſs were again excited, and though no ſcarcity of work had been experienced, a belief univerſally prevailed, that all manual labour would ſoon be annihilated by the uſe of theſe new machines. A third and more numerous mob therefore aſſembled in the year 1779, by which all the machinery turned by water or horſes, both for carding and ſpinning, and all the Jennies above a certain ſize, that could be found within eight or ten miles of Blackburn, were completely deſtroyed. Jennies of twenty ſpindles, or under, were alone reſpected, every machine turned by water was demoliſhed, and the large Jennies were either cut into two ſmall ones that came within the ſize preſcribed, or if the owner choſe, into one of twenty ſpindles, by ſawing off the extra number which was often conſigned to the flames. Theſe and ſimilar diſturbances in different parts of the country impeded for an inſtant, but could not arreſt the progreſs of this manufacture. Mr. Peel, whoſe machinery at Altham was totally deſtroyed and thrown into the river, and whoſe perſonal ſafety was oftentimes in danger from the fury of a licentious and ungovernable mob, retired in diſguſt from the country, and eſtabliſhed a cotton mill at Burton in Staffordſhire, on the banks of the Trent, where he continued to reſide many years afterwards.

Soon after the invention of the Jenney in 1767, ſir Richard, at that time Mr. Arkwright, brought forward his improvement in ſpinning, on which he had been long and laboriouſly engaged. This diſtinguiſhed character, whoſe perſeverance and invention raiſed him from one of the moſt humble occupations in ſociety to affluence and honour, was the youngeſt of thirteen children, and was born in the year 1732, at Preſton, in Lancaſhire. In this neighbourhood was then carried on a conſiderable manufacture of linen goods, and linen and cotton mixed, the various operations of which he had an opportunity of becoming intimately acquainted with, and being a man of uncommon natural powers, he directed his thoughts to the improvement of the mode of ſpinning, which had probably been conducted for ages by the ſame proceſs. The firſt hint for effecting this improvement, he accidentally received from ſeeing a red-hot iron bar elongated, by being paſſed through iron rollers. Between this operation and that of elongating a thread, as now practiſed in ſpinning, there is no mechanical analogy; yet this hint being purſued, has produced an invention, which, in its conſequences, has been a ſource of national and individual wealth unparalleled in the annals of the world.

The difficulties which Mr. Arkwright experienced before he could bring his machine into uſe, even after its conſtruction was ſufficiently perfect to demonſtrate its value, would perhaps for ever have retarded its completion, if his genius and application had been leſs ardent.

His circumſtances were by far too unfavourable to enable him to commence buſineſs on his own account, and few were willing to riſk the loſs of capital on a new eſtabliſhment.

Having at length, however, had the good fortune to ſecure the co-operation of ſome perſons who ſaw the merit of the invention, and were willing to aſſiſt his endeavours, he obtained his firſt patent for ſpinning by *means of rollers* in the year 1769, and to avoid the inconvenience of eſtabliſhing a manufacture of this kind in the heart of the cotton manufacture, ſuch as it then exiſted, he removed to Nottingham. Here, in conjunction with his partners, he erected his firſt mill, which was worked by horſes, but this mode of procedure was found to be too expenſive, and another mill on a larger ſcale was erected at Cromford in Derbyſhire in the year 1771, the machinery of which was put in motion by water.

This patent right was conteſted about the year 1772, on the ground that he was not the original inventor. He obtained a verdict however, and enjoyed the patent without further interruption to the end of the term for which it was granted.

As the eſſential part of Mr. Arkwright's machine was entirely new, and was applied with the happieſt ſucceſs in various other forms for *preparing* the raw material for ſpinning, of which we ſhall ſpeak hereafter, we ſhall pauſe a while in the hiſtorical detail of theſe inventions, and explain the general principles of its conſtruction, and the mode in which its operation was performed. Previous to the year 1767, as we have already obſerved, all the ſpinning was performed on the domeſtic one-thread wheel, of which there were two kinds. The firſt, which we have before deſcribed, required the raw material to be previouſly prepared and carded, and was uſed for wool and cotton. The cardings were ſoft and looſe rolls of the thickneſs of a candle, and from eight to twelve inches long, poſſeſſing little ſtrength or tenacity, the ſlighteſt force being ſufficient to break or pull them aſunder. One end of this roll being held between the finger and thumb of the ſpinner, and the other twiſted round the point of the ſpindle, was rapidly drawn out during its revolution, and formed a coarſe ſoft thread called a *roving*. For coarſe woollen goods, this operation was ſufficient,

ficient, and the thread was ready for the loom, but for fine cloth, and more eſpecially for cotton, this operation of *twiſting* and *drawing* was repeated, and the roving was converted into a ſmaller, firmer, and longer thread. To this laſt operation, the term *ſpinning* was more particularly applied, the firſt being conſidered as preparatory, and was generally denominated *roving*. For ſome time after the introduction of the Jenney, this mode of roving on the ſingle ſpindle continued in uſe, the joining of the ſhort rolls or cardings, rendering manual dexterity abſolutely neceſſary.

The ſecond mode of ſpinning was on the flax wheel, and uſed for thoſe ſubſtances, whoſe fibres from their nature, but more particularly from their length, would not admit of the preparatory proceſs of carding. Their fibres were dreſſed and diſpoſed in an even and parallel direction, by an operation reſembling *combing*, and were then coiled round the head of the diſtaff, affixed to a wheel furniſhed with a ſpindle, bobbin, and fly. The fly and ſpindle moved together, and were kept in rapid motion by a wheel and band, worked by the foot of the ſpinner. The bobbin which received the thread, ran looſe upon the ſpindle, and moved only by the friction of its ends, in proportion as the fibres of the flax were diſengaged from the diſtaff, by the finger and thumb of the ſpinner, and were twiſted by the fly. If we ſuppoſe the machine itſelf to be left at liberty, and turned without the aſſiſtance of the ſpinner, the twiſted thread being drawn inwards by the bobbin, would naturally gather more of the material, and form an irregular thread, thicker and thicker, till at length the difficulty of drawing out ſo large a portion of the material as had acquired the twiſt, would become greater than that of ſnapping the thread, which would accordingly break. It is the buſineſs of the ſpinner to prevent this, by holding the material between the finger and thumb, and by ſeparating the hand during the act of pinching, that the intermediate part may be drawn out to the requiſite degree of fineneſs previous to the twiſt.

To accompliſh theſe ends by machinery, the object of Mr. Arkwright's invention, two conditions became indiſpenſably neceſſary. 1ſt. That the raw material ſhould be ſo prepared as to require none of that intellectual ſkill, which is capable of ſeparating the knotty or entangled parts as they offer themſelves. And 2dly. That it ſhould be regularly *drawn out* by certain parts reſembling the finger and thumb of the ſpinner. The firſt of theſe was completely fulfilled by the various machines and contrivances for the preparation of cotton for ſpinning, which ſir Richard afterwards invented and obtained a patent for; the ſecond was accompliſhed in his firſt and capital machine, ſince called the Twiſt, or Water Frame.

The contrivance for *drawing out* the thread conſtituted the great merit of the invention, the fly, bobbin, and ſpindle connected with it, being derived with little alteration from the flax wheel before deſcribed. It conſiſted of a pair of cylinders, ſlowly revolving in contact with each other, at a little diſtance from a ſecond pair revolving with greater velocity, the lower cylinder of each ſet being furrowed, or fluted, in the direction of its length, and the upper ones neatly covered with leather to enable them to hold the thread. If we ſuppoſe the end of a roving, or looſely twiſted thread, to be paſſed through the firſt pair only, it may readily be imagined that it will be gradually drawn off the bobbin, and paſs through the cylinders without ſuffering any other ſenſible change in its form or texture, than a ſlight compreſſion from the weight of the incumbent cylinder. But if from the firſt pair it be ſuffered to paſs immediately to the ſecond, whoſe ſurfaces revolve much quicker, it is evident that the quicker revolution of the ſecond pair, will *draw out* the cotton, rendering it thinner and longer, when it comes to be delivered at the other ſide. This is preciſely the operation which the ſpinner performs with his finger and thumb, and the application of this ſimple and beautiful contrivance to the ſpindle and fly of the common flax wheel produced that machine for which Mr. Arkwright's firſt patent was obtained, and which laid the foundation of all his ſubſequent diſcoveries.

Soon after the erection of his mill at Cromford, Mr. Arkwright made many improvements in the mode of preparing the cotton for ſpinning, and invented a variety of ingenious machines for effecting this purpoſe in the moſt correct and expeditious manner; for all of which he obtained a patent in the year 1775.

The validity of this ſecond patent was tried in the court of King's Bench, in the year 1781, and a verdict was given againſt him on the ground of the inſufficiency of the ſpecification, but on the 17th of February 1785, in the court of Common Pleas, before lord Loughborough, the queſtion was again tried, and he obtained a verdict, having eſtabliſhed by evidence the ſufficiency of the ſpecification.

This verdict, in conſequence of great numbers having engaged in the erection of machines during the interval of four years that had elapſed ſince the former deciſion, occaſioned conſiderable alarm, and raiſed up a hoſt of enemies, from whom a premium on each ſpindle was demanded, under the threat of immediate ſuit. An aſſociation was formed of the manufacturers principally concerned in the buſineſs, and another cauſe inſtituted by writ of *ſcire facias*, was tried before judge Buller in the court of King's Bench, on the 15th of June 1785, in which, after a very long trial, he was caſt on the ground of his not being the original inventor.

Conſcious that this was not the caſe, he moved in the court of King's Bench, on the 10th of November 1785, for a new trial; ſtating that, not being aware of the nature of the evidence to be brought forward on this trial for the firſt time after ſo many years had elapſed, he was then unprepared, but was now able to ſubſtantiate by proofs the falſity of great part of the evidence which went to that point. The rule however was refuſed, and on the 14th November 1785, the court of King's Bench gave judgment to cancel the letters patent.

The inventions claimed by Mr. Arkwright, which gave riſe to theſe reiterated conteſts with the rival manufacturers of Lancaſhire, related chiefly to the operation of carding, which was now brought to great perfection. Before we enter however into any account of theſe improvements, it will be neceſſary to take a ſhort view of the nature of this operation, and the mode in which it was performed at the date of Mr. Arkwright's ſecond patent.

The *card* is a kind of bruſh made with wires inſtead of hair, ſtuck through a ſheet of leather; the wires not being perpendicular to the plane, but all inclined one way in a certain angle.

From this deſcription, ſuch as are totally unacquainted with the ſubject, may conceive that cotton, being ſtuck upon one of theſe cards or bruſhes, may be ſcraped with another card in ſuch a direction, that the inclination of the wires may tend to throw the cotton *inwards*, rather than ſuffer it to come out. The conſequence of the repeated ſtrokes of the empty card againſt the full one, muſt be a diſtribution of the cotton more evenly on the ſurface, and if one card be then drawn in the *oppoſite* direction acroſs the other, it will, by virtue of the inclination of its wires,

take

take the whole of the cotton out of that card, whoſe inclination is the contrary way.

In this mode, the operation of carding was formerly performed by hand with ſheets of card nailed upon thin boards, which were drawn and ſcraped againſt each other, till the cotton or wool was evenly diffuſed over the ſurface, and freed from all the knotty or entangled parts. One of the cards being then turned and applied in an inclined poſition, ſo as to ſcrape with one edge over the ſurface of the other card, in the direction of its teeth, the cotton was, by a particular manœuvre, ſtripped off and coiled up into thoſe ſhort ſoft rolls which we have ſpoken of already under the name of *cardings*. Such, in all probability, was the proceſs employed with little alteration, during the five laſt centuries in the woollen manufacture of this kingdom, and applied at ſubſequent periods to the preparation of cotton. The uſe of cards was moſt likely derived from the Netherlands, at or before the time our woollen manufactures were improved by the emigration of Flemiſh weavers to this country, during the reign of Edward III.

They continued to be imported hither till the year 1463, when the tradeſmen and manufacturers of London, and other parts of England, having made heavy complaints to parliament of the obſtruction to their own employment by the introduction of various foreign manufactured wares, an act was paſſed in the third year of Edward IV., prohibiting *wool-cards*, and various other articles of iron, ſteel, copper, &c. from being imported into this kingdom.

The hand-cards were ſucceeded by ſtock-cards, and theſe again by cylinder cards, as we have already obſerved, which were firſt attempted about the year 1763.

This machine conſiſted of two or more large cylinders covered with cards, revolving in oppoſite directions, and nearly in contact with each other, and ſurmounted by other ſmaller cylinders covered in like manner, by whoſe revolutions in various directions, and with different velocities, the cotton was carded and delivered to the laſt or finiſhing cylinder, from which it was ſtripped off by different contrivances. The cards were nailed on in ſtripes, or ſheets of ſix or eight inches broad, and the margin of each ſheet in which the nails were driven, being deſtitute of teeth, formed ſo many intervals or furrows acroſs the ſurface of the cylinder.

The cotton was ſtripped off firſt by hand, as in Mr. Peel's machine, and afterwards by a fluted cylinder, or by a roller armed with ſlips of tin-plate or iron, ſtanding erect like the floats of an underſhot wheel, and which revolving quicker than the card, and in cloſe contact with it, ſcraped off the cotton in diſtinct portions from each ſtripe or ſheet, which fell into a receptacle below. This was a harſh and rude operation, and rubbed and injured not only the carding, but the cards themſelves. Mr. Arkwright ſubſtituted for the fluted cylinder a plate of metal finely toothed at the edge, and moved in a perpendicular direction rapidly up and down by a crank.

The ſlight, but reiterated ſtrokes of this comb, acting on the teeth of the cards, detached the cotton in a fine and uniform fleece. On the finiſhing cylinder alſo, narrow fillet-cards, as they are termed, wound round in a ſpiral form, were ſubſtituted for the ordinary cards nailed acroſs.

The *continuity* of the fleece was thus preſerved, which was deſtroyed before by the intervals or furrows we have alluded to, and being gradually contracted in its ſize, by paſſing through a kind of funnel, and flattened or compreſſed between two rollers, was delivered into a tin can in one *continued, uniform, perpetual carding*, ſo long as the machine continued in motion, and was ſupplied with the raw material.

This is, without exception, one of the moſt ſtriking and beautiful operations in the whole proceſs of ſpinning. Mr. Arkwright's right to the invention of the crank and comb was the diſputed point at the laſt hearing of this cauſe, and the evidence which he was unprepared to meet having proved to the ſatisfaction of the jury, the prior claim of a mechanic, named Heyes, his excluſive right, not only to this improvement, but to all others included in the ſame patent, was cancelled by the judgment of the court. How far Mr. Arkwright would have been able in the event of another hearing to have diſproved the evidence thus unexpectedly brought forward, is not eaſy to determine. That the crank had been applied in ſome way or other, prior to the date of Mr. Arkwright's patent, though in a much leſs efficacious and approved manner, we believe will admit of the fulleſt proof, and this circumſtance, in a caſe in which the intereſt of a great body of manufacturers was deeply concerned, and was oppoſed only by that of a ſingle individual, would, in all probability, have confirmed the former deciſion in a court already weary of the diſcuſſion.

The improvement, as far as Mr. Arkwright was concerned, was original, and undoubtedly his own, and bears evident marks of that genius and happy invention which ſo ſtrongly characterize every part of his machinery. He was anticipated in a ſingle idea before it was matured and brought forth, and in this inſtance loſt the fruits of his induſtry and talents. His claim to the ſpiral cards, which produce the endleſs, or perpetual carding, has however never been diſputed. At the ſame time Mr. Arkwright brought forward other machines peculiarly adapted to the preparation of the materials for his own mode of ſpinning, and founded on the principle of his former invention. The firſt of theſe, in the ſeries of ſucceſſive operations, is the *drawing frame*.

This machine conſiſts of a ſyſtem of rollers ſimilar to thoſe before deſcribed in the twiſt frame, revolving with different velocities, either from the variation of ſize in the pairs of rollers, their performing a different number of revolutions in the ſame ſpace of time, or from both theſe cauſes united. Three or more cardings coiled up in deep tin cans are applied at once to theſe rollers; in their paſſage through which, they not only coaleſce ſo as to form one ſingle *drawing*, but are alſo drawn out or extended in length. This proceſs is ſeveral times repeated; three, four, or more drawings, as they are now termed, being united and paſſed between the rollers; the number introduced being ſo varied, that the laſt drawing may be of a ſize proportioned to the fineneſs of the thread into which it is intended to be ſpun. By this operation, the fibres of the cotton are drawn out longitudinally, and diſpoſed in an uniform and parallel direction, and all inequalities of thickneſs are done away by the frequent doubling or joining of ſo many different lengths.

A third machine was contrived by Mr. Arkwright for giving the neceſſary degree of twiſt to theſe prepared lengths of cotton. In the ſtate in which it comes from the drawing frame, it has little ſtrength or tenacity, and is received into ſimilar deep cans, from whence it was paſſed through the rollers. To enable it to ſupport the operation of winding, it is again paſſed through a ſyſtem of rollers ſimilar to thoſe in the laſt machine, and received in a round conical can revolving with conſiderable ſwiftneſs. This gives the drawing a ſlight twiſting, and converts it into a ſoft and looſe thread, now called a roving, which is wound by the hand upon a bobbin, by the ſmaller children of the mill, and then carried to the ſpinning or twiſt frame, of which we have already ſpoken.

Such

Such are the inventions and improvements for which we are indebted to the genius of Mr. Arkwright, and which compleat a ſeries of machinery, ſo various and complicated, yet ſo admirably combined and well adapted to produce the intended effect in its moſt perfect form, as to excite the admiration of every perſon capable of appreciating the difficulty of ſuch an undertaking. And that all this ſhould have been accompliſhed by the ſingle efforts of a man without education, without mechanical knowledge, or even mechanical experience, is moſt extraordinary, and affords a ſtriking inſtance of the wonderful powers diſplayed by the human mind, when its powers are ſteadily directed to one object.

