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# GREATER LONDON:

A NARRATIVE OF

*ITS HISTORY, ITS PEOPLE, AND ITS PLACES.*

BY

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*ILLUSTRATED WITH NUMEROUS ENGRAVINGS.*

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the centre, and graced with "delightful gardens and walks, and sundry other pleasant and necessary devices.\* Sir Samuel Pennant, who was Sheriff of London in 1745, died at Nynn House in 1750, during the year of his mayoralty. In 1774 a Mr. John Granger, who assumed the name of Lemans on coming into possession of the manor, pulled down the old house, and destroyed the gardens. The materials of the building were used in the erection of the present Northaw House, which stands about half a mile distant from the site of the old mansion.

The manor, on the death of the Countess of Warwick, in 1603—4, passed by deed of settlement to her brother, Lord William Russell, and it was a few years later sold to the Lemans, with whose family it remained for several generations; down to the middle of the last century, when it was bequeathed to the above-mentioned John Granger. About 1822 the property passed into the hands of the Rev. Dr. Trenchard, on whose death it was inherited by his son, Mr. Ashfordby-Trenchard. This family held the manor till 1876, when it was sold to Mr. John P. Kidston, the present owner. This gentleman has greatly improved and enlarged the house. The grounds are extensive, beautifully laid out, and contain an ornamental lake about five acres in extent.

There are a few other good houses in the parish, notably "The Hook," a substantial mansion of the old-fashioned type, on the south side of the village; and Northaw Place, which stands a little to the west of the church, built towards the end of the seventeenth century.

The parish itself, although of considerable extent, embracing no less than 3,000 acres, contains only about 600 inhabitants, showing but a slight in-

crease since the census of 1871. The parish is wholly agricultural.

The village green occupies a central position in the parish. It stands on a hill some three miles north-east from Potter's Bar Station on the Great Northern Railway. On one side of the green stands the parish church, a new building, of Early English architecture. It is built of stone, and consists of chancel, nave, south aisle, transepts, and a square tower at the south-west corner. The church, dedicated to St. Thomas à Becket, was erected in 1882, in the place of one destroyed by fire in the previous year. The predecessor of the present building—a pseudo-Perpendicular structure—was a comparatively modern edifice, dating from the beginning of the present century. It was built in the place of an older church, probably Late Norman or Early English. It was a commonplace cruciform building, covered with a coating of cement.

At Lower Cuffley, a valley lying about midway between the villages of Northaw and Cheshunt, is a chalybeate spring, which, at the time when the royal court was held at the neighbouring Palace of Theobalds, was much resorted to; but it shared the fate of the spring at Barnet\* and other similar places, and its medicinal qualities seem to have lost their virtue as soon as the spring ceased to be fashionable. Mr. Cussans, in his "History of Hertfordshire," says that "the water contained a large quantity of iron, and a favourite diversion of the inhabitants was to induce strangers to make tea with it. Though perfectly colourless, as soon as the boiling water was poured on the tea, the iron combined with the tannin, and formed ink—as much to the astonishment of the tea-makers as to the delight of the practical jokers."

## CHAPTER XLII.

### ENFIELD SMALL-ARMS FACTORY AND WALTHAM POWDER-MILLS.

"Fire answers fire."—SHAKESPEARE: *King Henry V.*, Act IV.

The History of the Rifle—Situation of the Royal Small-arms Factory—Particulars of its Establishment—Extent of the Buildings, &c.—Perfection of the Machinery and Plant—The Government Powder Mills—Situation of the Buildings—Description of the Works—The Composition of Gunpowder—Quantities produced.

BEFORE we leave Hertfordshire and Middlesex for the towers of Waltham Abbey and the green glades of Enfield Forest, we must pause, and devote a chapter to two public manufactories lying close together on the banks of the Lea, the one known as the Enfield Small-arms Factory, and the other as the Royal Gunpowder Factory, Waltham. Prac-

tically they belong to no parish or county, but are national to the fullest extent of the term, so we make them a connecting link between the district that we have visited and the county of Essex, on which we are about to enter.

The Royal Small-arms Factory is the establishment through which all the small-arms of every

\* Channey's "Hertfordshire," Vol. II., p. 385.

