500 gallons of milk, from which nearly 500 lb of cheese or 200 lb of butter would be obtainable.

Dairy Treatment.—Cows are commonly milked by hand two or three times a day. A milking machine of American origin, which was introduced about the year 1862, has been entirely abandoned. The milk should be drawn from the animals in as clean a condition as possible, but notwithstanding every precaution some amount of hair and epithelial and other animal débris invariably enters the milk-pail. It has therefore to be immediately strained through a sieve with fine wire-cloth or hair strainer. As milk is peculiarly susceptible of taint, and absorbs odours of all kinds with great avidity, it is of the utmost consequence that all vessels in which it is placed or kept should be so made as to be easily purified and that they should be kept scrupulously clean. In Switzerland milk is strained with most beneficial effect through sprigs of washed fir tops, which inserted loosely and uprightly into the hole of a funnel arrest all hair, skin, clots, and slimy matter on the acicular leaves. The milk drains through in a clean condition with a fresh slightly aromatized flavour favourable to its keeping. A fresh sprig is used on each occasion of straining milk, so that there is freedom from the risk of taint which arises through the use of imperfectly cleaned wire gauze. The milk must be removed from the cow-house as quickly as possible; and, if intended for use as new milk and for sale in the neighbourhood of the dairy, it may at once be put up for delivery. But if it has to travel a distance, or if it is to be kept for creaming or cheese-making, it should be rapidly cooled down, and kept in a cool airy milk-room if practicable, surrounded with fresh cold water.

The ordinary method of separating cream either for direct use or for butter making is by allowing it to form on the surface and skimming it off with a broad flat spoon, but ingenious adaptations of centrifugal machines—of which Laval's separator is one of the best known—have been introduced for the purpose of effecting the rapid and complete separation of the cream. The centrifugal force of such machines throws the denser portions of the fluid towards the sides of a rapidly revolving cylinder, collecting the cream on an inner layer, which is carried off by one channel while the impoverished milk escapes by another. The Laval separator gives very rich cream, as will be seen from the following analyses by Voelcker:—

	Ordinary Cream.	Cream by Separator.	Skimmed Milk by Laval Separator.	Ordinary Skimmed Milk.
Water	77·30	66·12	90·82	89·25
Butter fat	15·45	27·69	0·31	1·12
Casein	2·40	2·69	3·31	3·69
Milk sugar	3·15	3·03	4·77	5·16
Mineral matter	0·70	0·47	0·79	0·78

After being kept some time, depending principally on the temperature at which it is maintained, milk begins to turn sour owing to the formation of lactic acid, by a process of fermentation, at the expense of the lactose or milk sugar. The acid so developed causes a coagulation of the casein, and the milk separates into a solid white curd, and a thin transparent yellow milk serum or whey. These changes can to a certain extent be artificially produced, hindered, and controlled. The following are the results of analyses by Fleischmann:—

Constituents of 100 *Parts of Sweet Milk.*

20·00 cream	{	3·56 butter. 16·30 buttermilk. 0·14 loss.
79·70 skimmed milk	{	7·93 curd. 71·45 whey. 0·32 loss.
0·30 loss		0·30 loss.

Relative Composition of Milk and its Products.

	Water.	Fat.	Casein.	Albumin.	Milk Sugar.	Ash.
Whole milk	87·60	3·98	3·02	0·40	4·30	0·70
Cream	77·30	15·45	2·20	0·20	3·15	0·70
Skim-milk	90·34	1·00	2·87	0·45	4·63	0·71
Butter	14·89	82·02	1·97	0·28	0·28	0·56
Buttermilk	91·00	0·80	3·50	0·20	3·80	0·70
Curd	59·30	6·43	24·22	3·53	5·01	1·51
Whey	94·00	0·35	0·40	0·40	4·55	0·60

The simplest and most advantageous form in which milk can be disposed of as a commercial product is by its sale as sweet or new milk, and it is in this manner that the greater proportion of the milk produced within the reach of large centres of population is disposed of. New milk, cream, and skimmed milk are the only primary forms in which milk is sent into the market. CHEESE and BUTTER have been dealt with in separate articles (*q.v.*). Whey, the yellow liquid remaining after the separation of the curd in cheese making, is a source of milk sugar, employed to a limited extent in pharmacy; but it is principally used for feeding pigs. The buttermilk which remains after separating butter is a most wholesome and nutritious article of food.