Yet this was not the only employment of this eminent man, for at the ſame time that he was inventing and improving the machinery, he was alſo engaged in other undertakings, which any perſon, judging from general experience, muſt have pronounced incompatible with ſuch purſuits. He was taking meaſures to ſecure to himſelf a fair proportion of the fruits of his induſtry and ingenuity; he was extending the buſineſs on a large ſcale; he was introducing into every department of the manufacture a ſyſtem of induſtry, order, and cleanlineſs, till then unknown in any manufactory where great numbers were employed together, but which he ſo effectually accompliſhed, that his example may be regarded as the origin of almoſt all ſimilar improvements.

When it is conſidered, that during this entire period he was afflicted with a grievous diſorder (a violent aſthma) which was always extremely oppreſſive, and threatened ſometimes to immediately terminate his exiſtence, his great exertions muſt excite aſtoniſhment. For ſome time previous to his death, he was rendered incapable of continuing his uſual purſuits, by a complication of diſeaſes, which at length deprived him of life, at the Rock Houſe, Cromford, on the 3d of Auguſt 1792, in the 60th year of his age.

The honour of knighthood was conferred on him in December 1786, on the occaſion of preſenting an addreſs to his majeſty.

In the infancy of the invention, ſir R. Arkwright expreſſed ideas of its importance, which to perſons leſs acquainted with its merits appeared ridiculous, but he lived long enough to ſee all his conceptions more than realized in the advantages derived from it, both to himſelf and his country; and the ſtate to which thoſe manufactures dependant on it have been advanced ſince his death, makes all that had been previouſly effected appear comparatively trifling.

The ſyſtem of ſpinning introduced by ſir Richard was found moſt particularly applicable to the production of thread for warp, whilſt the Jenney of Hargreaves was chiefly employed in ſpinning the woof, or weft, for the coarſe kinds of which it was better adapted, indeed, than the more perfect machine of ſir Richard.

On theſe machines were ſpun for ſome years after their introduction all the twiſt and weft in the kingdom; the uſe of the Jenney has, however, ſince been almoſt wholly ſuperſeded by a third machine, called a Mule, for the invention of which we are indebted to the ingenuity of Mr. Samuel Crompton of Bolton.

The mule was invented about the year 1776, during the term of ſir Richard's patent right, and did not on that account come into general uſe till after its expiration. It is a compound of the two machines of Arkwright and Hargreaves, and is conſidered, as its name imports, as the offſpring of the twiſt frame and Jenney. It conſiſts of a ſyſtem of rollers like thoſe of the twiſt frame, through which the roving is drawn and received upon ſpindles, revo'ving like thoſe of the Jenney, and from which it acquires the twiſt. The carriage on which the ſpindles are diſpoſed is moveable, and receding from the rollers ſomewhat quicker than the thread is delivered, draws or extends it in the ſame manner as is done by the Jenney. See MULE.

This compleats the ſeries of machines now in uſe, and is the only important diſcovery in ſpinning ſince the invention of ſir Richard Arkwright, on which indeed its chief merit is founded.

Of its excellence, and alſo of thoſe other machines employed in the different preparatory proceſſes, ſome idea may perhaps be formed, when it is ſtated that a pound of fine cotton has been ſpun on the mule into 350 hanks, each hank meaſuring 840 yards, and forming together a thread 167 miles in length.

Hitherto we have entered only into ſuch details of the different proceſſes of ſpinning as were neceſſary to elucidate the hiſtory of their invention, and exhibit both the ſources and progreſs of the various improvements.

The operations which cotton undergoes in its paſſage from the raw material to the ſtate of thread, are various and multiplied in proportion to the fineneſs required, and the different uſes to which it is deſtined.

If we analize theſe operations, they reſolve themſelves into the following: Batting, carding, doubling, drawing, and twiſting. The three latter are never performed ſingly, but are variouſly joined in the ſame machine; and the ſame elementary proceſſes are oftentimes repeated in different machines, with various and different effects.

With reference to theſe effects, the operations which cotton undergoes, may be denominated batting, carding, drawing, and doubling, roving, and ſpinning.

Batting, is that operation which prepares the cotton for carding, by opening and diſengaging the hard compreſſed maſſes, in which it comes from the bales.

It is performed by beating the cotton with ſticks on a ſquare frame, acroſs which are ſtretched ſmall cords, about the thickneſs of a gooſe quill, with intervals ſufficient to ſuffer the ſeed, leaves, and other adventitious matter to fall through.

When a hard matted or compreſſed maſs of cotton is ſmartly ſtruck with a ſtick, the natural elaſticity and reſiliency of its fibres, gradually looſen and diſengage them, and the cotton recovers by repeated ſtrokes all its original volume. During this operation the ſeeds, &c. which adhere, are carefully picked out by the hand, and the cotton rendered as clean as poſſible.

Batting is generally and beſt performed by hand, though the ſcarcity of hands and coſt of labour have rendered other contrivances neceſſary. For a deſcription of the batting machine, with other particulars relative to this operation, ſee MACHINE.

Carding, is that operation in which the firſt rudiments of the thread are formed. It is performed, as we have before ſtated, by cylinders covered with wire cards, revolving with conſiderable ſwiftneſs in oppoſite directions, nearly in contact with each other, or under a kind of dome or covering, the under ſurface of which is covered with ſimilar cards, whoſe teeth are inclined in a direction oppoſite to thoſe of the cylinder.

By this means the ſeparation of almoſt every individual fibre is effected, every little knotty or entangled part diſengaged, and the cotton ſpread lightly and evenly over the whole ſurface of the laſt or finiſhing cylinder, from which it is ſtripped by the contrivance we have already deſcribed.

For Jenney ſpinning, which is ſtill in uſe for the coarſer kinds

kinds of thread, the cardings are ſtripped off in ſeparate lengths. The finiſhing cylinder is covered with the ordinary cards nailed on in ſtripes acroſs, and the cotton contained between the margins or intervals of each ſtripe, forms one carding, whoſe length of courſe depends on the width of the engine, or cylinder. When ſtripped off by the crank and comb, it forms a looſe and ſhapeleſs film, which falling on the ſurface of a plain wooden cylinder, the lower half of which revolves within a hollow ſhell or caſing, the cotton in its paſſage is rolled up and delivered at the other ſide in perfect and cylindrical cardings.

For mule or water ſpinning, the finiſhing cylinder is covered with ſpiral or fillet-cards, and the cotton being taken off in one continued fleece, and contracted by paſſing through the funnel and rollers, forms one endleſs and perpetual carding, which is interrupted only, or broken, when the tin can that receives it is compleatly filled.

In the Jenney carding, the fibres of the cotton are diſpoſed acroſs or at right angles to the axis of the carding; in the perpetual carding they are diſpoſed longitudinally, or in the direction of its length, and it is this circumſtance which renders the carding deſtined for mule or water ſpinning, inapplicable to the Jenney, and *vice verſâ*. For further details, and a deſcription of the carding engine, we muſt refer our readers to the article ENGINE.

Drawing, and *Doubling*, is one of the preparatory proceſſes for which we are indebted wholly to ſir Richard Arkwright, and belongs excluſively to the mule, or water ſpinning.

The doubling, or paſſing three or four cardings at once through a ſyſtem of rollers, by which they are made to coaleſce, is intended to correct any inequalities in the thickneſs of the cardings, and alſo to admit of their being frequently drawn out or extended by paſſing through the rollers. The effect of this frequent drawing is to diſpoſe the fibres of the cotton longitudinally, and in the moſt perfect ſtate of parallelism. The operation of carding effects this in a certain degree; yet the fibres, though parrallel, are not ſtraight but doubled, as may eaſily be ſuppoſed from the teeth of the cards catching the fibres ſometimes in the middle, which become hooked or faſtened upon them. Their diſpoſition is alſo farther diſturbed by the taker-off or comb, which ſtrips them from the finiſhing cylinder; and though the general arrangement of the fibres of a carding is longitudinal, yet they are doubled, bent, and interlaced in ſuch a way, as to render the operation we are now ſpeaking of abſolutely neceſſary.

When the cardings have been paſſed four or five times through the drawing frame, every fibre is ſtretched out at full length, and diſpoſed in the moſt even and regular direction; and though the average length of a fibre of cotton is not two inches, yet the finiſhed drawing, as theſe prepared cardings are now termed, has all the appearance of a lock of Jerſey wool, whoſe fibres, ſix or eight times as long as thoſe of cotton, have been carefully and ſmoothly combed.

Roving, is that operation by which the prepared cotton, as it comes from the carding engine, or drawing frame, is *twiſted* into a looſe and thick thread, and wound upon a ſpindle or bobbin.

In Jenney ſpinning, the cardings are roved without any other preparation, by a machine called a roving billy, for a deſcription of which, with other particulars relative to Jenney ſpinning, ſee JENNEY.

In mule or twiſt ſpinning, the prepared carding or drawing, as it is termed, is again paſſed through a ſyſtem of rollers, and is twiſted, either by a rapidly revolving can, into which it is delivered from the rollers, or by a fly and ſpindle ſimilar to thoſe of the flax wheel; in the latter caſe it is wound on the bobbin by the machine; in the former it is received in the conical can in which it acquires the twiſt, and is afterwards wound upon bobbins by the ſmaller children of the mill.

Sir Richard Arkwright always employed the revolving can, and it is ſtill employed in many of the firſt mills in the country. The roving frame with fly and ſpindle, which is in fact nothing more than the twiſt frame of ſir Richard, is now however very generally in uſe, eſpecially ſince later improvements have removed objections to the machine, which rendered its uſe heretofore inconvenient. See FRAME.

The operations through which the thread paſſes after it has received the firſt twiſt are various, and depend greatly on the uſe it is intended for.

The finer it is required, the oftener it is drawn out and twiſted, till by degrees, as in the proceſs of wire-drawing, it is brought down to the fineneſs required. The rovings are therefore diſtinguiſhed into firſt, ſecond, and third, according to the number of operations they have gone through.

Spinning, is the laſt operation which the thread undergoes in the ſeries of proceſſes employed in converting it into thread, and is that in which it receives the final extenſion and twiſting.

It is performed either on the Jenney, twiſt frame, or mule. Of theſe machines we have already ſpoken generally, and alſo of the nature of their operation; for further and more particular details, we muſt refer our readers to their proper heads.

Such are the operations by which the raw material is brought into the ſtate of thread, and ſuch the improvements by which the cotton manufacture of this kingdom has arrived at its preſent unexampled ſtate of proſperity. We cannot give our readers a better idea of the effects immediately reſulting from theſe various improvements and diſcoveries, than by the following extracts from a pamphlet, publiſhed in the year 1788, intitled, "An important Criſis in the Calico and Muſlin Manufactures of this Country explained;" the purport of which was to warn the nation of the bad conſequences which would reſult from the rivalry of the Eaſt India cotton goods, which then began to be poured into the market in increaſed quantities, and at diminiſhed prices.

The author aſſerts, that, not above 20 years before the time of his writing, the whole cotton trade of Great Britain did not return 200,000*l.* to the country for the raw material, combined with the labour of the people; and at that period, before the introduction of the twiſt frame and Jenney, the power of the ſingle wheel could not exceed 50,000 ſpindles:

In 1787, the number of cotton mills, as near as intelligence could be procured, was as follows:

In Lancaſhire	41	Flintſhire	3
Derbyſhire	22	Pembrokeſhire	1
Nottinghamſhire	17	Lanerkſhire	4
Yorkſhire	11	Renfrewſhire	4
Cheſhire	8	Perthſhire	3
Staffordſhire	7	Edinboroughſhire	2
Weſtmorland	5	Reſt of Scotland	6
Berkſhire	2	Iſle of Man	1
Reſt of England	6		
	119		24

The

The whole being 143, the coſt of which was eſtimated at - - -	£ 715,000
There were at the ſame time 550 mules, and 20,700 Jennies, containing, together with the water frames, 1,951,000 ſpindles; the coſt of which, and of the auxiliary machine y, together with that of the buildings, is ſtated to have been at leaſt - - - -	285,000
The total expenditure being	£ 1,000,000

Theſe eſtabliſhments, when in full employment, were eſtimated to produce as much cotton yarn as could be ſpun on the ſingle ſpindle by a million of perſons; and inſtead of diminiſhing the employment of the people as was apprehended, they called vaſt numbers from idleneſs to comfortable independence. At this time they were ſuppoſed to give employment to 26,000 men, 31,000 women, and 53,000 children in ſpinning alone; and in all the ſubſequent ſtages of the manufacture the number of perſons employed, was eſtimated at 133,000 men, 59,000 women, and 48,000 children, making an aggregate of 159,000 men, 90,000 women, and 101,000 children, in all 350,000 perſons employed in the different branches of the cotton manufacture.

The quantity of the raw material conſumed in this manufacture, which in 1781 did not amount to 6,000,000 lbs., in the year 1787 exceeded 22,000,000. The aſtoniſhing rapidity of this increaſe, which will be more clearly ſhewn by the following ſtatement, is to be in a great meaſure attributed to the extenſion of the manufacture to the goods of India, particularly calicoes and muſlins.

Cotton uſed in the Manufactures of Great Britain.

Years.	Pounds.	Suppoſed value when Manufactured.
1781	5,101,920	£ 2,000,000
1782	11,206,810	3,900,000
1783	9,546,179	3,200,000
1784	11,280,238	3,950,000
1785	17,992,888	6,000,000
1786	19,151,167	6,500,000
1787	22,600,000	7,500,000

The cotton imported for the manufacture of 1787, was of the following growth:

Britiſh Weſt India, eſtimated at	6,600,000 lbs.
French and Spaniſh ſettlements	6,000,000
Dutch Settlements	1,700,000
Portugueſe ditto	2,500,000
Eaſt India, procured from Oſtend	0,100,000
Smyrna and Turkey	5,700,000
	22,600,000

The application of this cotton to the different branches of manufacture was ſuppoſed, by intelligent perſons, to have been as follows:

Candlewicks - -	1,500,000 lbs.
Hoſiery - -	1,500,000
Silk and Linen mixtures -	2,000,000
Fuſtians - -	6,000,000
Calicoes and Muſlins - -	11,600,000
	22,600,000

In the branches applicable to muſlin and calico alone, it was calculated that employment was given in England and Scotland to 100,000 men and women, and at leaſt 60,000 children.

The progreſs of the Iriſh in the ſame line of induſtry muſt not be overlooked, and the laudable and ſpirited exertions of captain Robert Brooke deſerve to be more particularly noticed. In the year 1780, that gentleman eſtabliſhed a cotton manufactory on his lands ſituated on the great canal about 18 miles W. of Dublin. In 1782, the government of Ireland, underſtanding that ſome of the manufacturers of Mancheſter intended to remove to America, and carry their machinery with them, found means to perſuade them to go to Ireland, and gave captain Brooke about 3000 *l.* for ſettling them in houſes upon his lands, and they afterwards advanced him 32,000 *l.* upon intereſt and ſecurity, that he might give employment to a great number of weavers who were then ſtarving and riotous for want of employment in Dublin. By means of theſe and other acquiſitions of inhabitants, the manufacturing village which was called Proſperous, conſiſted now of ſeveral hundred houſes, erected on a ſpot where, in the year 1780, there ſtood one ſingle hut; and the manufacture gave employment to about three thouſand men, women, and children. Beſides captain Brooke's, which was the principal one, there were at this time ſeveral other manufactures of cotton eſtabliſhed in various parts of Ireland by the ſpirited exertions of individuals, and the liberal encouragement of parliament.

It may be proper here to obſerve, that two ſpinning mills were eſtabliſhed in France, near Rouen, under the direction of Mr. Holker, an Engliſh manufacturer, who, with his partners, was aſſiſted and patronized by the French government: and it was not long before Arkwright's machinery was even tranſported acroſs the Atlantic, and a ſpinning mill erected in Philadelphia.

Calicoes were firſt brought hither from India in the year 1631, and derived their name from the province of Calicut, where they were chiefly made or exported. They were firſt manufactured in this country about the year 1772, or 1773. Various attempts had been made previous to this time to manufacture cloth with cotton warp or web, but owing to the imperfection of the twiſt or yarn, ſpun either on the one thread wheel or Jenney, they all proved unſucceſsful. The warp was too flimſy, and unable to ſupport the ſtretch or tenſion of the loom, or when it did, too ſoft to form a cloth of firm and uſeful texture. The improvements that rapidly followed the introduction of machine ſpinning, and more eſpecially thoſe of ſir Richard Arkwright, ſoon remedied this defect; yet, though moſt excellent yarn or twiſt was produced, the manufacturers could not at firſt be prevailed upon to weave it into calicoes. Mr. Strutt, therefore, of Derby, in conjunction with Mr. Samuel Need, both in partnerſhip with ſir Richard Arkwright, attempted the manufacture of calicoes about the year 1773, and proved ſucceſsful; yet after a large quantity had been made, it was diſcovered that they were ſubject to double the duty (*viz.* 6*d.* per yard) of cottons with linen warp, and when printed were prohibited. They had therefore no other reſource than to aſk relief of the legiſlature, which after great expence and oppoſition, they at length obtained, and thus laid the foundation of a branch of manufacture which has ſince become one of the moſt important in the kingdom.

The manufacture of calicoes was begun at Blackburn, in Lancaſhire, about this period alſo, at firſt from twiſt ſpun in the neighbourhood upon Jennies, but afterwards principally

from the water twiſt. The goods manufactured here before the introduction of calicoes, were *Blackburn greys*, made of cotton woof, but linen warp of Hamburgh or Iriſh yarn, but chiefly of the latter. Theſe goods, which were the calicoes of that day, were manufactured as early as the year 1727, at which period all the cotton goods, ſuch as pillows, jeans, jennets, moſt of the cords and thickſets were made with linen warp, and even the warps for dimities were half linen. The Blackburn greys were ſold in the unbleached ſtate to the calico-printers of London, and afterwards to thoſe of Lancaſhire and Cheſhire, till the introduction of the real calico put a ſtop to this manufacture about the year 1775.