\* See *ante*, p. 323.



description have been supplied—at all events, since the Crimean War—to the regular army, the militia, yeomanry, and volunteers. Its long ranges of buildings and tall chimneys are conspicuous objects from whatever side they are viewed.

With reference to the special manufacture carried on here, a short account of the rifle itself may not be judged out of place.

"As early as 1498," observes a writer in *Chambers's Cyclopædia*, "the citizens of Leipzig possessed the germ of the future rifle, for their arms had a grooved bore, but the grooves were

vidual skill of the marksman. The spiral groove gives to the bullet, if it fits into the grooves, a rotation rapid in proportion to the force of the explosion and the sharpness of the twist in the spiral. This revolution of the bullet on its own



ENFIELD SMALL-ARMS FACTORY.

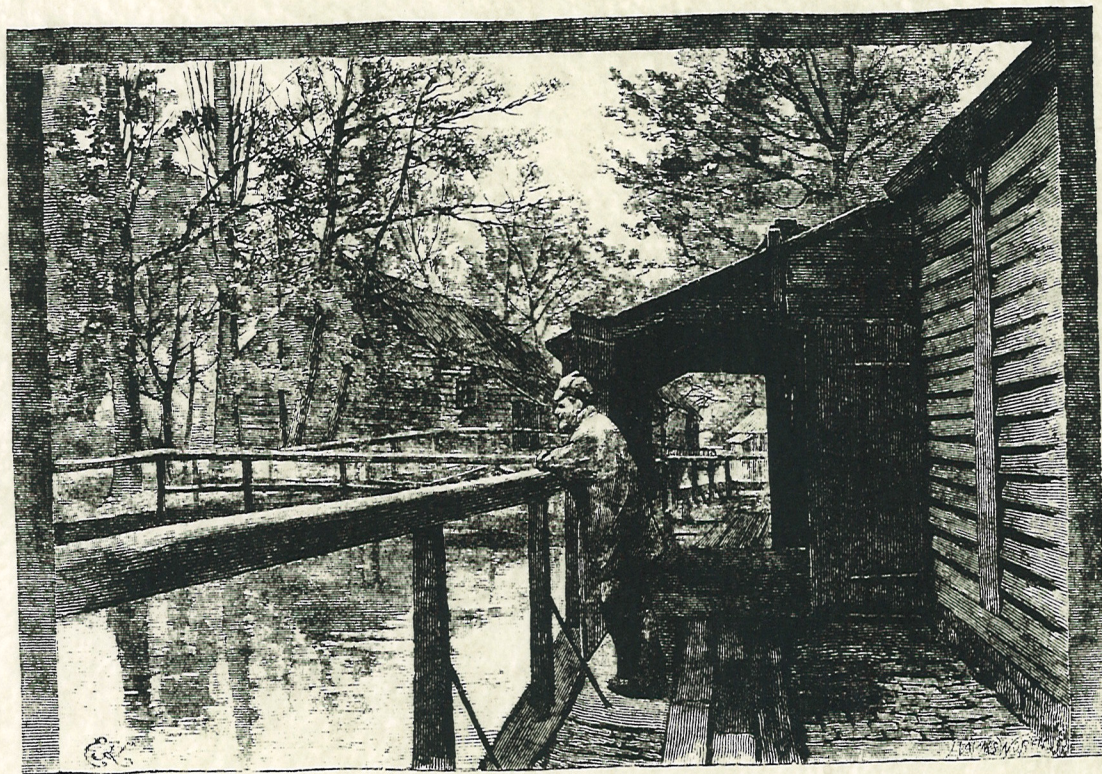
straight. Not many years after, in 1520, Augustin Kutter (or Koster), of Nürnberg, was celebrated for his rose or star-grooved barrels, in which the grooves had a spiral form. It took its name from the rose-like shape of the bore at the muzzle; and, setting aside superiority of workmanship subsequently developed, Kutter's arm was the veritable rifle, and to him, therefore, so far as history shows, is due the invention of this terrible weapon, which reduces the flight of the projectile to a question of the indi-