Preservation of Milk.—The numerous methods which have been proposed for the preservation of milk in a condition fit for use over a lengthened period resolve themselves into (1) chemical treatment with alkaline salts and antiseptic bodies, (2) physical treatment, such as cooling or icing, boiling, and aeration, and (3) condensation with or without the addition of a preservative agent. All systems of preservation, however, are subject to serious disadvantages either from their serving their purpose for too limited a time, or their interfering with the natural constitution and properties of the milk. Of all preservatives cold is the most efficient and least objectionable. It has been shown by Soxhlet (*Dingler's Polytech. Journal*, ccxxiii. 329) that milk cooled by ice-water remains sweet and unaltered for fourteen days, but after that time acquires a rancid taste. After twenty-eight days it coagulates on boiling owing to the presence of acids resulting from the oxidation of the cream, and in thirty-four days it coagulates even in the ice-water. It is also found that milk which has undergone aeration with atmospheric air has its keeping properties much improved. The aeration is effected by allowing the milk to fall from some height in a state of fine division by passing it through the meshes of a sieve. By another method air cooled by passing over ice is blown through the milk.

Milk keeps sweet for a longer time when boiled, but the smell, taste, and other properties are affected, partly owing to the escape of gases mixed with it when fresh. The unpleasant flavour communicated by boiling can be avoided if the action takes place in a closed vessel and the milk is immediately cooled down in a refrigerator connected therewith. In the case of any suspicion of taint in milk either from disease in the cow, contamination from unhealthy persons, or the use of infected water in cleaning vessels, boiling is also strongly to be recommended, as it effectually destroys the germs of disease, in the carrying and spreading of which milk is a most active agent. It is with the utmost difficulty that boiled milk can be coagulated by means of rennet; but by treatment with acid it coagulates more rapidly and freely than if unboiled.

Of the various chemical compounds which have been suggested and more or less used for preserving milk, the most successful hitherto has been salicylic acid, which has the advantage of being tasteless and inodorous. By briskly stirring in rather less than 2 grains to a pint of milk, it can be kept liquid and sweet in a temperature of from 65° to 68° Fahr. for twelve hours, and at 55° Fahr. for a whole day. If 4 grains be used to a pint, coagulation in the higher temperature is delayed from two or three days, and at the lower temperature the milk may be kept good from three to five days. Boracic acid and borax are also employed by dairymen, the former being known as glacialine salt. The presence of any chemical antiseptic in milk is, however, at best a matter of doubtful advantage.

Condensation.—Milk is now treated on a large scale by a process of concentration, the product of which comes into the market in two forms—as "plain condensed milk" and as "preserved milk." The credit of originating the industry is due to Mr Gail Borden of White Plains, New York, who began his experiments about 1849. In 1851 he introduced his plain condensed milk, which is simply milk from which between three-fourths and four-fifths of the water has been removed, and in 1861 he rendered important services to the army in the field by supplying preserved milk which was in effect milk similarly concentrated, with a proportion of sugar added, and hermetically sealed in tin cans. The manufacture was transplanted to Switzerland in 1865, after which condensing factories were established in England, Ireland, Denmark, Bavaria, Norway, and elsewhere. With the introduction of the condensing trade there has also been associated the factory system of dealing with dairy products, by which the milk of many dairies is carried to one centre and dealt with either for condensing or for cheese or butter making. The following epitome of the process of condensing milk is from a paper by Mr Willard of Cornell university, New York (*Jour. Roy. Agric. Soc.*, 2d series, vol. viii., 1872). The milk when received at the factory is first passed, he says, "through a strainer to the receiving vat; from this it is conducted off, going through another strainer into the heating cans, each holding about 20 gallons; these cans are set in hot water, and the milk is held in them till it reaches a temperature of, 150° to 175° Fahr.; it then goes through another strainer into a large vat, at the bottom of which is a coil of copper pipe, through which steam is conducted, and here the milk is heated up to the boiling point. Then the best quality of white granulated sugar is added, in the proportion of 1¼ lb of sugar to the gallon of milk, when it is drawn into the vacuum-pan having a capacity of condensing 3000 quarts or more at a time. The milk remains in the vacuum-pan subjected to steam for about three hours, during which time about 75 per cent. of its bulk in water is removed, when it is drawn off into cans, holding 40 quarts each. The cans are only partially filled, and are then set in a large vat containing cold water, the water being of a height equal to that of the milk in the cans. Here it is stirred until the temperature of the condensed fluid is reduced to a little below 70°; it is then turned into large drawing-cans with faucets, in order to facilitate the filling of the small cans, ... holding 1 lb each, which are immediately soldered to exclude the air."