Blackburn has ſince become the great mart for calicoes, and the chief ſource from whence the printers of Lancaſhire, as well as thoſe of London and Scotland, are ſupplied.

The quantity manufactured, or rather ſold there, (for the Blackburn houſes employ weavers in all parts of the ſurrounding country, and even at conſiderable diſtances) amounted a year or two ago to upwards of one million pieces annually. The quantity now made is perhaps leſs than this, but of finer quality, a larger capital is employed, and the manufacture is on the increaſe.

The quantity of calicoes manufactured in the whole kingdom, not twenty years ago, was little more than half what the Blackburn market now affords, and it is probable that this forms but a ſmall part of the quantity annually made in this country. They are chiefly printed into garments, ſhawls, and furnitures, both for home conſumption, and a conſiderable foreign trade. The finer ſorts are worn as dreſſes, white or plain, and large quantities are uſed for linings, and other purpoſes for which the coarſer kinds of linen were formerly employed.

The lightneſs, as well as cheapneſs, of the calicoe, has rendered it a chief article of dreſs amongſt all claſſes of people, and annihilated the manufacture of many of the lighter kinds of woollen and worſted ſtuffs, formerly ſo much in demand. The trade of Halifax, and the ſurrounding country, which conſiſted almoſt wholly in ſuch ſtuffs, has gone entirely to decay, and been replaced by the manufacture of calicoes and other cotton goods: and ſuch are the quantities now manufactured, more eſpecially in the country around Colne, and thence to Bradford, that from 16 to 20,000 pieces are brought weekly to the Manchester market; the produce of thoſe diſtricts which adjoin, or are included between theſe two towns.

To the ſame improvements in ſpinning which gave birth to the manufacture of calicoes, we are indebted for that of muſlin, a branch not leſs important to the country than honourable to our pride and induſtry as manufacturers. For this elegant article of dreſs all Europe had long been tributary to India, where the manufacture has, through the long laps of ages, arrived at the greateſt perfection. Muſlins were firſt introduced into this country by the Eaſt India company, about the year 1670, before which time cambrics and Sileſia lawns were worn, and ſuch fine linens from Flanders and Germany, as were brought back in exchange for our woollen manufactures of various kinds exported thither in conſiderable quantities. The manufacture was attempted at Paiſley as early as the year 1700. A few looms were employed, but this trade was ſoon annihilated by the introduction of the goods of India. Eighty years afterwards a more ſucceſsful rivalſhip commenced. Britiſh muſlins were firſt ſucceſsfully introduced in the year 1781, but were carried to no great extent till 1785, ſince which period their progreſs has been rapid beyond all example. In the year 1787, it was computed, that not leſs than 500,000 pieces of muſlin, including ſhawls and handkerchiefs, were annually made in Great Britain. The manufacture has, from that time to the preſent, continued progreſſively to increaſe and improve, and bids fair to become the moſt lucrative and extenſive of any in this country. The rapidity with which it approaches to perfection, and its ſurpriſing extent in the ſhort ſpace of twenty years, are amongſt the many important conſequences that have reſulted from the improvements in the art of ſpinning.

By the cheapneſs and ſuperior quality of our yarn, we are enabled to employ thouſands of looms in the production of this elegant and uſeful article of dreſs, to keep in this country millions of ſpecie which was heretofore ſent to the Eaſt to purchaſe this commodity, and to clothe ourſelves with this fabric at one-third of the expence formerly required. The demand for, and the uſe of this article, are proportionate to its cheapneſs and elegance, and it is not difficult to ſee that it will become a ſtaple manufacture of this country.

Glaſgow and Paiſley in Scotland, and Bolton in Lancaſhire, are the chief ſeats of this manufacture, which is however conſiderably extended over many other parts of the country. India ſtill maintains her ſuperiority in the finer kinds of muſlin, ſome of which of moſt exquiſite beauty and fineneſs are ſold in this country, as high as ten or twelve guineas *per* yard. In productions like theſe, no rivalſhip can exiſt; in India they are looked on as maſter pieces of art, and the time employed by an Indian weaver in their production would ruin an European.

The common kinds, or ſuch as are more adapted to general uſe, are alſo preferred by our Engliſh ladies to thoſe of home manufacture, on the ſcore of their enduring greater hardſhips and retaining their colour, or rather whiteneſs, better. This excellence, which exiſts to a certain degree, is the reſult of no ſuperiority in the manufacturing proceſſes, but in the raw material, of which that of India is the fineſt and beſt in the world.

Muſlins were manufactured at Zurich and St. Gall in Switzerland long before we ſucceeded, yet ſuch were the advantages which the improvements in ſpinning afforded us, that till within theſe few years (during which the unſettled ſtate of the continent has interrupted, and in ſome countries annihilated, all commercial intercourſe) we ſupplied all Europe with muſlins, not only of Indian, but Britiſh manufacture.

Nankeens and ginghams were manufactures, which, without the improvements of the ſpinner, could not poſſibly have ſucceeded.

Theſe articles, like the two preceding, were formerly brought from the Eaſt excluſively. Fuſtians, dimities, jeans, quiltings, velvets, velverets, velvetteens, and a variety of cotton goods, which the limits of our article will not allow us to particularize, have been improved to ſuch a pitch, that Manchester has ſupplied all Europe with theſe fabrics.

Cotton hoſiery forms no inconſiderable part of this immenſe manufacture, and it was the demand for cotton thread for the ſtocking weavers, that urged forward the improvements of Mr. Arkwright, and held out ſuch ſtrong inducements to thoſe whoſe aſſiſtance firſt enabled him to give his invention to the world.

Excluſive of theſe various manufactures, great quantities of twiſt were exported to the continent, and a conſiderable part of the yarn ſpun in Manchester, before the late diſaſtrous occurrences in Germany, was employed in the foreign loom. It was this demand for twiſt, which our continental rivals were unable to produce of equal quality

or

or price with ours, which raiſed this branch of the cotton manufacture to a ſtate of proſperity, of which ſome idea may be formed, when it is ſtated that the various eſtabliſhments for ſpinning only in this country, when in full activity, give employment to near 180,000 perſons, a number little ſhort of that which is employed in France in all the different branches of the cotton mannfacture together, and which, according to the report of Chaptal, late miniſter of the Interior, amounts to near 200,000

The value of theſe improvements in ſpinning was ſo obvious and ſo important, that it is not ſurpriſing they were ſoon diffuſed over the continent, notwithſtanding every precaution uſed to prevent it. By the emigration of mechanics, and the clandeſtine exportation of machinery conſtructed here, our neighbours ſoon became poſſeſſed of our improvements, and had we paused in our exertions, the ſuperiority we had acquired would long ere this have paſſed away. France, as we have juſt obſerved, has a great population employed in the manufacture of cotton. Pruſſia and Germany have many and increaſing eſtabliſhments, and in the two former countries, and in the hereditary dominions of the emperor of Germany, our piece goods have been long prohibited.

Our ſpinners however, by their ingenuity, and the improvement and perfection of their machines, have ſtill kept the lead; and the attention of our manufacturers is now directed to the perfection of thoſe operations more immediately connected with the labours of the loom, in which, till within theſe few years, little has been done. Every day brings forth new diſcoveries, and it is not difficult to ſee that what has already been atchieved, and what, from the general ſpirit of improvement which is now abroad, muſt inevitably follow, will ſoon place us far beyond the reach of competition in the manufacture of cotton goods, and give us advantages greater than ever we enjoyed ſince its firſt eſtabliſhment in this country. Before we enter into ſuch a detail of theſe improvements however, as will enable our readers fully to comprehend their nature and extent, it will be proper to take a ſhort view of the different operations and proceſſes through which the thread paſſes in its progreſs from the hands of the ſpinner to the loom.

The thread is of two kinds, viz. *twiſt*, ſo called from its being harder twiſted than the other, forming a ſtouter thread, and uſed for the web or warp of piece goods, and *weft*, which is a looſer, ſofter thread, and uſed for the woof. The *weft* is delivered to the weaver in ſmall oblong rolls called *cops;* in the ſtate they are ſtripped off the ſpindles of the mule or Jenney. When theſe are uſed, a ſmall pointed piece of wood or ſkewer is carefully paſſed through the axis of the cop into the place formerly occupied by the ſpindle, and one end of it being held between the teeth, the thread is wound off the cop upon the weaver's bobbin by a wheel ſomewhat ſmaller in ſize, but the ſame in principle as the common one thread wheel on which all the ſpinning was formerly performed.

This is generally done by children, and the bobbins are then ready for the ſhuttle. Twiſt undergoes ſeveral operations before it is ready for the loom. It is delivered by the ſpinner either in *hank*, or *cop*.

Hank twiſt is that which is ſpun on the water frame, from the bobbins of which it is *reeled* into hanks of a determinate length, each meaſuring 840 yards. The value and fineneſs of the thread are proportionate to the number of hanks in a pound, and they are denominated by numbers, as Nos. 20, 50, 100, &c. which expreſs the hanks which a pound of twiſt contains. In this ſtate it is generally *ſized*, an operation which is intended to give additional ſtrength and tenacity to the thread, and enable it to ſupport the different operations in its paſſage to the loom. It conſiſts in impregnating the thread fully with thin ſize, chiefly formed of wheat flour boiled in water, with the addition of a little glue. The twiſt is carefully worked in this and afterwards wrung and dryed. The thread acquires conſiderable ſtrength by this operation, and the looſe fibres are all firmly attached or glued to its ſurface. It is then delivered to the winder.

Winding is that operation by which the thread is tranſferred to the warping bobbin, either from the cop, hank, or twiſt frame bobbin.

Formerly this was chiefly done by females, and the work was carried home and performed by any of the family not engaged in domeſtic concerns, on a ſmall wheel that turned two bobbins at a time.

This mode is ſtill in uſe, but the work has been greatly abridged and facilitated by the uſe of machines of various conſtructions, for a deſcription of which, ſee MACHINE.

Cop twiſt is that which is ſpun on the mule or Jenney. It is reeled only occaſionally to aſcertain its value and fineneſs, and is delivered in cops to the winder.

The next operation is that of *warping*, or the formation of the web. The machine on which this is performed is an octagonal priſm five or ſix feet high, and ſomewhat leſs in diameter, revolving vertically, and put in motion by a band and pulley placed under the ſeat of the warper. The bobbins which furniſh the thread are ſuſpended horizontally in a frame on one ſide. Twenty-eight or thirty threads, forming together a ſyſtem called a *half beer*, are wound round the priſm in a ſpiral form from top to bottom. The machine is then turned the contrary way, and the thread wound round the priſm upwards from bottom to top, and this is repeated backwards and forwards till a ſufficient number of *half beers* have been wound to form a web of the breadth required.

When finiſhed, and the ends properly ſecured, the whole is wound off and coiled upon the hand into a round ball called the *warp*. For further particulars of this operation, and a deſcription of the machine, ſee MILL.

If the thread has been previouſly ſized in the hank, it is now ready for the loom, but if the warp is made of cop twiſt, that operation is next performed.

The warps are boiled ſeveral hours in water till they are thoroughly penetrated and ſoftened; after draining ſome time they are then uncoiled and worked in the ſize till fully impregnated, after which the ſuperfluous ſize is ſqueezed out, and they are ſuſpended on poles to dry: the warp is then ready for the loom.

Without this operation of ſizing, which, as we have before obſerved, gives ſtrength and tenacity to the thread, it would not ſupport the friction of the loom. Two threads are paſſed between each dent of the reed, and at each ſtroke of the treadle one aſcends whilſt the other deſcends. There is therefore a conſtant friction of the threads upon each other, as well as againſt the teeth of the reed. The motion of the reed itſelf alſo backwards and forwards, and of the healds up and down, is very ſevere upon the warp, and unleſs it has been well penetrated by the ſize, and its fibres well cemented or glued together, this continual rubbing is ſufficient to deſtroy its texture.

Good ſizing prevents this, but it is ſtill further aided by another operation called *dreſſing*, which is performed by the weaver himſelf after the warp is got into the loom. This conſiſts firſt in applying with a bruſh a kind of paſte made

of wheat flour well boiled, to which is often added a ſmall portion of common ſalt; ſometimes of potaſh, and ſometimes even a little tallow.

It is in fact a repetition of the operation of ſizing, with this difference, that the dreſſing is applied chiefly to the ſurface of the thread, which is ſlightly ſmeared with the paſte, and bruſhed uniformly in one direction from the healds to the beam, by which means the looſe fibres are all diſpoſed evenly one way, and firmly glued faſt to the thread.

In ſummer the warp is dried ſimply by fanning it, but in winter, and in damp cold weather, a hot iron is lightly paſſed over it. It is then dreſſed again with a bruſh dipped in tallow or butter, with which it is ſlightly greaſed. This gives ſuppleneſs and ſmoothneſs to the thread, and greatly diminiſhes the friction of the healds and reed. As ſuch a portion of the warp as is extended between the healds and beam can alone be dreſſed at one time, this is woven, and the dreſſing repeated again upon another portion, and ſo on alternately dreſſing and weaving till the whole of the web is finiſhed.

Various improvements on theſe different proceſſes have taken place during the laſt ſix or eight years, which have made greater or leſs progreſs in proportion to their importance. We ſhall enumerate, therefore, not only thoſe of recent date, but ſuch as, though known ſome time, have not been generally adopted.

The weaver's bobbin is ſtill wound by hand in the manner already deſcribed, though the uſe of a ſmall machine, by which twenty bobbins or upwards are wound at once, is daily gaining ground. They are to be ſeen now in almoſt every weaver's cottage where ſeveral looms are employed. This labour is further abridged by a very ingenious contrivance for which a patent has been obtained. The cops, inſtead of being wound, are compreſſed or ſqueezed till they are ſmall enough to enter the ſhuttle. The winding here is done away, and the cops thus compreſſed are preferred, by the weavers to the common bobbin. In thoſe large eſtabliſhments where the different proceſſes, ſuch as ſpinning and weaving, are carried on together, the cops are ſpun ſmall enough to enter the ſhuttle without compreſſion. The weft is transferred at once from the ſpindle of the mule to the weaver's ſhuttle, and the time and waſte of winding, and even of compreſſing, ſaved entirely.

On the ſame principle alſo, a conſiderable reduction has been made in the labour of reeling and winding twiſt. Till within a late period, the practice has uniformly been to reel it into hanks from the bobbin it was ſpun on, to ſize it in the hank, and then wind it for warping. An obvious reduction of this labour is to warp it directly from the bobbin it is ſpun on, and ſize it in the warp like cop twiſt. For reaſons, however, which it will not be neceſſary here to enter into, this has been found impracticable. It is, however, transferred to the warping bobbin without the intermediate labour and waſte of reeling, and the ſizing is done in the warp.

Conſiderable improvements in the mode of ſizing have been made within theſe few years, eſpecially in the ſizing of warps.

Formerly, the practice was to work the warp in the warm ſize by the hand, the heat of which was of courſe limited to that degree which could be readily borne by the workman. Experience having proved that the hotter the ſize, the more evenly and perfectly was the warp penetrated, various contrivances were adopted for applying it at a high temperature. Amongſt others are oblong troughs furniſhed with ſeveral pairs of rollers, through which the warp paſſes, and is ſtrongly compreſſed whilſt immerſed in the hot ſize. Mr. Marſland's idea of placing the twiſt in an exhauſted receiver, and admitting the hot ſize, promiſes conſiderable advantages in ſome caſes, and when the plan has been matured, will no doubt be ſuſceptible of many applications.

But the greateſt improvement that has been made in theſe different proceſſes, and one that muſt eventually effect a compleat revolution in the whole ſyſtem, is Meſſrs. Ratcliffe and Roſs's mode of dreſſing. Hitherto this operation has been performed by the weaver in the manner we have already deſcribed, at the expence of one-third of his time and labour. As it is only poſſible for him to dreſs at once as much of the work as is contained between the healds and beam, he is ſcarcely got ſettled to his work, after each operation, before he is again called off to dreſs another portion. By this continual interruption of one ſpecies of labour by another totally different, it muſt be obvious to every one, that not only much time is loſt, but that the labour itſelf cannot be equally well performed.

There is a delicacy and certainty of touch in weaving, dependant on long habit and experience, and on which the evenneſs and goodneſs of the cloth depends.

If the force with which the woof or weft is driven up by the reed, be not always alike, if it is greater at one time and leſs at another, the cloth will be thicker and thinner at thoſe places, and ſuch is the nicety on which this depends, that the moſt experienced weaver, after an interruption of ſome hours, cannot at once regain it.

Meſſrs. Ratcliffe and Roſs dreſs the whole of the warp before it is wound upon the beam, the labour of the weaver is therefore uninterrupted, and his attention directed ſolely to one object. This alone is a great point gained, but it is attended alſo by other, not leſs important, advantages. Great part of the intellectual ſkill required in weaving is in the dreſſing and beaming of the warp; the mere mechanical part of throwing the ſhuttle, &c. is ſoon acquired, even by a boy. A more accurate diviſion of labour, by reducing the beaming and dreſſing to a ſyſtem by which they are better, more economically, and more expeditiouſly performed than before, has removed the great difficulty in the art of weaving, and rendered it in a great meaſure the employment of children.