vidual skill of the marksman. The spiral groove gives to the bullet, if it fits into the grooves, a rotation rapid in proportion to the force of the explosion and the sharpness of the twist in the spiral. This revolution of the bullet on its own axis keeps that axis, gravity excepted, in the line in which it leaves the piece. In 1628 Arnold Rotsiphen patented a new way of 'making gounes,' which, from a subsequent patent granted him in 1635, appears to have consisted, among other improvements, in rifling the barrels. It would be tedious to enumerate the various principles of rifling which were tried during the two centuries following Rotsiphen; suffice it to say, that scarcely a form of rifling now prevails but had its prototype among the old inventions. The difficulty of mechanical appliances making the rifling true deferred, however, their general introduction, and the cost of rifled arms limited their use to the purposes of the chase. The revolutionary government of France had rifles issued to portions of their troops, but they met with so indifferent a success that Napoleon recalled them soon after he came to power. In the Peninsula, however, picked companies of sharpshooters practised with rifles with deadly effect on both the English and



French sides. During the American War—1812-14—the Americans demonstrated incontestably the value of rifles in warfare, but many years were yet to elapse before they were definitively placed in the hands of soldiers, many of those of every nation in the Crimea having fought with the ineffective and almost ridiculous 'Brown Bess.' Soon after the French invaded Algeria they had armed the Chasseurs d'Orleans with rifles, to counteract the superior range of the Arab guns. The inutility of the old musket was shown in a

right, however, to state that this contrivance is claimed for Mr. Greener as early as 1836.) Notwithstanding the many advantages of the Minié system, it was found defective in practice. Experiments were set on foot in all directions, and resulted in 1853 in the production of the 'Enfield rifle,' which had three grooves, taking one complete turn in seventy-eight inches, and fired a bullet resembling the Minié, except that a wooden cup was substituted for one of iron. From 1853 to 1865 this was the weapon of the British army.



THE POWDER MILLS, WALTHAM.

battle during the Kaffir War, where our men discharged 80,000 cartridges, and the damage to the enemy was twenty-five men struck. After experiments with the old musket, it was found that its aim had no certainty whatever beyond 100 yards. It was soon discovered that a spherical ball was not the best missile, one in which the longer axis coincided with the axis of the gun flying truer—the relative length of the axis and the shape of the head being matters of dispute. In England no improvement took place until 1851, when 28,000 rifled muskets to fire the Minié bullet were ordered to be issued. The Minié bullet, being made smaller than the bore of the piece, could be almost dropped into the barrel. (It is

In 1865 the adoption of breech-loading arms caused the Enfield to be converted into a breech-loader by fitting the 'Snider' breech mechanism to the Enfield barrel. This arrangement was, however, only temporary; and after a most exhaustive series of trials before a special committee on breech-loading rifles, the Henry barrel was in 1871 adopted, in conjunction with the Martini breech, for the new small-bore rifle for the British army, now known as the Martini-Henry rifle. No fewer than 104 different kinds of breech-loading small-arms were submitted to this committee, who decided that the Henry .45-inch bore barrel 'was the best adapted for the requirements of the service,' on account of its 'superiority in point of



accuracy, trajectory, allowance for wind, and penetration, and also on account of its great durability. The Henry system of rifling is the invention of Mr. Alexander Henry, gunmaker, Edinburgh, and its essential peculiarity consists in the form of the rifled bore. . . . The length of the Henry barrel is  $32\frac{1}{2}$  inches. The mean diameter of the bore is  $\cdot 450$  of an inch, and the rifling takes one complete turn in 22 inches. Its bullet is solid, with a slight cavity in the rear, and weighs 480 grains, the charge of powder being 85 grains."

The Royal Small-arms Factory, at Enfield Lock, on the narrow strip of land between the River Lea and the water-way known as the "Lea and Stort Navigation," about a mile and a quarter from Enfield Wash, dates its erection from 1855-6. It is true that a small ordnance factory was established here by the Government early in the present century, where a few thousand muskets were laboriously forged by hand each year; but when the sudden introduction of the rifle and the demands of the Russian War called for a supply of arms, which the trade, not only of Birmingham, but of all Europe and America, was unable to meet, the Government determined to erect machinery for the fabrication of arms on its own account. For this purpose the factory at Enfield was entirely re-modelled, but the successive adoption of the Snider and Martini-Henry rifles, as above shown, has been the means of producing a great change in the plant.