In the case of plain condensed milk the concentration is usually carried farther than is practised in preparing the preserved milk, it being evaporated down to between one-fourth and one-fifth of the original bulk. It is not put up in sealed tins, being intended for immediate use, and keeps sweet only for a few days, varying with the state of the weather, whereas the sugared milk in sealed cans keeps for years. The large amount, however, of cane sugar added to preserved milk seriously disturbs its balance of proportion as a perfect food, and renders it unfit to be used alone in a dilute state as a substitute for mother's milk by infants, a purpose for which it is largely employed. It should also be observed that the relative proportion of fat is small, the milk being partially skimmed before it is operated on, so that the statement that preserved milk diluted with a small proportion of water is equal to cream is not to be relied on. Preserved milk, rich in cream, has always a more or less rancid oily taste, and cannot be obtained so sweet and even in flavour as that largely deprived of fat. According to a German patent of E. Klebs in Prague, plain condensed milk may be preserved by adding to every 100 litres of the original milk a solution of 50 grains of benzoate of magnesium in one litre of water.

Adulteration.—Practically the invariable mode of sophisticating milk for sale consists in the addition of water and in the subtraction of cream,—in other words, passing off skimmed or partly skimmed as new milk. Now and again there are found certain little refinements on these simple frauds, such as adding a quantity of sugar to correct the specific gravity, flour or starch to increase opacity, and a touch of colouring matter to cover the bluish tinge which would betray skimmed milk. In the United Kingdom no official standard of what constitutes pure milk has been promulgated, but the so-called Somerset House standard has been generally recognized in law courts. According to this, new milk should contain as a minimum of solids not fat 8·6 per cent. and of fat 2·5 per cent., and of water a maximum of 88·9 per cent. The most satisfactory manner of discovering the probable genuineness of a sample of milk is by chemical analysis carried sufficiently far to determine the amount of fat and of other solids present. Numerous attempts have been made to place in the hands of dairymen, dealers, and consumers of milk a trustworthy method of estimating the condition and value of the article by simple quantitive tests for cream or fat—at once the most valuable constituent and one the presence of which in average proportion is indicative of the quality of the whole. The simplest but at the same time the least trustworthy and efficient method is by means of the so-called "creamometer," which consists merely of a graduated glass tube in which a measured amount of milk is placed and the amount of cream it throws up is read off by means of the scale. Specific gravity determinations have by themselves no significance, seeing milk deprived of its cream can by dilution with water be brought to correspond exactly with the original milk. But by a combination of two methods,—first taking the specific gravity, next observing the yield of cream by the "creamometer," and finally taking the specific gravity of the milk deprived of cream, regard being had to the temperature of the milk in these observations, an approximately accurate idea of the value of a sample may be obtained. Among so-called "lactoscopes," the operations of which are based on the fact that milk rich in cream is a much more opaque fluid than that from which cream has been taken or to which water is added, that invented by Professor Feser of Munich is one of the simplest and most useful. It consists of a glass tube open at the upper end and attenuated at its lower extremity. Into this narrower portion is fused a small cylindrical rod of opaque milk glass on which black lines are marked. These lines are invisible when the lower portion of the tube is filled with a measured quantity of milk, but on addition of water they become visible. When the black lines become by the gradual admixture of water perfectly distinct, the richness of the milk in cream globules is indicated by the height to which the mixture of milk and water has risen in the wide portion of the tube, which has engraved on it a scale showing on one side the amount of water added and on the other the proportion of cream equivalent to the transparency resulting from such addition.