From what we have already ſaid, it will appear that the object in dreſſing and ſizing is nearly the ſame, and Meſſrs. Ratcliffe and Roſs, by this improved mode of dreſſing, have ſucceeded in reducing theſe operations to one. They have gone ſtill further; they have done away the neceſſity of warping, by forming the web at once from the bobbin, and thus reduced the warping, ſizing, dreſſing, and beaming, to one operation. A thouſand bobbins and upwards ſupply the materials for the warp, which in its progreſs is properly diſpoſed and arranged, ſized, dreſſed, and finally wound upon the beam. This improvement, which may juſtly be regarded as the moſt important that has taken place in weaving ſince the invention of the fly ſhuttle fifty years ago, muſt in the end effect a compleat change in the ſyſtem of labour. Great however as its advanatges are, ſome time muſt neceſſarily elapſe before it can be accommodated to general uſe. In large eſtabliſhments, where the different proceſſes of the manufacture are carried on together, ſuch as ſpinning, weaving, and the labour immediately connected with them, it has been adopted with the happieſt ſucceſs, but the weaving in this country is chiefly done in the cottages of the poor, and to their uſe the coſtly and bulky apparatus of Meſſrs. Ratcliffe and Roſs is not adapted.

To derive all the advantages poſſible from this improvement, therefore, it will be neceſſary either that the weaving

be

be done in large ſhops, to each of which a dreſſing machine may be attached, or that the warps be delivered to the country weavers ready dreſſed and wound upon the beam. The former plan is daily gaining ground, and perhaps it is not difficult to foreſee, that at no very diſtant period all the weaving of the country will ſhare the fate of the ſpinning, and quit the cottage for thoſe larger eſtabliſhments in which it will be ſuſceptible of better management, and more accurate diviſion of labour.

The laſt improvement, which we ſhall notice in the manufacture of cotton, and which, when once eſtabliſhed, will compleat what Arkwright has ſo happily begun, is that of weaving by machinery. Various attempts have been made of late years to apply the great moving powers, ſteam, and water, to the common loom. Mr. Dolignon, many years ago, conſtructed a loom adapted, as we are told, to the manufacture of all kinds of cloth. It might be wrought by the power of wind, water, ſteam, or animal ſtrength, and poſſeſſed an inſtinctive capacity (if we may be allowed the phraſe) of knowing when any thread of the weft or warp was broken, in which caſe the loom ceaſed its motion, thus calling on the attendant to repair the damage, which being done, it immediately went on as before; ſix of theſe looms might be attended with eaſe by a girl of ſixteen, or an aged or infirm perſon of either ſex. The inventor did not live to reap the fruit of his labour, nor to introduce his machine properly to the world. He died ſoon after its completion, when he had brought it to a ſtate of perfection ſatisfactory to himſelf, and with him periſhed the reſult of his induſtry and talent. Such is the account which the friends of Mr. Dolignon give of this invention: ſince that time ſeveral other looms of ſimilar conſtruction have been invented.

Mr. Auſtin of Glaſgow has produced one, a model of which is depoſited at the houſe of the Society of Arts in the Adelphi, in favour of which numerous teſtimonies were tranſmitted to the ſecretary. In the year 1798, a loom on this conſtruction was ſet to work at Mr. Monteith's ſpinning works near Glaſgow, which anſwered the purpoſe ſo well, that a building was erected by Mr. Monteith for containing thirty looms, and afterwards another to hold about 200.

The model depoſited in the Adelphi is an improvement on thoſe firſt made for Mr. Monteith, whoſe name we do not however ſee amongſt the liſt of thoſe who bear teſtimony to its value. A loom of this kind, ſays the inventor, occupies only the ſame ſpace as a common loom. The expence is about one-half more. The reeling, winding, warping, beaming, looming, combing, dreſſing, fanning, greaſing, drawing bores, ſhifting heddles, rods, and temples, which is nearly-one half of the weaver's work, together with the general waſte accompanying them; all which occur in the operation of the common loom, do not happen in this, which by its ſingle motion, without trouble, performs every operation after the ſpinning, till the making of the cloth is accompliſhed. One weaver and a boy are ſufficient to manage five looms of coarſe work, and three or four of fine work. The conſtruction of this loom is ſo complicated, that the ſociety have not, in their Tranſactions, given the public a drawing of it, conceiving that a model only could render it intelligible.

Other looms of a more ſimple, and conſequently of more uſeful conſtruction, have been invented by Meſſrs. Horrocks and Marſland of Stockport near Manchester, which, combined with the dreſſing machine of Meſſrs. Ratcliffe and Roſs, promiſe to be of conſiderable utility, and have already been tried on a ſufficiently extenſive ſcale by the inventors. The dreſſing machine, indeed, has removed the great difficulties in machine weaving, and without it nothing important or advantageous could have been accompliſhed. It has alſo rendered the machine loom itſelf of leſs importance, by ſimplifying the art of weaving ſo much as to render that the employment of boys, which was formerly entruſted only to experienced weavers. To the rapid extenſion of this improvement, however, there are objections at the preſent moment ariſing from moral as well as political conſiderations which muſt greatly retard its progreſs, and we muſt look to happier times for the proof of its general utility, and its final adoption or rejection.

The preceding ſketch, ſhort and imperfect as it is, will ſerve to convey ſome idea of this immenſe and important manufacture. Of the population at preſent engaged in it, and of its annual value, we have only ſuch conjectures to offer as are founded on thoſe materials which are within the reach of individuals, and unleſs government order ſuch an enquiry, it can only be eſtimated by the importation of cotton, which is for the moſt part manufactured at home.

Perhaps the manufacture of Scotland, as being in a narrow field, is more within the reach of obſervation than that of England; we therefore venture to lay before our readers, as being apparently an approximation to the truth, the following,

Eſtimate of the ſtate of the cotton manufacture in Scotland, made up in the year 1796 at Glaſgow, the centre of the principal commerce and manufactures of that kingdom.

39 water mills, which coſt for machinery and buildings 10,000 *l.* each - -		£ 390,000
and work	124,800 ſpindles	
1200 Jennies 84 ſp. each	100,800 at 6*l.* each	7,200
600 mules 144 ſp. each	86,400 at 30*l.* each	18,000
Total, working by day and night	312,000 ſpindles.	
Building for the Jennies coſt - -		75,000
Capital veſted in machinery and buildings		£ 490,200
The yarn annually ſpun is valued at		£ 1,256,412
The cotton 4,629,043 lbs, average value 2*s.*		462,904
The people employed are eſtimated at 25,000 of both ſexes, young and old, but the greater part under 15 years of age, whoſe labour, aided by machinery, thus improves the value of the raw material in the firſt ſtage of manufacture. - - - -		793,508
From which deduct wages eſtimated at		500,000
Remains for coſt, and wear and tear of machinery, and proprietors profits, the ſum of - - - -		293,508
The annual value of calicoes and muſlins, now deſervedly eſteemed the ſtaple of Scotland, when finiſhed, including the exciſe düty on a part of them which are printed, and the coſt of tambouring and needle work on about a third part of them, was then eſtimated at		£ 3,108,549
Value of the cotton yarn as above -	£ 1,256,412	
Yarn got from England	520,000	
		£ 1,776,412

The

The wages of weavers, tambourers, needle-workers, the charges, the profits of the manufacturers, and the revenue paid to government, thus amounted to £1,332,137

Which great ſum is produced by capital, ingenuity, management, and labour in the ſubſequent ſtages of the buſineſs.

The cotton manufacture in Scotland employs - -	38,815	weavers.
For winding warp and weft	12,938	women.
And ſuppoſing $\frac{1}{3}$ of the muſlin adorned with needle work -	105,000	women.
and girls moſt children.		
Beſides thoſe employed in the ſpinning branch	25,000	
Hence it appears that - -	181,753	perſons

derive their immediate ſubſiſtence from the cotton manufacture in Scotland, and alſo a proportional number in England, employed in producing yarn to the value of 520,000 *l.*; beſides the innumerable people of all claſſes concerned in providing neceſſaries and accommodations of every kind for that great multitude, and in conſtructing and repairing the machinery and buildings; and the cultivators of the cotton in the Eaſt and Weſt Indies, ſeamen, merchants, &c. who are all wholly or partly ſupported by this moſt beneficial manufacture, by which the cotton is raiſed, taking the whole manufacture together, to about ſeven times the value it was of when imported.

The cotton manufacture has increaſed very much in Scotland ſince the year 1796. The imports of cotton into the kingdom in the year 1800, were nearly treble thoſe of the year 1796. The printing buſineſs however appears to have declined a little, as may be inferred from the following

Account of the Calicoes, Muſlins, Linens, and Stuffs, printed in Scotland in the years 1796 and 1800.

	1796			1800.	
	Rate of Duty.	Yards.	Amount of Duty.	Yards.	Amount of Duty.
	d.		£. *s.* *d.*		£. *s.* *d.*
Foreign Calicoes and Muſlins - -	7	141,403	4,124 5 1	78,868	2,300 6 4
Britiſh Calicoes and Muſlins - -	$3\frac{1}{2}$	4,258,567	62,103 19 $1\frac{1}{2}$	4,176,939	60,913 13 $10\frac{1}{2}$
Linens and Stuffs - - -	$3\frac{1}{2}$	1,185,500	17,288 10 10	1,220,714	17,802 1 7

In England and Wales, on the contrary, the printing buſineſs has increaſed during the above period, as will appear from the following

Account of the Calicoes, Muſlins, Linens, and Stuffs, printed in England and Wales in the years 1796 and 1800.

	1796.			1800.	
	Rate of Duty.	Yards.	Amount of Duty.	Yards.	Amount of Duty.
	d.		£. *s.* *d.*		£. *s.* *d.*
Foreign Calicoes and Muſlins - -	7	1,750,270	51,049 10 10	1,577,536	46,011 9 4
Britiſh Calicoes and Muſlins - -	$3\frac{1}{2}$	24,363,240	355,297 5 0	28,692,790	418,436 10 5
Linens and Stuffs - - -	$3\frac{1}{2}$	3,464,862	50,529 4 11	3,232,073	47,134 7 11

If we follow the calculation aſſumed in an eſtimate laid before a committee of the houſe of commons, that the duty is one tenth of the value, we may eſtimate the value of the Britiſh calicoes and muſlins printed in England and Wales in 1796, at - - £ 3,552,972 0

And thoſe in 1800 at - - 4,184,365 0

From theſe ſtatements, which are official, it appears that in 1800 there were printed about a million and a half of calicoes and muſlins in Great Britain, excluſive of linens, ſtuffs, and foreign calicoes. From that time, to the year 1806, the buſineſs has continued progreſſively to increaſe, the amount of duties on printed goods for that year being upwards of 600,000*l.*, which will bring the number of pieces printed nearly to two millions.

The quantity of white calicoes and muſlins made in England and Wales, is certainly much greater than that of the printed; probably not leſs than three million pieces annually.

From the ſignatures to the petition of the journeymen calico-printers to the houſe of commons in the year 1806, it would appear that, in Great Britain and Ireland, the number is 7000; we ſuſpect however that this number includes apprentices, and that the liſt alſo has been ſwelled, as is uſual in ſuch caſes, by unfair means.

During

During the progreſs of the work we ſhall have frequent opportunities of reverting again to the ſubject of the cotton manufacture, and of ſupplying thoſe omiſſions which, in a buſineſs of ſuch magnitude and extent, when ſubmitted to individual inveſtigation, muſt unavoidably occur. We ſhall conclude therefore with obſerving that, from the beſt information we have been able to collect, and from calculations founded on the quantity of the raw material imported into the country and of goods exported, it appears that the cotton manufacture of theſe realms gives employment to 800,000 perſons, and that its annual value is upwards of 30 millions.

COTTON MANUFACTURE.

PLATE I.

CALICO PRINTING.

Fig. 1.

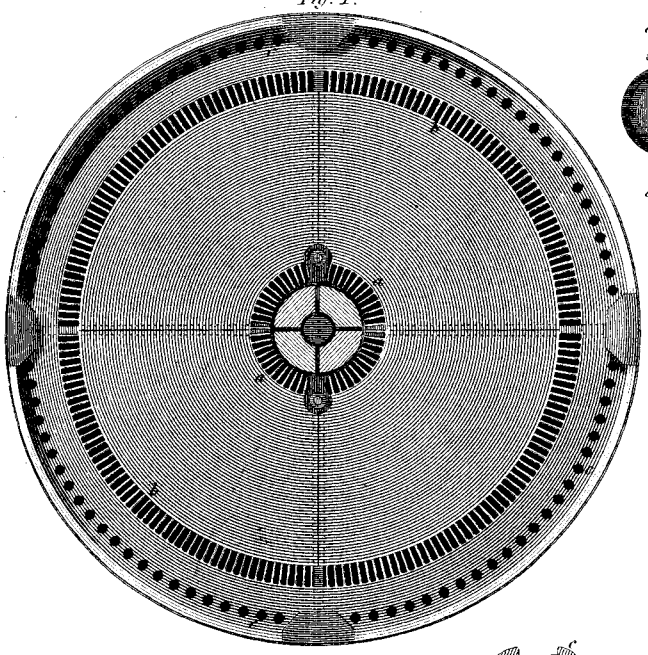


Fig. 6.

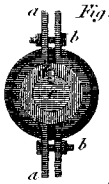


Fig. 2.

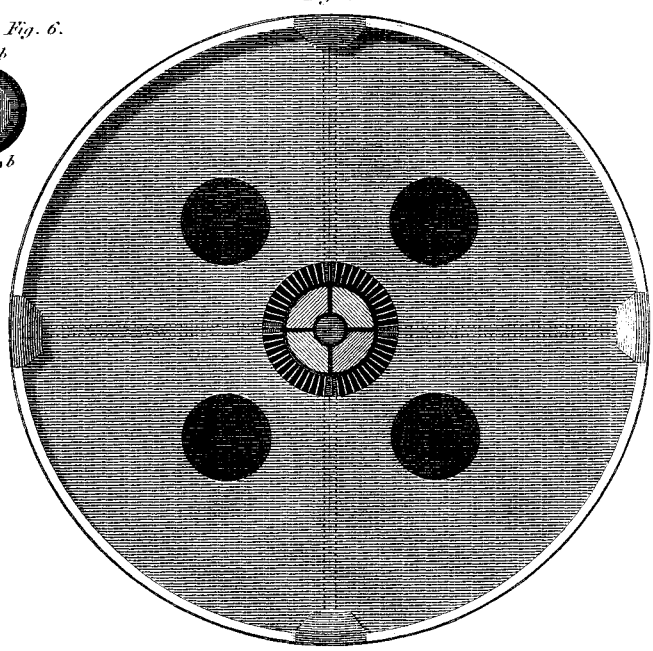


Fig. 5.

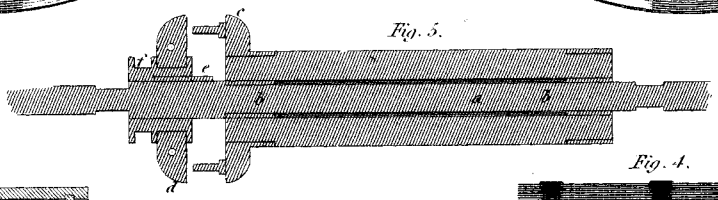


Fig. 3.

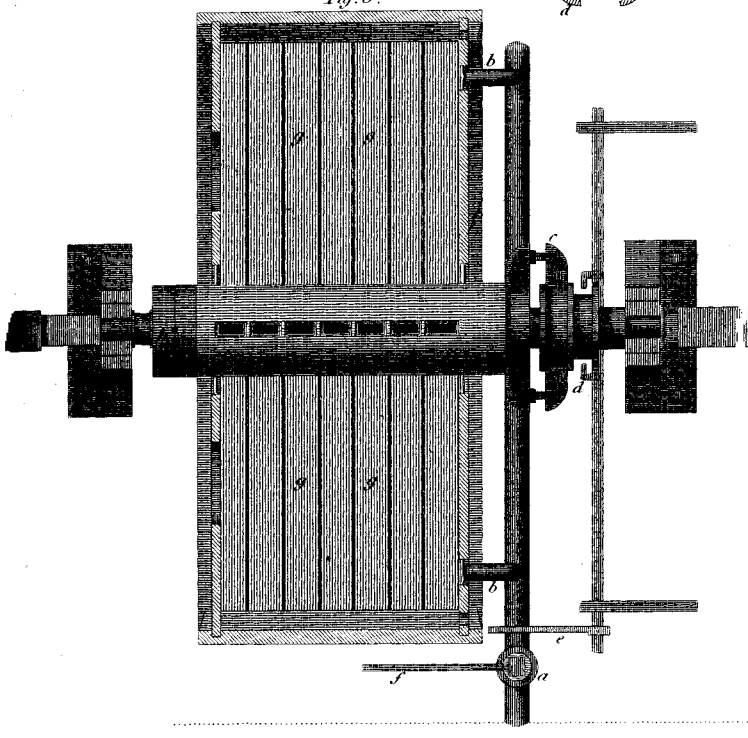
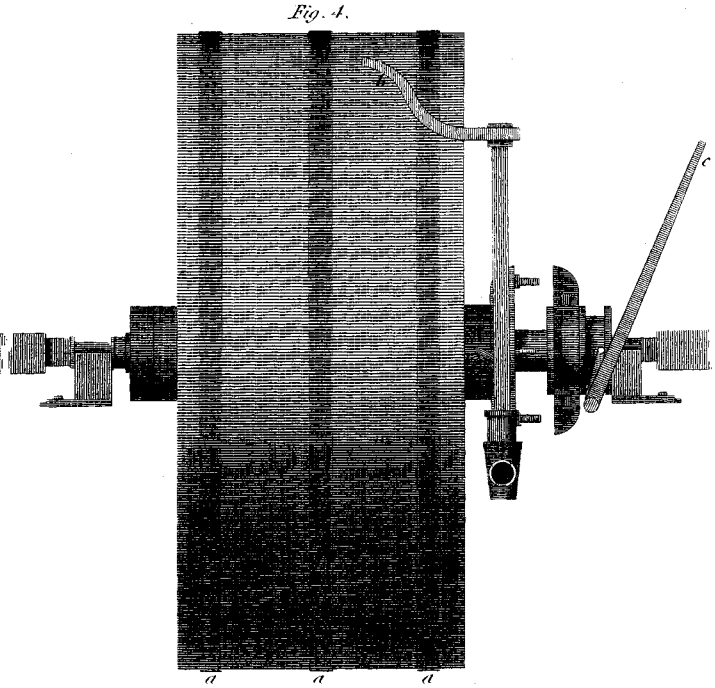


Fig. 4.