The manufactory on its present footing originated in the dissatisfaction for some time felt by the Board of Ordnance at being almost wholly dependent on private manufacturers for so important a part of the *matériel* of war, and in the recommendation, based on that feeling, of a Committee of the House of Commons on small arms, which sat in the session of 1854. The following interesting particulars of the establishment of this factory we quote from Tuff's "Enfield":—"Before 1804, when the manufactory in its original form was established at Enfield, the Government depended on the private trade for their small arms, and when that failed to provide a sufficient supply, recourse was had to the foreign market. At one time, indeed, the art of making muskets became extinct in this country. This occurred in 1802; and Lord Chatham, then Master-General of the Ordnance, stated the circumstance publicly. Mr. John Colgate, who held an appointment in the Ordnance Department, was sent to Liège in 1779 to superintend the setting up of 40,000 stand of arms for the service of the British Government. Major General Miller was despatched to Liège on a

similar service in 1794, to Hamburg in 1795, and again to Hamburg in 1800, the store of arms in the Tower being at that time entirely expended. Again, in 1823, the names of not less than twenty English artificers had been ascertained who were in full employment in the national armoury establishments of Russia and the United States, and no doubt many more might have been discovered. This was attributable to the encouragement and inducements to emigrate held out to our skilled artificers in that branch of trade by foreign nations, backed by the want of employment in their vocation at home; and it was apprehended at that time by men conversant with the subject that, unless the fostering care of the Government was continued in support of its armoury institution, the art must again be lost, or so far reduced that the country would a second time be left to depend on the casual supplies furnished by individual manufacturers. It has always been contended by men who have advocated the formation of Government armouries that the views of tradesmen were confined to individual profit. When they entered upon a contract, their only object was to bring their workmanship to such a state as to pass the official examination; they had no motive, it was said, to improve, or inducement to perpetuate, the art. When the call for arms by the Government ceased with a war, they turned their industry to other occupations, and their workmen were driven to seek employment in foreign countries, or left to neglect the art at home. It was also alleged that a national establishment offered the most perfect means of making experiments for the improvement of the service, and caused the saving of money in time of war as well as of peace, by operating as a check upon the prices of private manufacturers. But its principal object was to keep up among us the art of making military guns.

"It was considerations such as these and others that induced the Government, upon the recommendation of the committee of 1854—the year of the Crimean War—to establish a manufactory of small arms to a limited extent, under the direction of the Board of Ordnance."

While the Parliamentary committee was sitting, a deputation of practical men, previously sent out by the Board of Ordnance to make inquiries in the United States of America as to the mode of manufacturing small-arms there, and having extensive powers to purchase machinery to be applied to their fabrication in this country, was pursuing its mission; and on the report of the committee, the House of Commons voted a sum not exceeding £150,000 towards the experiment. It should be



mentioned here that down to this date most of the small-arms used by our soldiers were manufactured at Birmingham and in other parts of the kingdom, and purchased by the Government.

Since the above period extensive ranges of buildings have been constructed here. They occupy three sides of a square, are built of brick, in a good substantial manner, but quite devoid of ornamentation. About forty acres of ground describes the extent of the factory premises, including the land used as butts for testing each piece that is turned out. Machinery for the manufacture of rifles was imported from America, and was placed under the supervision of Mr. Perkins, as manager. The factory was subsequently taken in hand entirely by the Government, the first superintendent being Colonel Manley Dixon, R.A., who had charge of the works till 1872, when he was succeeded by Colonel Fraser. The factory at the present time is carried on under the superintendence of Colonel H. T. Arbuthnot, R.A., with a staff of military and civil officers, the whole being under the direction of the War Department. The machinery here is probably the most perfect of any gun-making establishment, whether private or Government, at home or abroad; and as the manufacture proceeds it produces the various parts which are ultimately brought together to produce the gun with such accuracy of finish, that if a number of such guns were taken to pieces, and each part thrown together in a heap, the parts could be taken up indiscriminately, and be fitted together to make up guns without the slightest alteration or re-adjustment of either. This great nicety of finish is of immense importance, with regard to both convenience and economy, for if any part of a rifle becomes damaged or rendered unserviceable, the regimental armourer has merely to remove the injured portion, take the corresponding piece from his repository, and at once fit it into its place, without trouble or loss of time.