Statistics.—In the year 1878 it was calculated by Mr J. C. Morton that the total yield of milk from the 2,250,000 cows and heifers in milk or in calf in England and Scotland amounted to about 1,000,000,000 gallons yearly. He assumed that about one-sixth of that quantity (167,000,000 gallons) went to feed calves, and that the daily consumption of the population was 1,000,000 gallons, being rather more than a quarter of a pint per head, which accounts for 365,000,000, still leaving 468,000,000 gallons to be used for butter and cheese making. Two-thirds of this quantity, or 312,000,000 gallons, Mr Morton assumes was used for cheese-making, yielding 2,800,000 cwts. of cheese (rather less than 1 lb per gallon of milk), and the remainder, 156,000,000 gallons, of milk devoted to butter-making would yield 530,000 lb of butter, or 1 lb of butter for every 21 pints of milk. In these figures no account is taken of Ireland, whence at that period there were sent to England alone yearly 3,500,000 lb of salted butter. In June 1882 the number of cows and heifers in milk and in calf in Great Britain did not vary greatly from the number on which Mr Morton's estimate for 1878 was based, being 2,267,175, whilst in Ireland the number was 1,398,905, making the total for the United Kingdom 3,682,317. If we take approximately Mr Morton's data as the basis of calculation, the 3,682,317 milk cows and heifers in the United Kingdom would yield, at 440 gallons per head, 1,620,219,480 gallons of milk. Further, assuming that one-sixth of this is consumed by calves, one-third consumed by population, one-third used for cheese-making, and one-sixth used for butter-making, we have as the yield of cheese 4,846,600 cwts. and as the yield of butter 920,000 cwts. As Ireland is much more a butter-producing than a cheese-yielding country, the quantity of cheese made is probably overestimated in these figures, and the amount of butter made is correspondingly understated. To bring out the consumption of dairy products for the year the following imports must be added:—

	Cwts.	Value.
Cheese	1,692,495	£4,742,368
Butter (including butterine)	2,167,428	11,339,226

Thus we find the total supply of cheese to the United Kingdom in 1882 was 6,538,495 cwts., and of butter the supply was 3,087,428 cwts. Estimating the home produce of both articles at the same value as the imports, the cheese supply cost £18,320,000, and the butter £16,150,000. Adding to these the probable cost of the milk consumed as such (say 550,000,000 gallons at 1s. per gallon =£27,500,000), we have for the year 1882 in round numbers £62,000,000 expended on dairy produce within the United Kingdom.

The total number of milch cows at present (1883) in the United States is stated at 15,000,000, which, taking the 440 gallons basis, yield annually 6,600,000,000 gallons, or nearly 30,000,000 tons of milk. In America the factory system of treating milk has attained much greater dimensions than in Europe, and that perfection of treatment, combined with the cheapness of raising and feeding stock, enables the American companies to enter the European markets with large quantities of cheese and other dairy products of uniformly good quality which find a ready and remunerative sale.

Koumiss.—Under this name is properly understood a fermented drink prepared from mare's milk by the Tartar tribes of the Russian empire and by all the nomad races of the northern parts of Asia. It is made by diluting mare's milk with about one-sixth part of its quantity of water, and adding as a ferment about one-eighth part of very sour milk or of old koumiss. This mixture is placed in a wooden vessel which is covered over with a thick cloth, and so left for about twenty-four hours in a moderately warm situation. During that time a thick coagulum rises to the surface, which is thoroughly reincorporated by churning. After standing for another day, the whole mass is again thoroughly churned and mixed up, and in this state it forms new koumiss, having an agreeable subacid taste. The liquor is mostly stored and preserved by the Tartars in skin bottles, in which the fermentation continues developing its alcoholic qualities, and mellowing and improving its taste. Genuine Tartar koumiss has the following composition:—alcohol 3·21, lactic

acid 0·19, sugar 2·10, albuminoids 1·86, fat 1·78, salts 0·509, carbonic acid 0·177, and water 93·46. A distilled spirit is prepared from koumiss, which is drunk among the Tartars under the name of araca or arsa. Koumiss has of late years come into prominent notice as a remedial agent in cases of pulmonary consumption, and generally as a nutritious form of food easily assimilated by delicate stomachs. It is probable that all its virtues reside in the original milk from which it is prepared, in which case the koumiss can only be regarded as valuable in so far that it is a convenient form under which the essential properties of the milk can be preserved for use. Under the name of koumiss a preparation of cow's milk is now very generally sold. It is made by adding to each quart of new milk about a tablespoonful of common sugar and brewer's yeast, allowing the fermentation to proceed a sufficient length, then bottling and corking as in the case of aerated waters. Such a preparation contains about the same proportion of alcohol as genuine koumiss, but a non-alcoholic variety can also be obtained, made by a process of natural fermentation, which continuing after bottling develops a large amount of carbonic acid and renders the liquor highly effervescent. (J. PA.)