Drawn by Wm. Thomson.

Published as the Act directs, 1833, by Longman, Hurst, Rees & Orme, Paternoster Row.

Engraved by Wilson Lowry.

COTTON MANUFACTURE.

BATTING MACHINE.

Fig. 1.

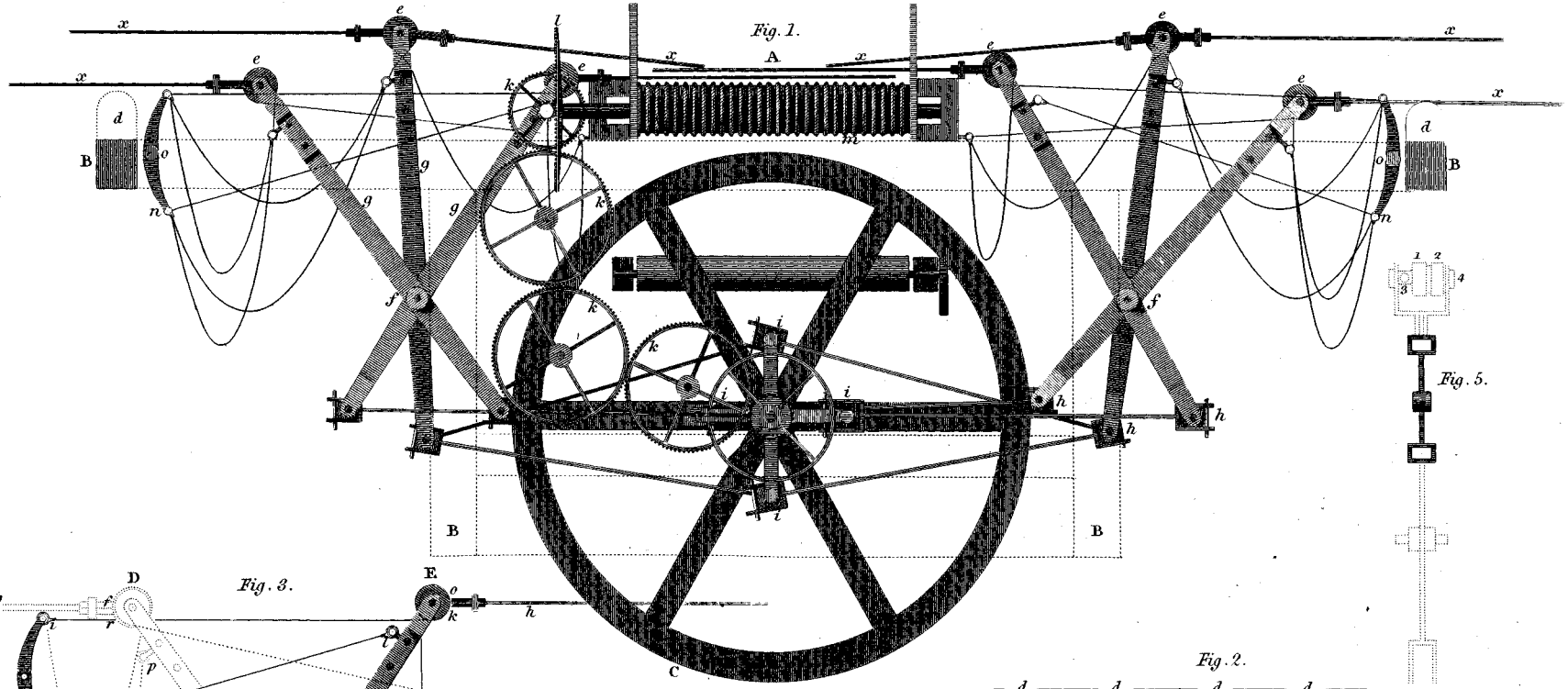


Fig. 5.

Fig. 3.

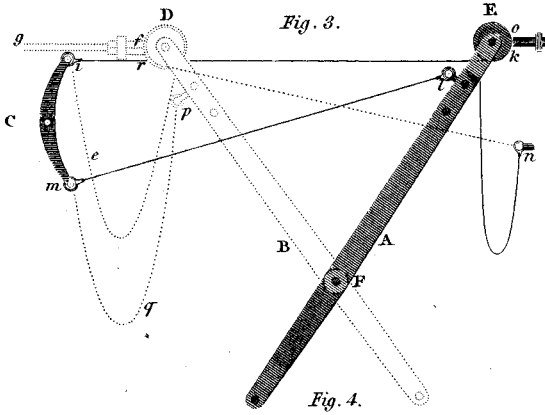
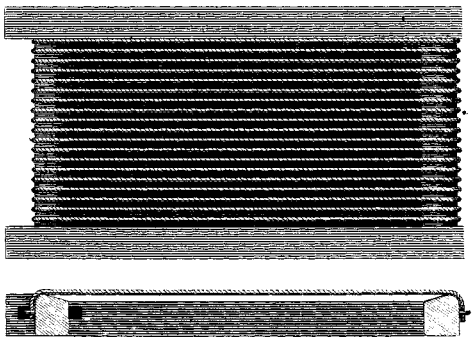


Fig. 4.



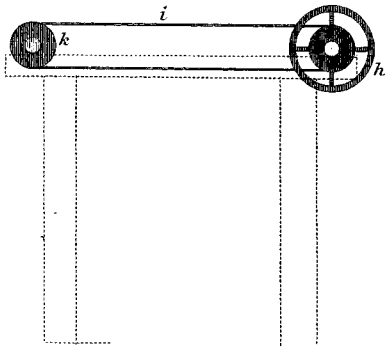
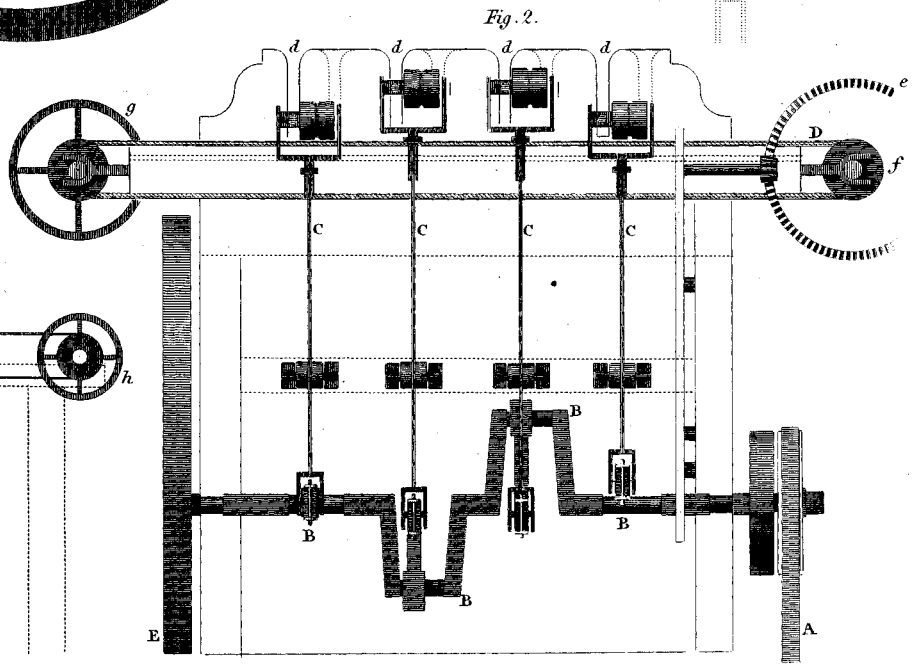


Fig. 2.



Drawn by J.s Burton.

Published as the Act directs, 1809, by Longman, Hurst, Rees & Orme, Paternoster Row.

Engraved by Wilson Lowry.

DEVILING.

Fig. 5.

Fig. 3.

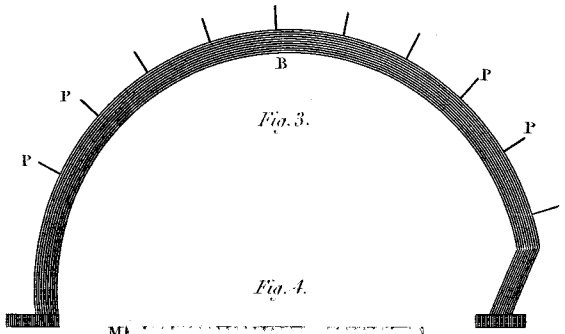
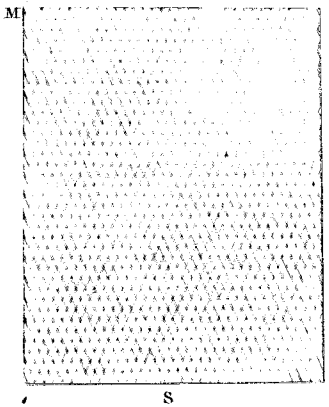


Fig. 4.



Plan

Fig. 1.

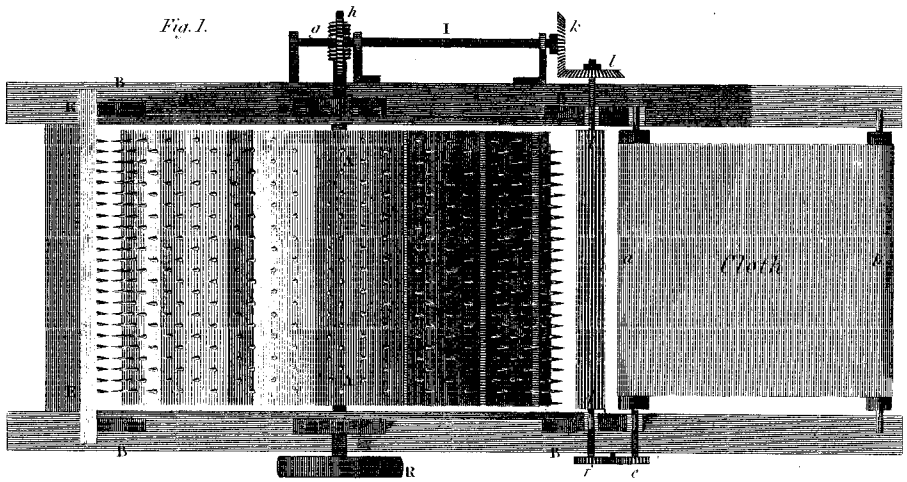
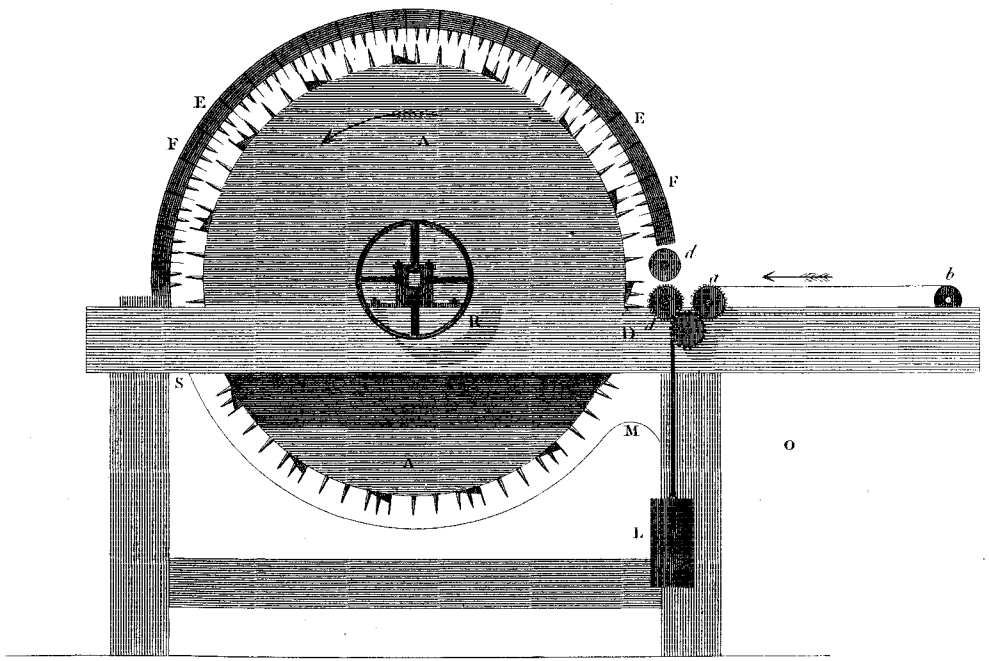


Fig. 2.

Section.



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COTTON MANUFACTURE.

PLATE IV.

CARDING.

Fig. 1. Plan

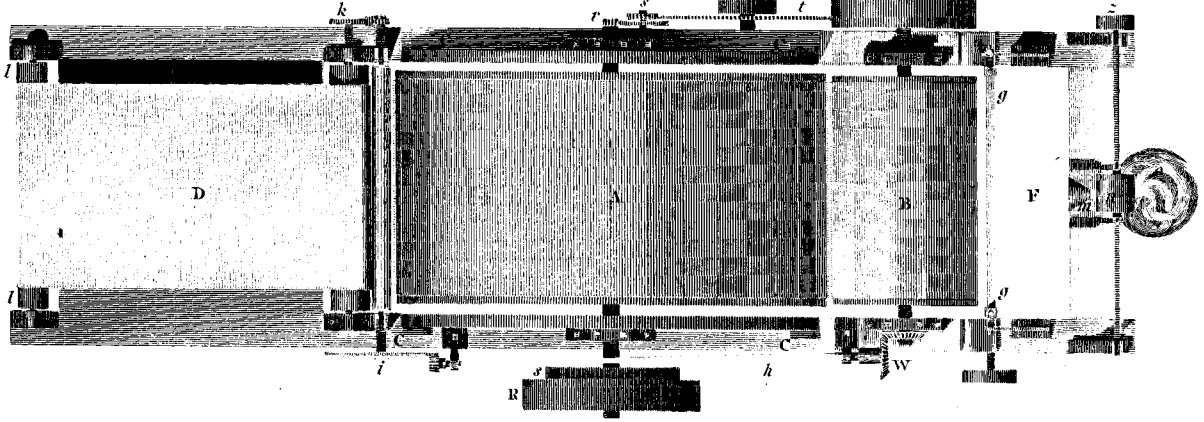


Fig. 4.

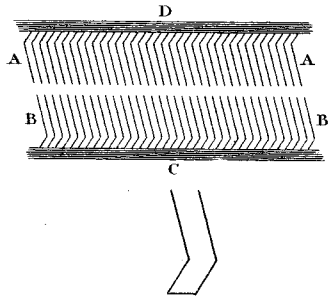


Fig. 3.

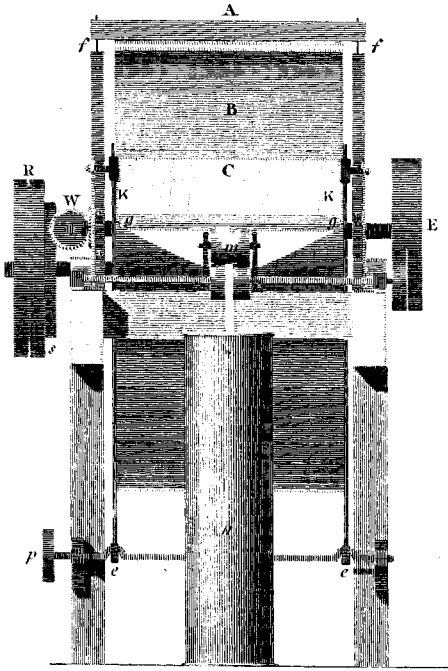
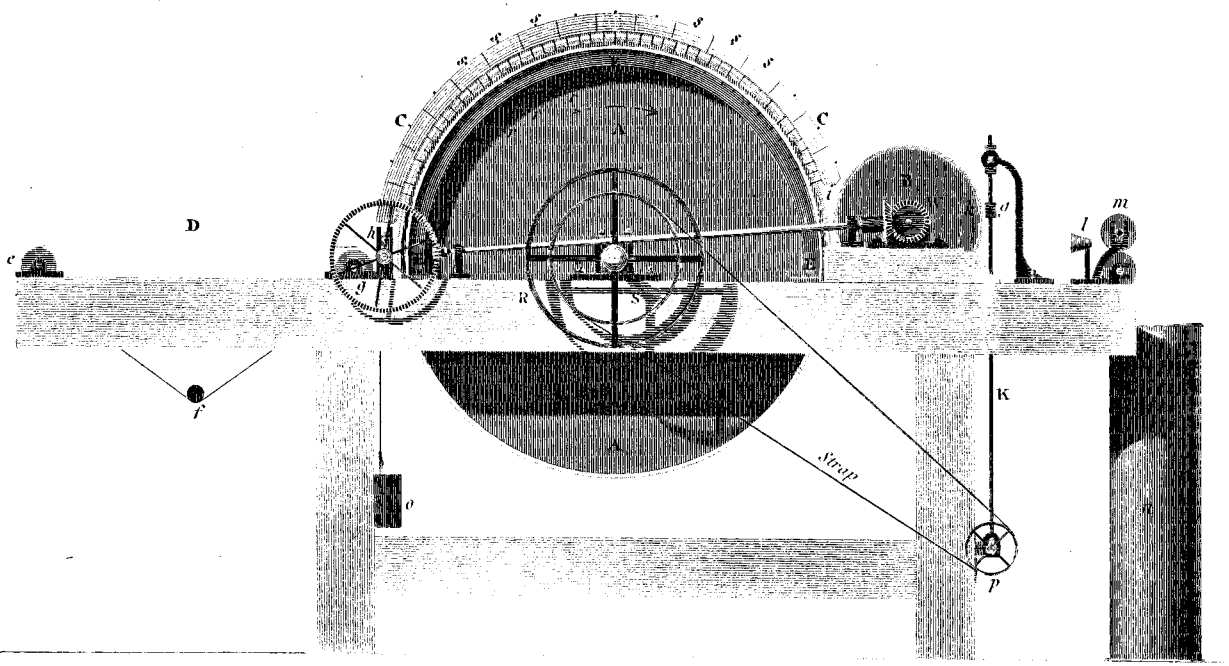