The mechanism of the "Martini-Henry" is much more simple than either of its predecessors above mentioned, for whilst the old "Enfield rifle" was composed of no less than fifty pieces, and the "Snider" of thirty-nine, the "Martini-Henry" consists of only twenty-seven pieces. Taking the average for the last four years, the number of weapons turned out at the factory in the course of a year is as follows:—Rifles (various), say 40,000; pistols, 5,000; and swords for rifles, 8,000. The plant and general facilities of the factory are in such condition that under great pressure 150,000 arms could be manufactured annually. The motive power is mainly steam, but one water-wheel is still

used in certain work. The number of hands employed here is generally about 1,500.

The interior of the factory consists of a series of large work-rooms. The first usually entered by visitors is called the "action shop," from the fact that here everything relating to the action (or breech-loading and lock apparatus) being finished in it. The room is 200 feet in length, and contains nearly a thousand different machines. The turning-lathes, or machines for forming the butt or stock, are of the most ingenious character, and finish the work in such a delicate manner that the "action" can be instantly fitted to it without the slightest trouble or difficulty. The fitting the lock into the stock was a work involving much time and labour when performed by hand. By this machine a lock can be completely let into the stock in three minutes; indeed, the whole process of making and perfecting the stock does not occupy more than half an hour, and the only hand labour employed upon it is that which causes the friction of a little sand-paper along its surface after its removal from the last machine. Besides the work-rooms, several buildings are occupied as stores of stocks, barrels, &c., which are kept constantly in readiness for use as may be required.

The factory is open to visitors, even without previous application, on Mondays and Thursdays; but the proof-house, immediately to the south of the factory, is not usually shown. Every "piece" manufactured here is *tested* in the meadows close by.

The Powder-mills stand on the left hand as you enter Waltham Abbey, between two branches of the River Lea, which, as already stated, here is divided into several channels. They are screened from sight by groves of poplars and willows, mostly planted in long rows diagonally, after the fashion described by Virgil, in his "Georgics," under the name of a "quincunx."\* This shelter is useful to keep away all grit and dust, and also, as already noticed, in order to counteract the violence of an explosion. These are the only powder-mills belonging to the Government, those at Faversham, Dartford, and Hounslow, being in private hands. They employ about 250 hands, and they cover a long strip of land about 200 acres in extent, which runs along the banks of the river from south to north.

It is almost needless to add that these powder-mills are very closely guarded, and are shown only to such strangers as have a genuine object in view in inspecting them. There is no special day set apart for their inspection.

\* Virgil, Georg. II., 277, &c.



The appointment of superintendent of the powder-mills is made by the War Office, and is always held by an officer of the Royal Artillery. It is held generally for five years. The present superintendent is Colonel C. B. Brackenbury.

The visitor who wishes to inspect the works on entering the grounds passes along a very beautiful avenue of poplars, and finds himself at the gates of the superintendent's office. He is here warned that he must not carry lucifer-matches or other explosive articles about him, and that whenever he is required to put on leather-soled boots he will do so, as a single particle of grit from the high road, if it were to be driven into some parts of the mills, would cause an explosion.

The wood used for making charcoal is to a great extent grown on the estate. It is either alder, willow, or dog-wood; the latter comes chiefly from Germany, and each kind of wood is used in the composition of different sorts of powder, and is treated differently.

The wood is stacked about the grounds in every available corner, awaiting the time when it will be wanted, in order to be manufactured into that deadly combustible which renders the hearths and homes of soldiers desolate, and the necessity for which is a scandal to the Christian name. However, we must accept the actual state of things.

All the "hands" employed are bound to be steady and sober; no smoking is allowed on the premises; and each man on coming to work puts on a suit of greyish-black. Many of the "hands" are the sons of parents who were employed here before them; and the fact that they carry their lives constantly in their hands, and work with death ever before their eyes, has a sobering effect on them, and even (so I was informed) on their families at home.

The authorised visitor to the works, having been duly challenged at the gates by the police, and passed to the office of the superintendent, is placed in the care of an experienced guide, and thence conducted to the various "houses" where the several operations of gunpowder-making are carried on. These houses are separated by considerable spaces thickly planted with willow and alder wood. Thus if an explosion were to take place in one house the force would be broken by a screen of trees, and the other houses would not be likely to be affected by it.