MILL, JAMES (1773–1836), historian and political and mental philosopher, was born 6th April 1773, in the little village called Northwater Bridge (Bridge of North Esk), in the parish of Logie-Pert, in the county of Forfar. His father, James Mill, was a shoemaker; his mother, Isabel Fenton, belonged to a race of respectable farmers. The father was industrious, good-natured, and pious, but not known as specially intelligent. The mother was of a proud disposition, and resolved to educate James, her eldest son, for a superior destiny. He began his education at the parish school, and went on to the Montrose Academy, where he remained till the unusual age of seventeen and a half, when he went to the college of Edinburgh (1790). According to the usage of the time and neighbourhood, he ought to have been sent about thirteen or fourteen to Marischal College, Aberdeen. His remaining so long at the Montrose Academy, and his going to Edinburgh for his university course, must be connected with his being taken up by Sir John and Lady Jane Stuart of Fettercairn, who engaged him to be tutor to their only daughter, known for having inspired the affection of Sir Walter Scott, and for being the mother of Principal James David Forbes. Sir John and Lady Jane Stuart contracted a warm attachment for Mill, which lasted throughout their lives. At Edinburgh University Mill was distinguished as a Greek scholar. But he received his greatest impulse from Dugald Stewart, for whom he always expressed unbounded admiration. In October 1798 he was licensed as a preacher, but seems to have preached very seldom. His years from 1790 to 1802, besides being occupied with incessant studies extending into history and moral and political philosophy, were devoted to various tutorships.

Failing to find a career to his mind in Scotland, in 1802 he went to London in company with Sir John Stuart, then member of parliament for Kincardineshire. He soon obtained literary occupation, to which he applied himself with untiring energy. His first important venture was to start a periodical on a new plan, entitled *The Literary Journal*, which began to appear in January 1803, and continued under his editorship till the end of 1806. It was the most comprehensive in its aims of any periodical hitherto in existence, being a summary view of all the leading departments of human knowledge. Thomas Thomson, the chemist, took charge of science; and many other men of ability co-operated. Mill himself wrote largely in biography, history, political philosophy, political economy, and also in theology, on which his views at the time were broad without being sceptical. The publisher of the journal was Baldwin, who was also the proprietor of the *St James's Chronicle*, a Conservative paper appearing three times a week. For two or three years, from 1805 onwards, Mill was editor, but at last gave it up, partly on conscientious grounds, although in conducting it he never lent himself to the expression of any illiberal views, but often made it the vehicle of the opposite.

In 1804 he wrote a pamphlet on the *Corn Trade*, advocating the impolicy of a bounty on the exportation of grain. This was the beginning of his career as a political economist. In 1805 he published a translation of Villers's work on the *Reformation*, an unsparing exposure of the vices of the papal system. He added notes and quotations by way of confirmation of the author's views. On this subject also he continued to hold strong opinions all through life, and often recurred to it in his articles in the reviews. In 1805 he married Harriet Burrow, whose mother, a widow, kept an establishment for lunatics in Hoxton. He then took a house in Rodney Street, Pentonville, where his eldest son, John Stuart, was born in 1806. It was about the end of 1806 that he entered upon the composition of the *History of India*, which he expected to finish in three or four years. He was actually engaged upon it for twelve, giving, however, a considerable portion of his time to other writing for the support of his family. The strain upon his energies for those years was enormous.

He became acquainted with Jeremy Bentham in 1808, and was for many years Bentham's chief companion and ally. In 1810 Bentham, to have Mill nearer him, gave him Milton's house, which adjoined his own, and was his property. After a few months' trial Mill had to give up this house on account of his wife's health, and went to live in Newington Green; but in 1814 Bentham leased the house No. 1 Queen's Square, now 40 Queen Anne's Gate, close to his own garden, and gave it to Mill at a reduced rent; here he remained till 1831. The intimacy with Bentham was rendered still closer. For four years, from 1814 to 1817, Bentham was at Ford Abbey, near Chard, in Somersetshire, and there Mill and his family were domesticated with him nine or ten months each year,—in which retirement it is probable that Mill was able to accelerate the completion of his history.