Fig. 2. Section



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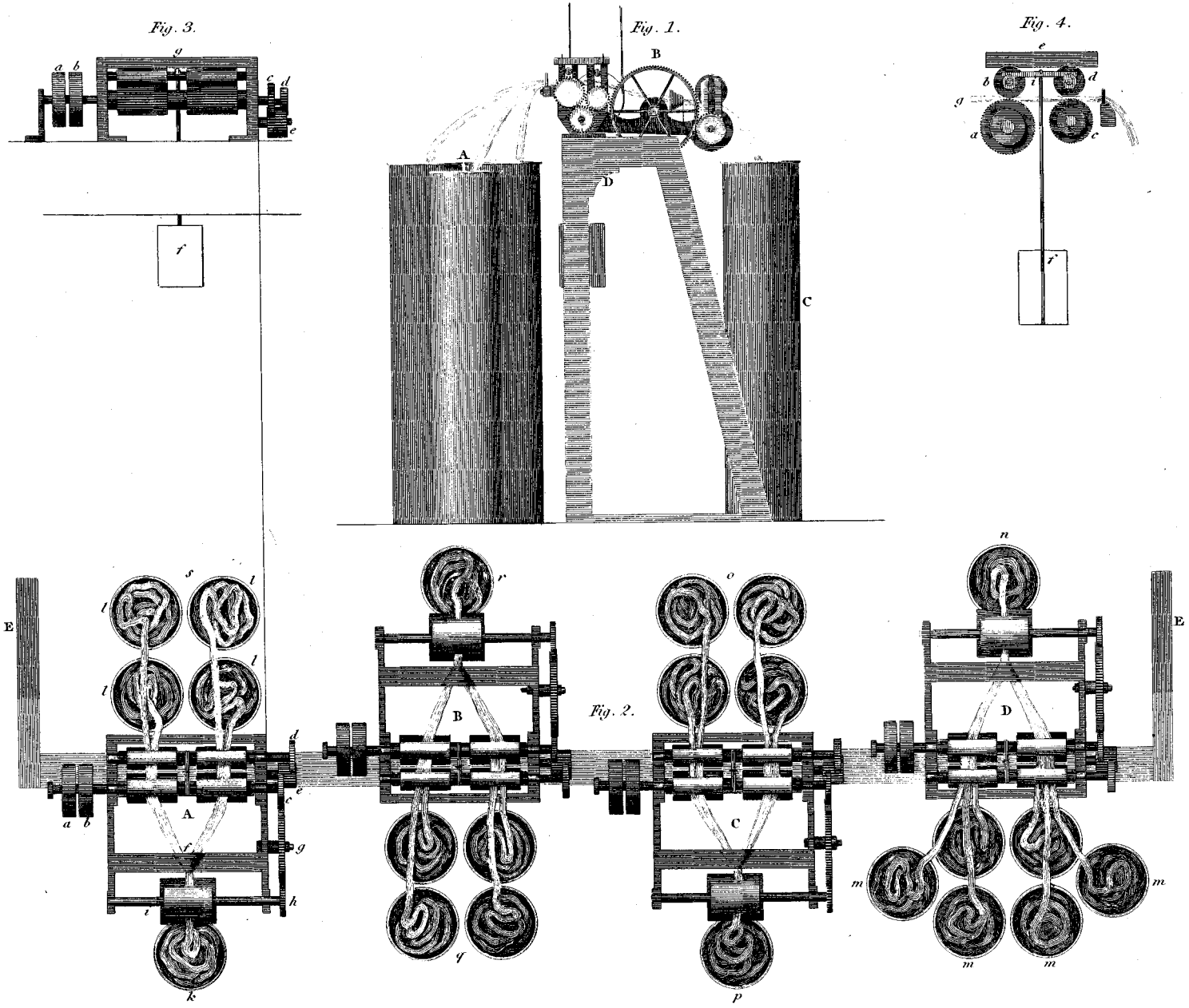
Published as the Act directs, 1809, by Longman, Hurst, Rees & Orme, Paternoster Row.

Engraved by Wilson Lowry.

COTTON MANUFACTURE.

PLATE V.

DRAWING FRAME.

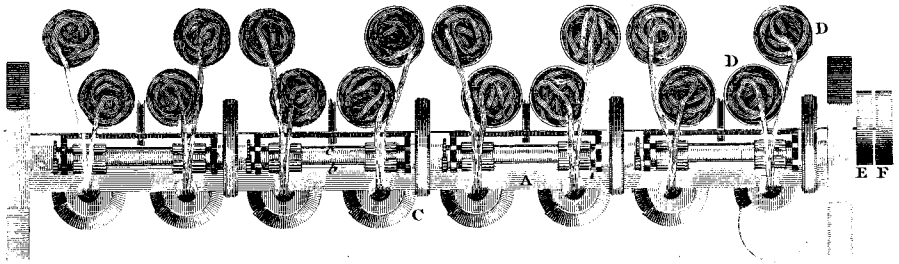


Published as the Act directs, 1808, by Longman, Hurst, Rees & Orme, Paternoster Row.

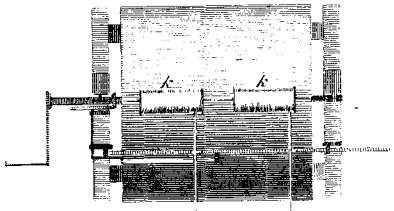
Engraved by Wilson Lowry.

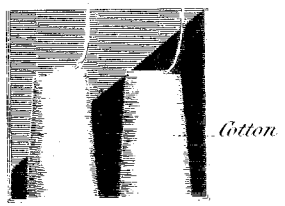
COTTON MANUFACTURE.

ROVING CAN FRAME.

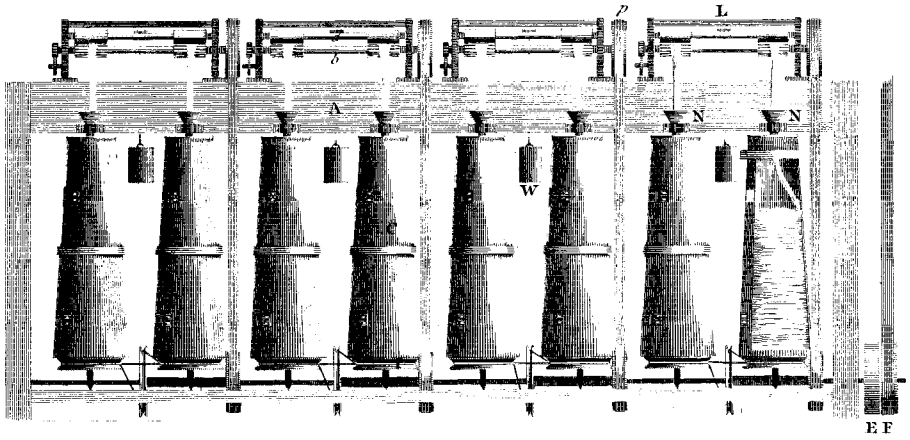


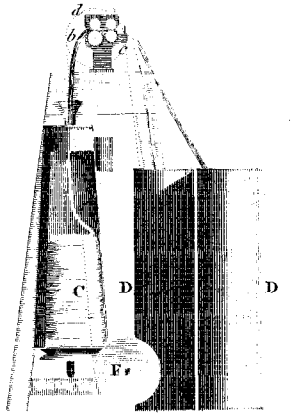
Winding Block.





A *Roller beam.*
b Front Roller.
c Back Dº
d Top front Roller.
C *Revolving Can.*
W *Roller weights.*
P *Can Pulley.*
DD *Back Cans.*
E *Driving Pulley.*
F *Loose Pulley.*
NN *Can Funnels.*
L *Clearer.*
p Front roller Pulley.
k-k Bobbins.





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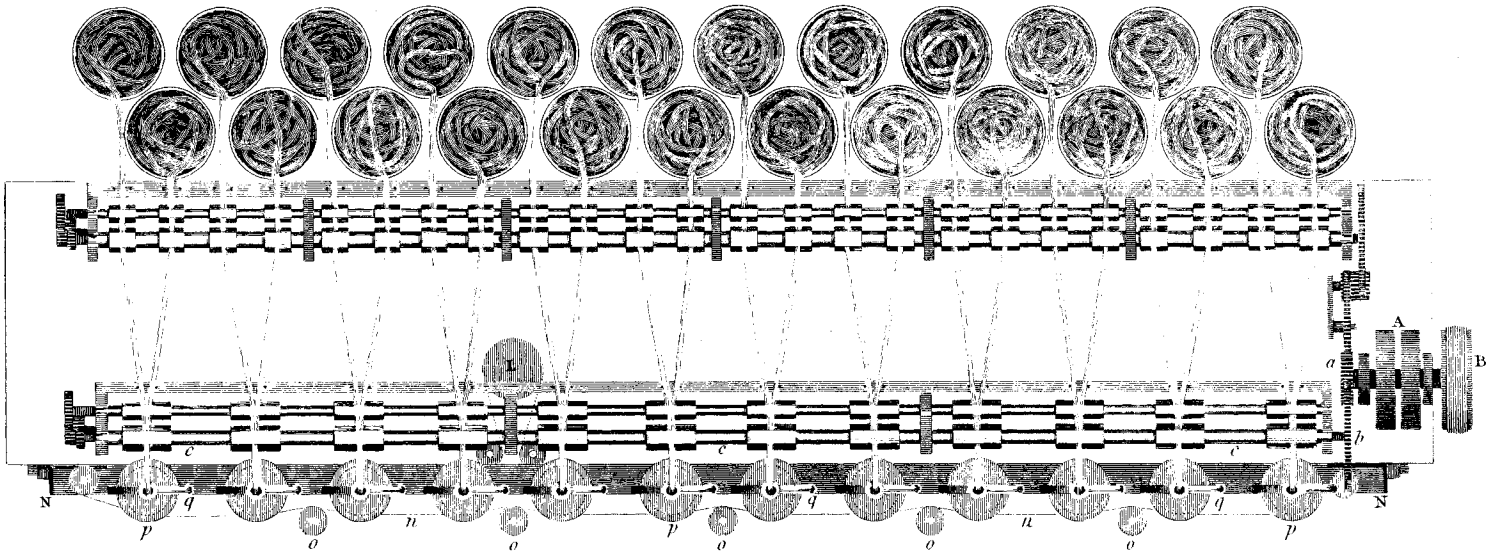
Engraved by Wilson Lowry.

COTTON MANUFACTURE.

ROVING FRAME, Plate 1st.

These cans contain the slivers brought from the Drawing frame.



Horizontal Plan of the Machine called Double Speeder.

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COTTON MANUFACTURE.

ROVING FRAME termed *DOUBLE SPEEDER.*

Fig 1. Elevation in Front.

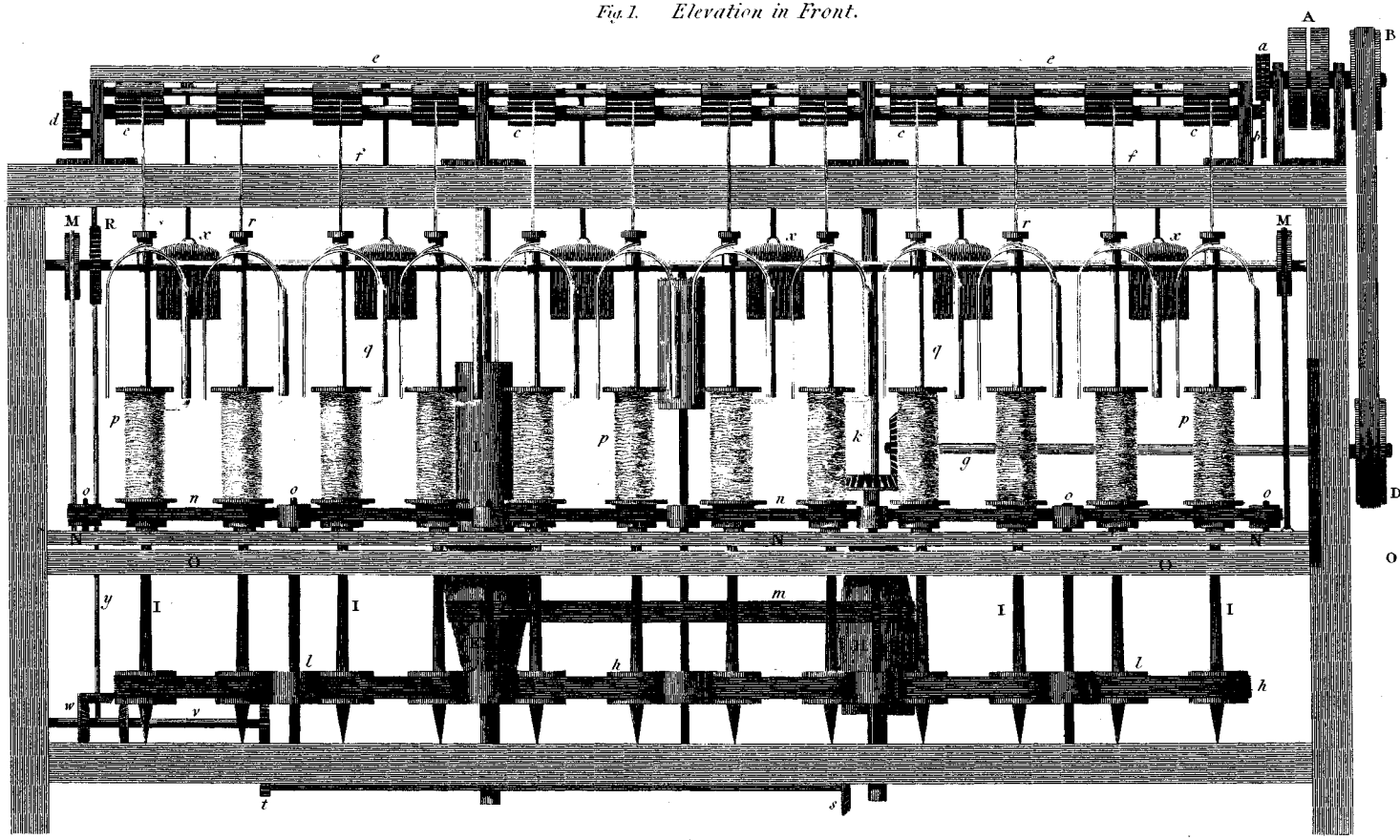
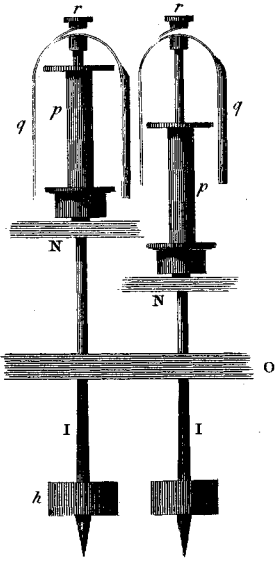


Fig. 2. & 3.



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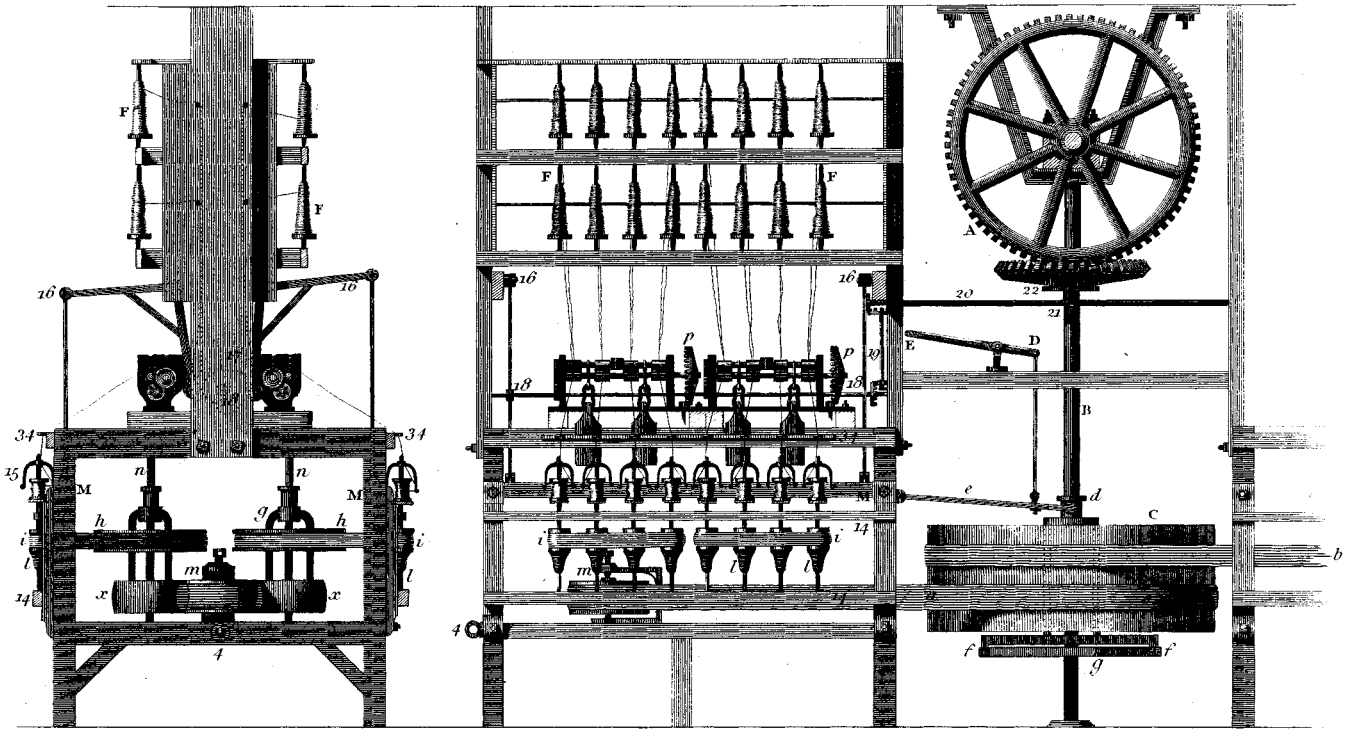
COTTON MANUFACTURE.