The three ingredients of which gunpowder is composed are saltpetre, sulphur, and charcoal. For ordinary English gunpowder the proportions by weight are—saltpetre 75, sulphur 10, and charcoal 15 per cent. The processes required for the

manufacture of one of the newest kinds of powder, called prismatic, are as follows:—1, refining the saltpetre; 2, refining the sulphur; 3, burning wood to produce charcoal; 4, mixing the ingredients for the "green" charge; 5, incorporating the "green" charge; 6, breaking down the mill-cake; 7, pressing the powder; 8, granulating; 9, dusting and glazing; 10, prismatic pressing; 11, stowing, to dry the powder; 12, blending prismatic powder.

1. The saltpetre arrives in bags from India, and is refined by boiling in a large quantity of water, and filtering the solution, which then runs into shallow receptacles, where it cools down, being kept in a state of agitation by wooden rakes. The saltpetre crystallises out in a form which closely resembles snow. It is then shovelled into vats, where it receives several washings.

2. The sulphur is next refined by being placed in a retort, and heated until it first melts and then commences to sublime, that is, to pass into a state of vapour. The vapour is led through a pipe kept cool by water outside it, and condenses into a treacle-like fluid, which passes into a receiver, and is then ladled out into tubs, where it sets into the beautiful yellow material which is known as refined sulphur. The impurities are, at the same time, left behind in the retort. Before being used for gunpowder, the sulphur has to be ground into a fine powder.

3. The woods used for gunpowder charcoal are three, as mentioned above. The larger descriptions of powder are made of willow and alder, the willow giving a rather stronger powder than the alder; while the fine-grained powders for use in small-arms are made of dog-wood, which is more expensive, and has not hitherto been grown largely on English soil. The woods are packed in iron cylinders, called slips, and introduced into furnaces also lined with iron. The flame from the fuel plays round the outside of the iron furnace-lining, heating it and the slip within. The various juices of the wood begin to distil, and the gases so produced pass through two holes in the far end of the slip and corresponding holes in the back of the furnace, whence they are carried down into the fire and contribute to the fuel, so that after the process has once been established the wood helps to burn itself. When the work of burning is completed, the slip, with its heated charcoal within, is taken out of the furnace, and placed in an iron cooler for twenty-four hours, after which it is emptied out, but not used for several days, in order to avoid the possibility of any heat existing in it. The charcoal is then ground in an apparatus like a coffee-mill.



4. The next process is that of mixing the ingredients. Hitherto the visitor has entered the houses without any other precaution than the leaving behind of any dangerous material; but henceforth a new danger has to be provided against. The dust from powder flies about the houses, blackening the floor, and filling every cranny with explosive material, in spite of constant sweeping and washing. It is therefore most important that not a single particle of sand or grit should be introduced, lest the motion of a foot on the floor or any friction in the processes themselves should create heat enough to ignite the smallest atom of powder. All persons who enter the powder-houses are therefore obliged to have their feet encased in special leather boots, which never touch the ground outside. A small threshold board, about a foot high, marks the division between the black powder-house, which is called "clean" in the parlance of the factory, and the beautiful outside world, with its waving trees and glittering streams, which are all classed under the one word "foul." If by inadvertence a visitor plants his outside feet within the charmed precincts, he is instantly obliged to withdraw them, and the spot which he touched is carefully purified with wet mops.

In the mixing-houses the air is full of dust, and we literally breathe powder. Fifty pounds of the thin ingredients are placed in a drum, which revolves with great rapidity in one direction, while an orb armed with forks revolves within it in an opposite direction. In about five minutes the process of mixing is complete, and from that moment the three ingredients begin to be highly dangerous.

5. Though the "green" charge is explosive, it is not yet enough intimately mixed to make good gunpowder. It is accordingly next carried in bags to the incorporating mills, which are heavy iron or stone rollers, travelling round in pairs, each roller following its fellow in monotonous round upon its powder-bed, fenced from the rest of the incorporating house by the inclined sides of a sort of basin. The crushing and grinding motion thus produced brings each particle of the three ingredients into mutual contact, and produces, after a certain number of hours (which differ according to the powder to be produced), a soft cake, which is called the mill-cake. Before the runners are set in motion, the green charge placed upon the bed is sprinkled with distilled water, the quantity of which varies, according to the nature of powder sought and the condition of the atmosphere.