In the twelve years between 1806 and 1818 he wrote a great many articles for various periodicals. Among these were the *Anti-Jacobin Review*, the *British Review*, and the *Eclectic Review*; but there is no means of tracing his contributions. In 1808 he began to write for the *Edinburgh Review*, and contributed steadily till 1813, most of his articles being known. In the *Annual Review* for 1808 two articles of his are traced—a "Review of Fox's History," and an article on "Bentham's Law Reforms," probably his first published notice of Bentham. The first known article in the *Edinburgh* was on "Money and Exchange" (October 1808). In 1809 (January and July) he wrote at great length on Spanish America and General Miranda, with whom he was on terms of intimate friendship. In the July number he also wrote on China. In 1810 (April) he made a severe attack on the East India Company. He also wrote on the liberty of the press and on the Church of England in connexion with the Lancasterian schools. He was an active member of the committee for promoting education on Lancaster's plan. In 1811 a periodical named the *Philanthropist* was started by William Allen, and published in quarterly numbers till 1817. Mill co-operated with Allen both in the writing and in the management. He contributed largely to every number,—his principal topics being education, freedom of the press, and prison discipline (under which he expounded Bentham's "Panopticon"). He made powerful onslaughts on the church in connexion with the Bell and Lancaster controversy. In 1814 Macvey Napier engaged him to contribute to the supplement to the fifth edition of the *Encyclopædia Britannica*. Many of the articles became notable. The list included "Government," "Jurisprudence," "Liberty of the Press," "Prisons and Prison Discipline," "Colony," "Law of Nations," "Education," "Beggar," "Benefit Societies," "Banks for Savings." In "Jurisprudence" and "Prisons" he was largely indebted to Bentham; in most of the others he was either altogether or in great part original. The article on "Government" will occupy a permanent position in English history.

In 1818 was published the *History of India*, which had a great and speedy success. It was the means of changing the author's future position. The year following he was appointed an official in the India House, in the important department of the examiner of Indian correspondence. He gradually rose in rank till he was appointed, in 1830, head of the office. He introduced his eldest son into the same department in 1823.

In 1824 Bentham projected the *Westminster Review*, and Mill was a principal writer for three years. Some of his most vigorous writings are included among those contributions. The first was an elaborate criticism of the *Edinburgh Review* as a whole; it was followed by an onslaught on the *Quarterly*. Other articles dealt with English history and with ecclesiastical establishments, which he severely impugned. To a periodical of short duration, *The Parliamentary History and Review*, he contributed an elaborate political retrospect of the parliament of 1820–26. In 1829 appeared the *Analysis of the Human Mind*. From 1831 to 1833 he was largely occupied in the defence of the East India Company during the controversy attending the renewal of its charter, he being in virtue of his office the spokesman of the court of directors. In 1834 Sir William Molesworth projected the *London Review*, and Mill contributed to it during the last two years of his life. His most notable article was one entitled "The Church and its Reform," which was much too sceptical for the time, and injured the *Review*. His last published book was the *Fragment on Mackintosh*, which appeared in 1835. He died on the 23d June 1836.

A considerable space would be required to do justice to Mill's character—intellectual and moral—as shown both in his writings and in his intensely active and influential career. He was an excellent scholar, in the sense of knowing the Greek and Roman classics. His other accomplishments included general history, the philosophy of politics in the most comprehensive acceptation, logic, ethics, and mental philosophy. The type of his intellect was logical in the highest degree; he was, above all things, clear and precise, an enemy of every form of looseness of reasoning, and a crusher of prevailing fallacies. This is the most notable feature in his writings throughout. His was also an original mind. Except in a few subjects, which had been so well elaborated by Bentham that he was content to be little more than an expounder of Bentham's views, he gave a fresh turn to whatever topic he took up. At a time when social subjects were subjected almost exclusively to an empirical handling, he insisted on bringing first principles to bear at every point; in this lay both his strength and his weakness.

His greatest literary monument is the *History of India*. The materials for narrating the acquisition by England of its Indian empire were put into shape for the first time; a vast body of political theory was brought to bear on the delineation of the Hindu civilization; and the conduct of the actors in the successive stages of the conquest and administration of India was subjected to a severe criticism. The work itself, and the author's official connexion with India for the last seventeen years of his life, effected a complete change in the whole system of governing that country.

Mill played a great part as a politician and political philosopher in English affairs as well. He was, more than any other man, the founder of what was called philosophical radicalism. His writings on government and his personal influence among the Liberal politicians of his time determined the change of view from the French Revolution theories of the rights of man and the absolute equality of men to the claiming of securities for good government through a great extension of the electoral suffrage. Under this banner it was that the Reform Bill was fought and won.