WATER SPINNING FRAME.

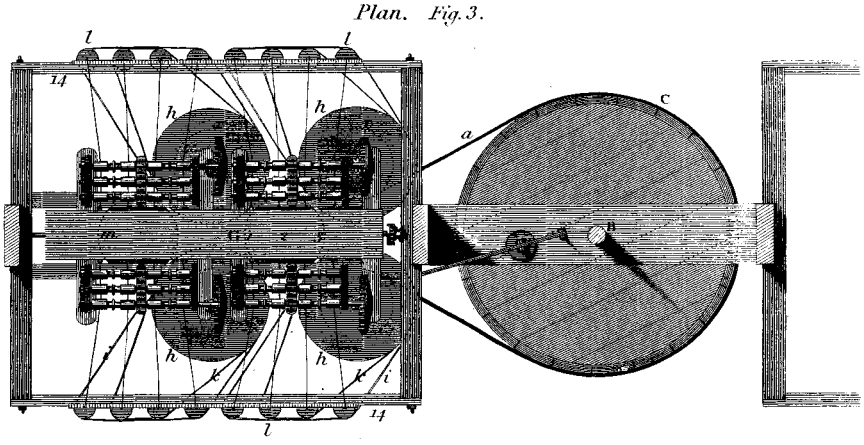
End View. Fig. 2.

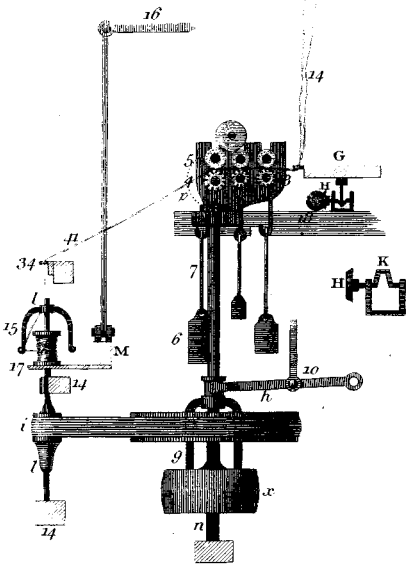
Elevation. Fig. 1.

Plate IX.

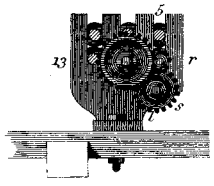


Plan. Fig. 3.

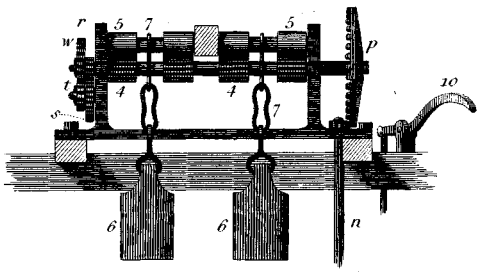




Spindle enlarged. Fig. 4.



End View. Fig. 6.



Elevation of Rollers. Fig. 5.

J. Farey junr. delt.

W. Lowry sculpt.

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COTTON MANUFACTURE.

THROSTLE SPINNING FRAME.

Fig. 1.

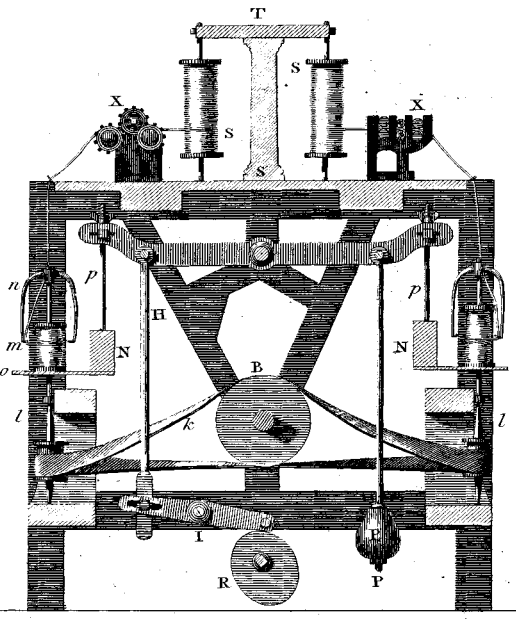


Fig. 2.

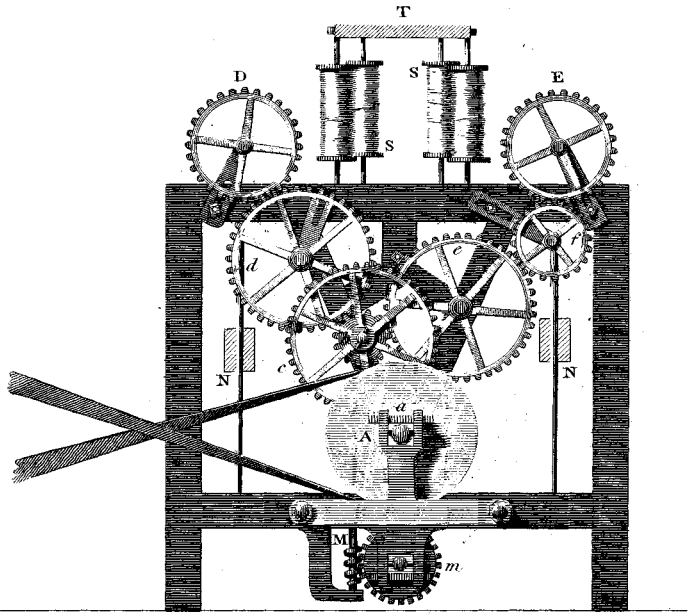
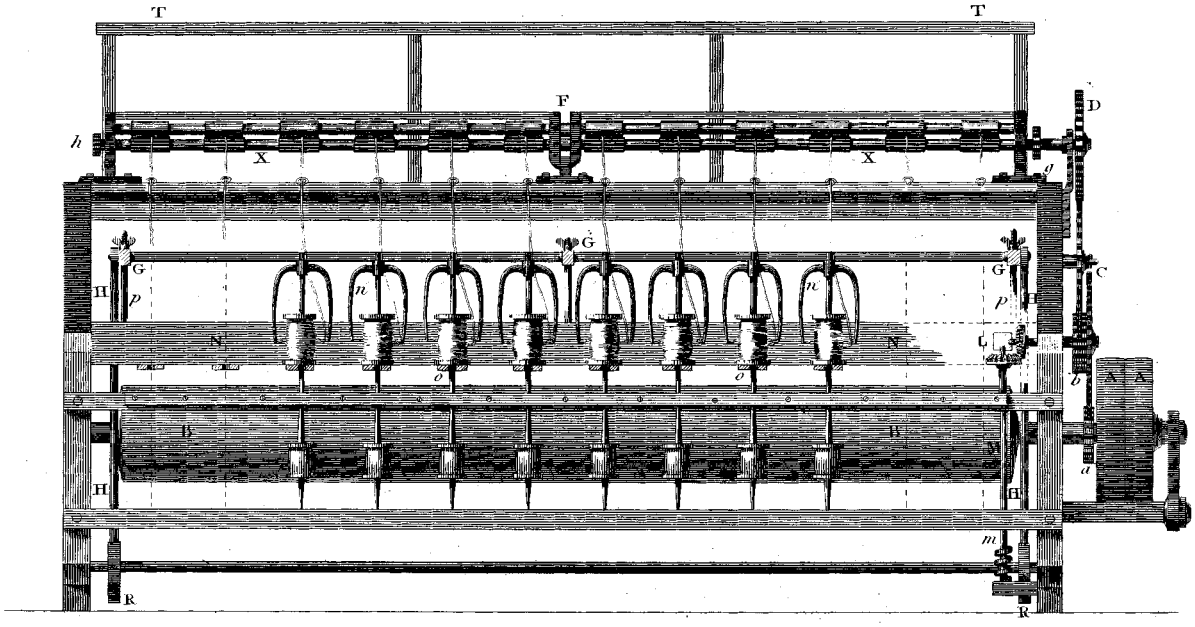


Fig. 3.

Elevation in Front.



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COTTON MANUFACTURE

PLATE XI.

MULE SPINNING.

Fig. 1.

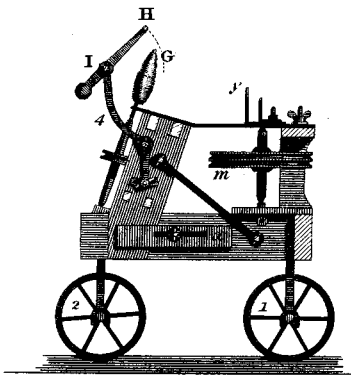


Fig. 2.

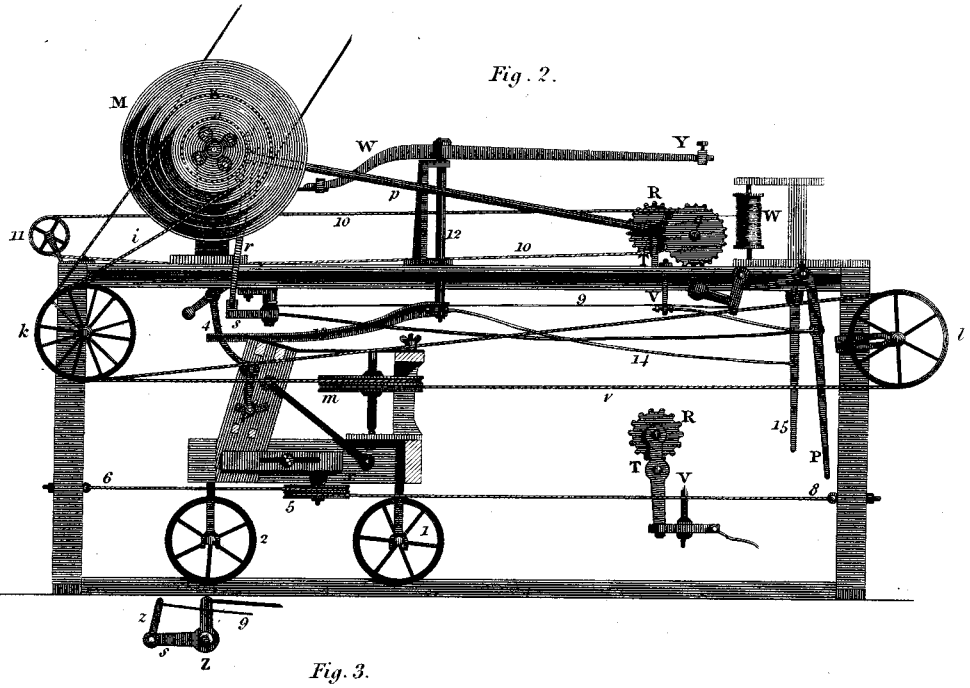


Fig. 3.

Elevation in Front.

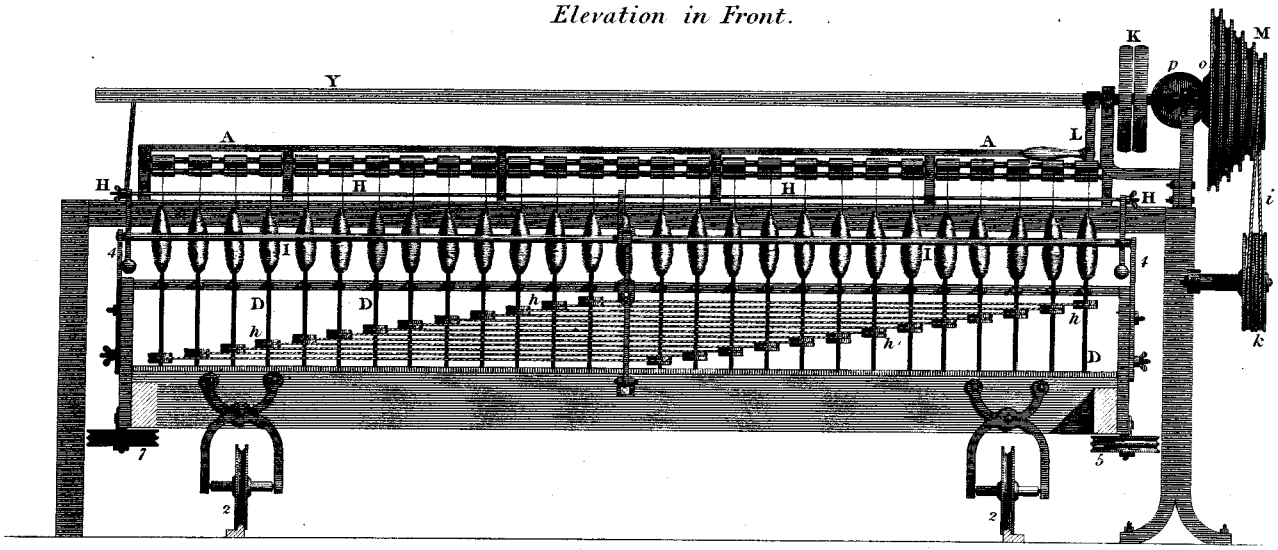


Fig. 4.

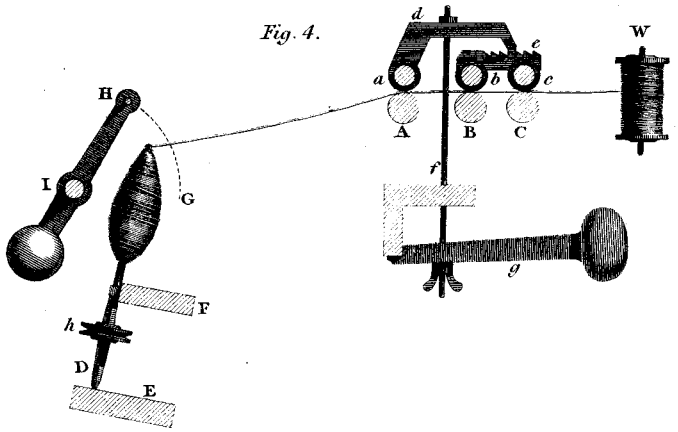
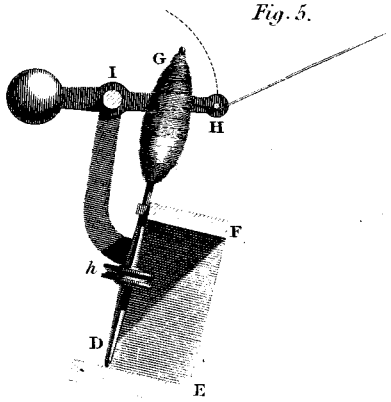


Fig. 5.



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COTTON MANUFACTURE.

REELING.

PLATE XII.

Fig. 1.

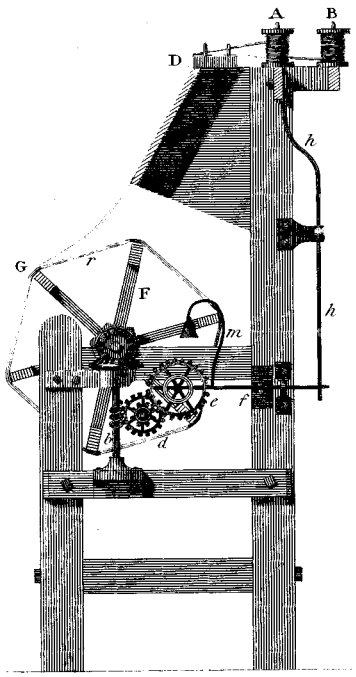
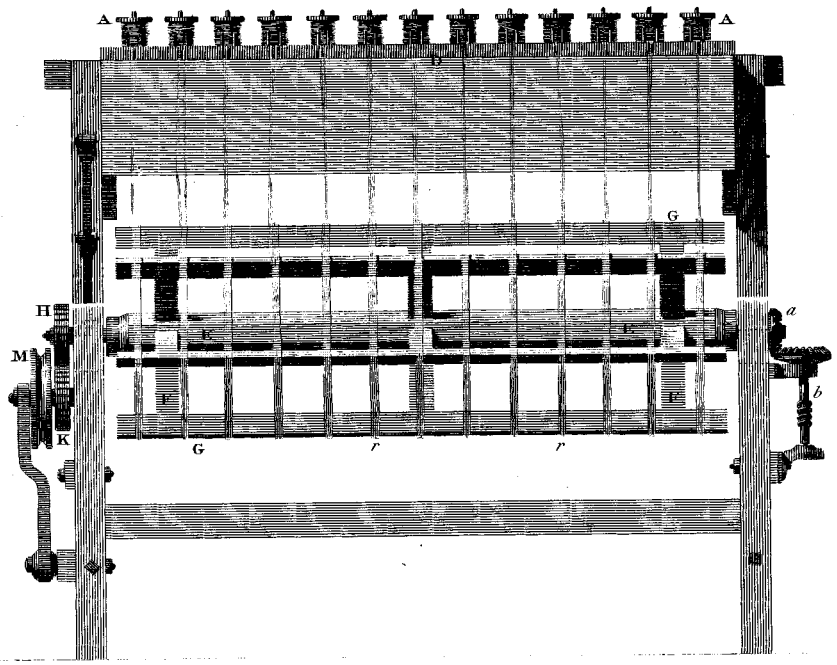


Fig. 2.