6. The mill-cake is then taken to the breaking-down house, where it is made to pass, carried on a

canvas band, between a series of grooved rollers, which crush it into dust much more powerfully explosive than the "green" charge of the mixing-house.

7. The "meal," as it is now called, is next carried to the press-house. The press is a very strong box, containing a number of copper or gun-metal plates, so arranged that the meal can be filled in vertically between them, while they are kept separate by means of grooved plates. When the box is full, the grooved plates are withdrawn, and the spaces left by them filled up with meal, so that nothing now prevents the copper plates from coming together except the meal between them. The side of the box which has hitherto been open is now closed, and the box itself turned over, so that the copper-plates become horizontal. What is now the top of the box is then opened, and the whole placed on an hydraulic press. A ram rising from beneath thrusts the layers of copper plates and powder against a square block of wood above, which just fits into the box. The pressure is continued until the meal has become "press-cake" of the density required for the particular powder which is being made. The time is notified by the release of a spring when the box has risen high enough; this spring rings a bell in a smaller room, where the powder-men are now ensconced; for there are always some 800 pounds of powder in the press-box, and any atom of grit might possibly cause an explosion. A huge traverse of masonry stands between the press-house and the room where the men remain during the process. In addition to the lower growth of the willow and groves of alders, walnut and ash trees surround these terrible press-houses, which are thus mysteriously hidden, not only from the outer world, but even from the rest of the works. The dusky shade and the dark reflection of the green trees in the water, and the black powder-houses themselves, lend an air of mystery to these temples of the art of destruction.

8. The press-cake is carried by water, in black roofed boats, not unlike gondolas, to the granulating-house, where it enters a machine not unlike the breaking-down machine already described, but larger, and with toothed instead of grooved rollers. The cake is here cut by the rollers into "grain" of various sizes, and sorted by sieves kept in perpetual agitation under the stream of grain.

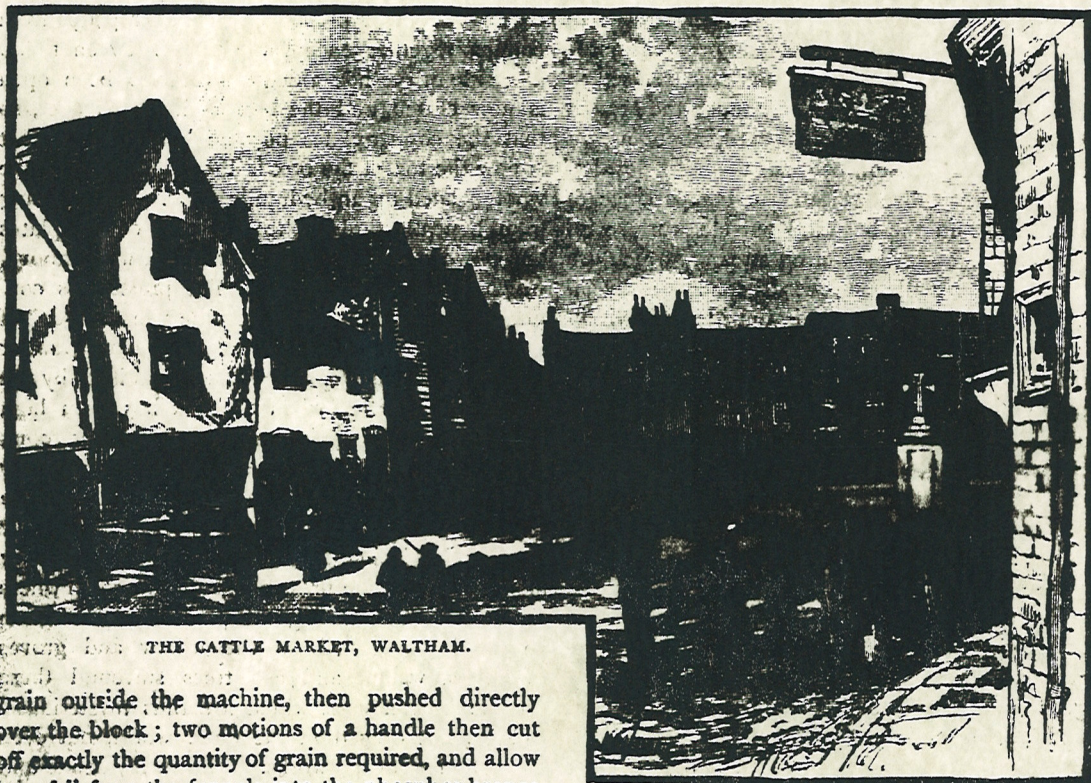
9. The dusting and glazing operations are carried on in long cylindrical reels and wooden barrels, of which different sorts are used, according to the work required. For some powders a little black-lead is introduced, to give them a glossy facing.