His work on *Political Economy* was intended as a text-book of the subject, and shows all the author's precision and lucidity. It followed up the views of Ricardo, with whom Mill was in habitual intimacy. It urged strongly the modern application of the principle of population, and started the doctrine of taxing land for the unearned increment of value.

By his *Analysis of the Mind* and his *Fragment on Mackintosh* Mill acquired a position in the history of psychology and ethics. Attached to the *a posteriori* school, he vindicated its claims with conspicuous ability. He took up the problems of mind very much after the fashion of the Scotch school, as then represented by Reid, Stewart, and Brown, but made a new start, due in part to Hartley, and still more to his own independent thinking. He carried out the principle of association into the analysis of the complex emotional states, as the affections, the æsthetic emotions, and the moral sentiment, all which he endeavoured to resolve into pleasurable and painful sensations. But the salient merit of the *Analysis* is the constant endeavour after precise definition of terms and clear statement of doctrines. The *Fragment on Mackintosh* is a severe exposure of the flimsiness and misrepresentations of Mackintosh's famous dissertation on ethical philosophy. It discusses, in a very thorough way, the foundations of ethics from the author's point of view of utility.

Mill's influence on the young men of his time by his conversation has been especially celebrated. Among those that came under this influence were some of the greatest names in the generation that succeeded him. He had himself a very high ideal of public virtue, which he carried out, at the risk of sacrificing all his chances of worldly advancement, and he impressed this ideal on those that surrounded him,—most of all on his own son, who has since eclipsed his father in fame, if not in genius.

See J. S. Mill's *Autobiography*, Bain's *Life of James Mill*, G. S. Bower's *Hartley and James Mill*. (A. B.*)

MILL, JOHN (*c.* 1645–1707), editor of an historically important critical edition of the New Testament, was born about 1645 at Shap in Westmoreland, entered Queen's College, Oxford, as a servitor in 1661, and took his master's degree in 1669. Soon afterwards he was chosen fellow and tutor of his college; in 1676 he became chaplain to the bishop of Oxford, and in 1681 he obtained the rectory of Blechingdon, Oxfordshire, and was made chaplain to Charles II. From 1685 till his death he held the appointment of principal of St Edmund's Hall; and in 1704 he was nominated by Queen Anne to a prebendal stall in Canterbury. He died on June 23, 1707, just a fortnight after the publication of his Greek Testament.

Mill's *Novum Testamentum Græcum, cum lectionibus variantibus MSS. Exemplarium, Versionum, Editionum SS. Patrum et Scriptorum Ecclesiasticorum, et in easdem notis* (Oxford, fol. 1707), was undertaken by the advice and encouragement of Fell, his predecessor in the field of New Testament criticism; it represents the labour of thirty years, and is admitted to mark a great advance on all that had previously been achieved. The text indeed is that of R. Stephanus (1550), but the notes, besides embodying all previously existing collections of various readings, add a vast number derived from his own examination of many new MSS. and Oriental versions (the latter unfortunately he used only in the Latin translations). He was the first to notice, though only incidentally, the value of the concurrence of the Latin evidence with the Codex Alexandrinus, the only representative of an ancient non-Western Greek text then sufficiently known; this hint was not lost on Bentley (see Westcott and Hort, *Introduction to New Testament*). Mill's various readings, numbering about thirty thousand, were attacked by Whitby in his *Examen* as destroying the validity of the text; Antony Collins also argued in the same sense though with a different object. The latter called forth a reply from Bentley (*Phileleutherus Lipsiensis*). In 1710 Kuster reprinted Mill's Testament at Amsterdam with the readings of twelve additional MSS.

MILL, JOHN STUART (1806–1873), son of JAMES MILL (*q.v.*), was born in London on the 20th May 1806. His education was from first to last undertaken by his father, and is likely long to remain a standing subject for wonder and discussion. Much of the wonder is no doubt due to his father's monstrous inversion of custom, the boy being set almost as soon as he could speak to work at our time-honoured subjects of secondary and higher education. He was taught the Greek alphabet at the age of three, and one of his earliest recollections, as he has recorded in his autobiography, was learning lists of common Greek words with their English meanings, written for him by his father on cards. By his eighth year he had gone through in the original a great many Greek books. "Of grammar," he says, "until some years later, I learnt no more than the inflexions of the nouns and verbs, but after a course of vocables proceeded at once to translation; and I faintly