Machine for winding sewing cotton into Balls.

Fig. 3.

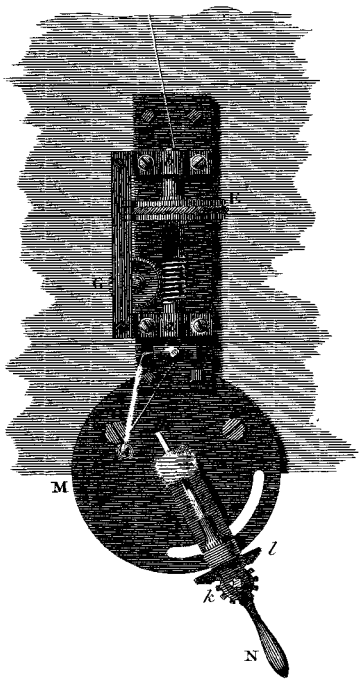
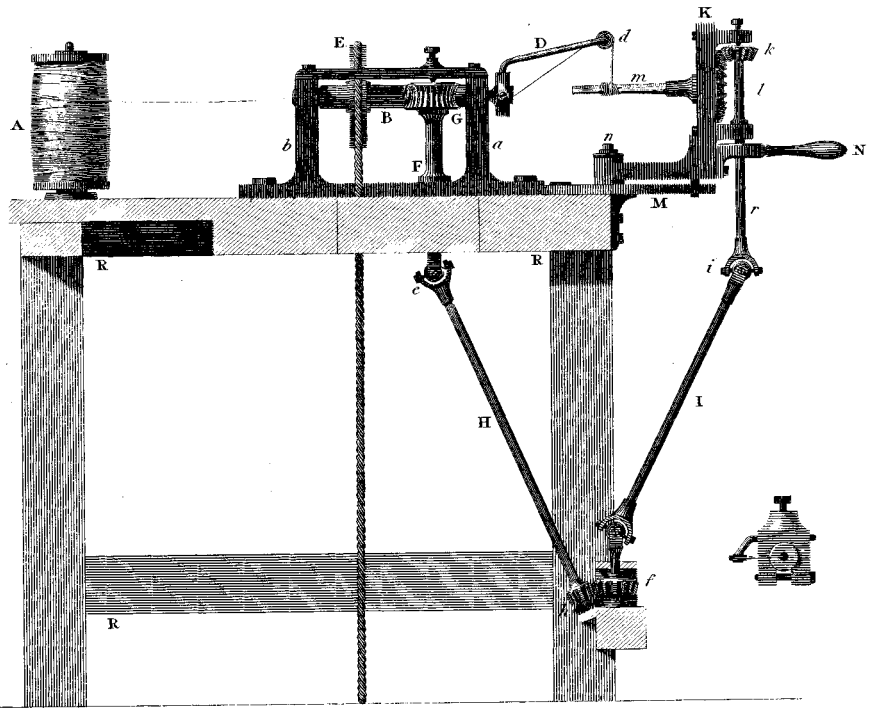


Fig. 5.



J. Farey del.

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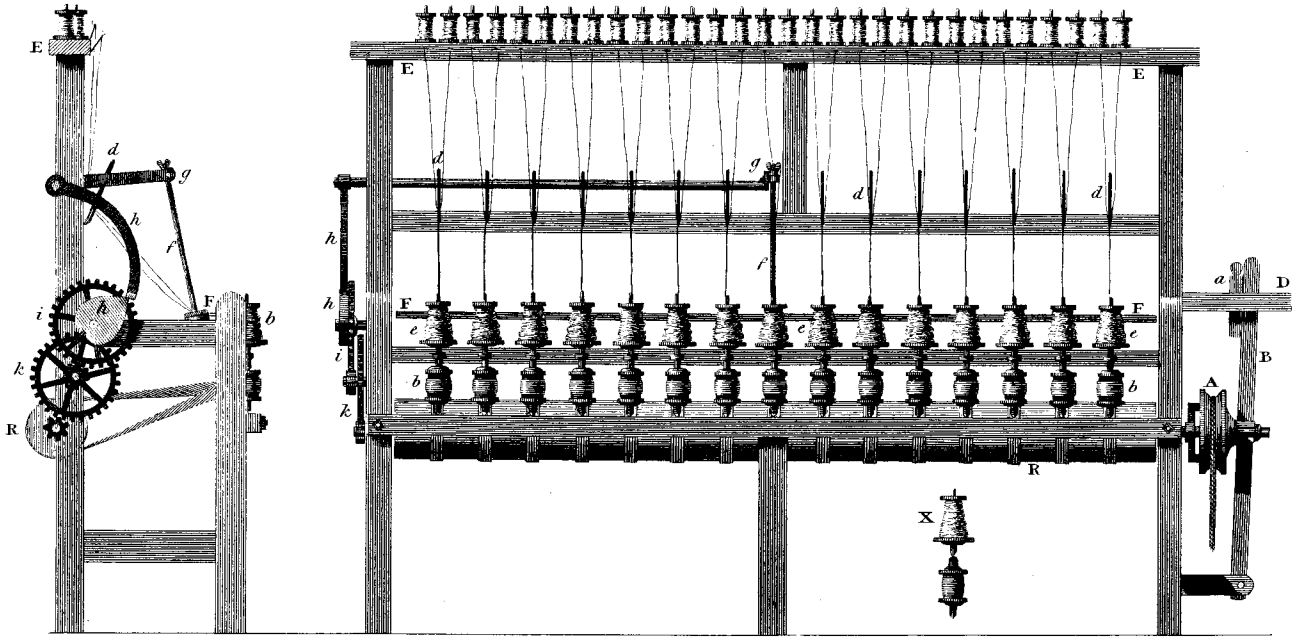
Lowry sculp.

COTTON MANUFACTURE.

PLATE XIII.

Fig. 2.

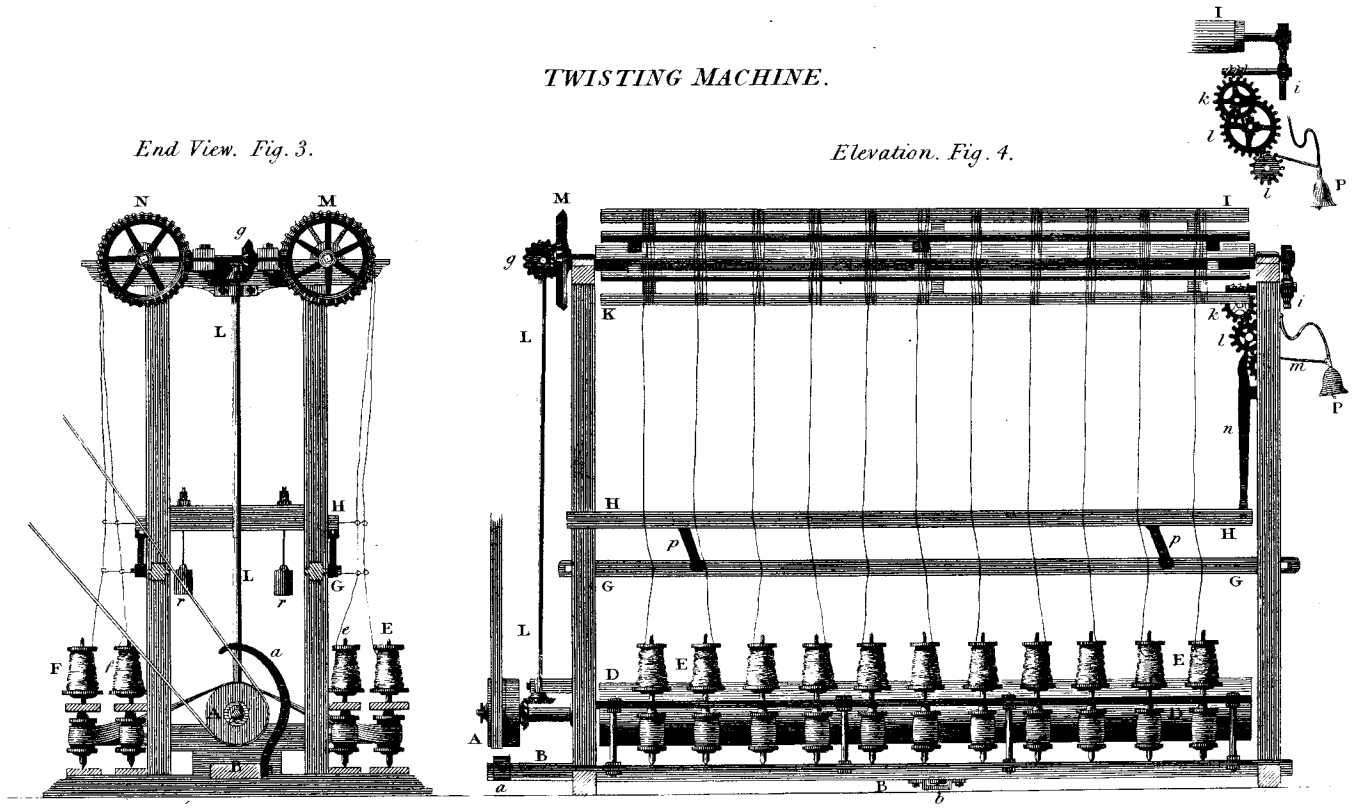
Fig. 1. DOUBLING MACHINE.



TWISTING MACHINE.

End View. Fig. 3.

Elevation. Fig. 4.



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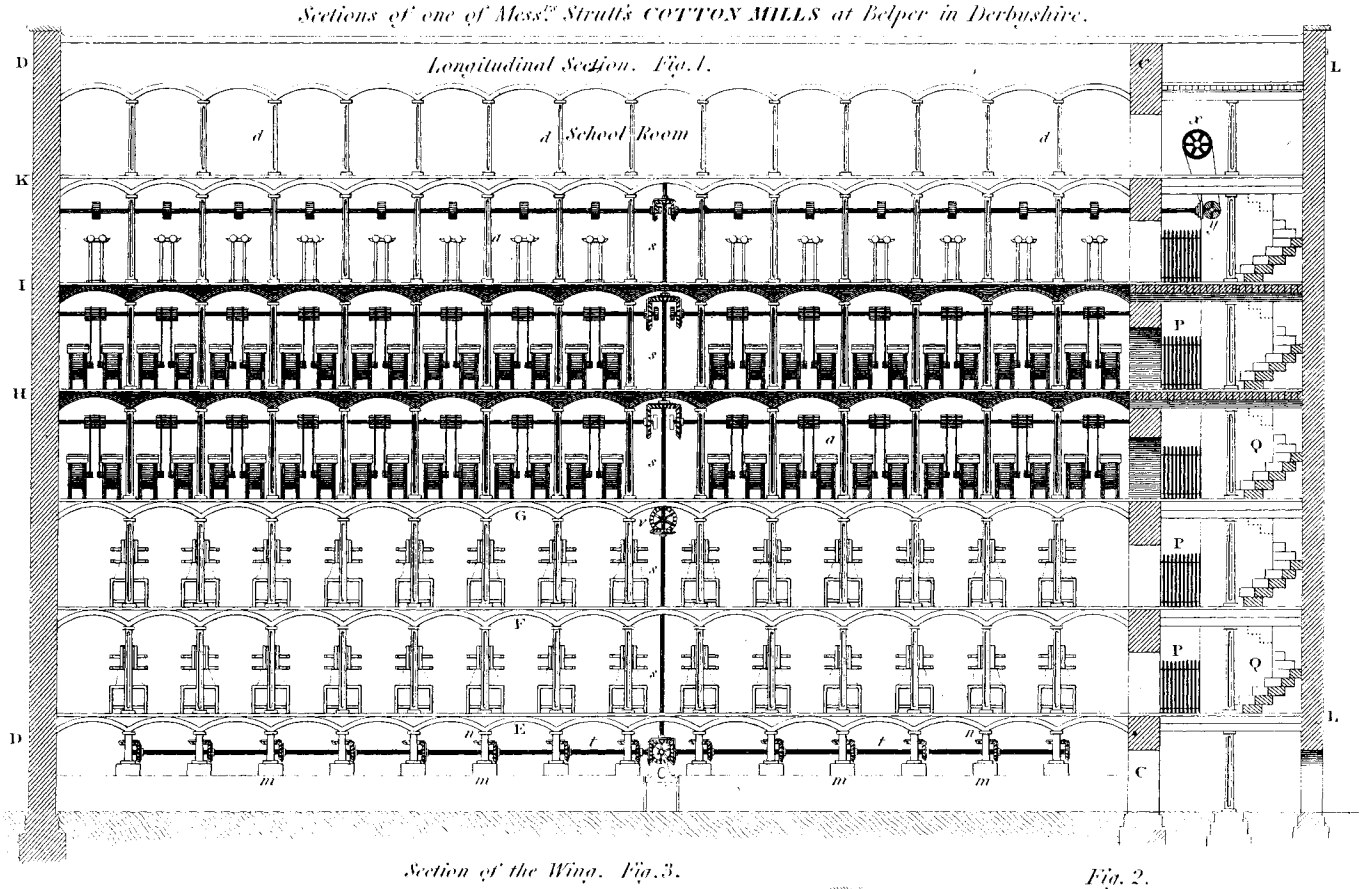
COTTON MANUFACTURE.

PLATE XIV.

Sections of one of Messrs. Strutt's **COTTON MILLS** *at Belper in Derbyshire.*

Longitudinal Section. Fig. 1.



Section of the Wing. Fig. 3.

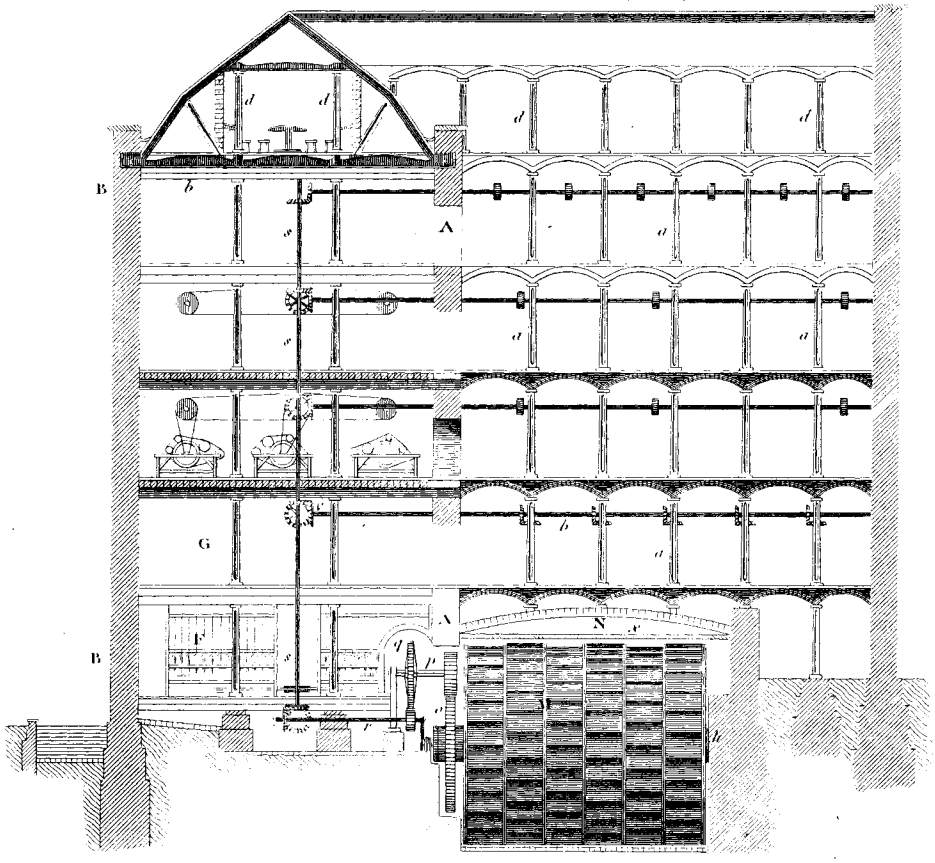
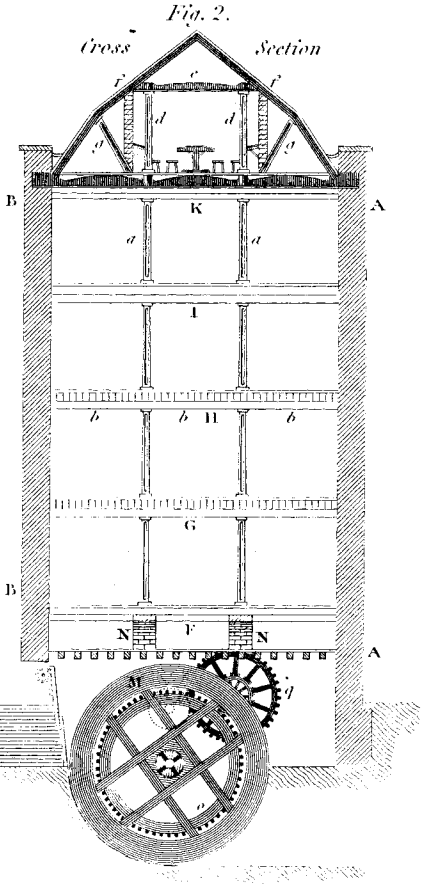


Fig. 2.

Cross Section



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