10. We now come to the prismatic press-house. The grain suitable for making prismatic powder is carried also in boats to the prismatic press-house, where stands an elaborate machine, consisting mainly of a huge iron circular block, which contains thirty holes. In each hole is put a cylindrical plug of phosphor-bronze, the interior of which is cut exactly to the shape of the prism required. A so-called "charger," with thirty funnels corresponding with the thirty holes in the block, moves backwards and forwards on rails. It is filled with the

a considerable amount of moisture; this is now to be expelled by means of heat. For this purpose the powder is placed on trays in drying-chambers, which are gradually raised to a heat differing according to the character of the powder required. For some powder it is as much as 125 degrees Fahrenheit.

12. But in spite of all the care taken, and though a series of scientific experiments follow the powder through all its stages, there always exists a certain amount of difference between quantities of powder,



THE CATTLE MARKET, WALTHAM.

grain outside the machine, then pushed directly over the block; two motions of a handle then cut off exactly the quantity of grain required, and allow it to fall from the funnels into the phosphor-bronze moulds below. The charge is then withdrawn, the top of the machine brought down to seal the tops of the holes, and then, by hydraulic pressure, thirty plungers, one for each hole, rise up and compress the charges of grain, so as to form them into prisms of the size and shape required. The top is then raised, and the pressed prisms are thrust out of their moulds by pressure from below. The skill required in powder-making may be estimated from the fact that the time necessary to press prismatic powder which will produce certain definite effects varies greatly, according to the state of the atmosphere. The variation at Waltham Abbey has been found to be as much as between twenty-five and sixty-five seconds.

11. All powders hitherto made here have in them

which are called "lots," made at different times and under different atmospheric conditions. It is, therefore, very important to bring the material to a certain average, so that the accurate shooting of artillery or of small-arms may be counted upon. For this purpose every "lot" of powder is proved by actually firing a charge of it. The lots which give the higher results are then mixed in strict proportion with lower lots, so that it is impossible, in making up a cartridge, to take an undue quantity of either the higher or the lower lot. This process is called "blending," and after it is gone through, a charge is again taken and fired, to secure the fitness of the powder for its destined use.

All sorts of strange stories are told about the experiences and hairbreadth escapes of employees



in these interesting works. Thus, on one occasion a lucifer-match was found to have passed between the rollers of the granulating machine; and on another occasion a key was discovered in the same condition. It seems little less than a miracle that such a thing could have happened without causing an explosion.

The works here can turn out about 30,000 barrels of powder in a year, or about 700 barrels weekly. It may be of interest to add that, in-

allowed to dig in them, these grounds are virgin soil, and accordingly they nourish a profusion of wild flowers which are scarcely known outside. Hence they are a favourite haunt of botanists who can procure admission to them; but the favour is sparingly accorded.

The introduction of gunpowder into England is connected with the honoured name of Evelyn, as that family are said to have brought from Holland the secret of its manufacture. Mr. George Evelyn,



ON THE LEA.

cluding the sidings and canals, there are about ten miles of water on the estate, of which three and three-quarter miles are navigable. In addition to the screens of trees, the more dangerous portions of the works are isolated by solid traverses of earth or brick, to minimise the effects of explosion.

The "works" which I have described can boast of almost a venerable antiquity. In the "*Anglorum Speculum, or the Worthies of England*" (1684), it is stated that there were gunpowder mills "on the River Ley, between Waltham and London." In 1735 Farmer speaks of them, in his "*History of Waltham*," as being the property of a Mr. John Walter; and in the same book there is a delightful description of gunpowder. As nobody is

grandfather of the author of "*Sylva*," received, about 1590, a licence to set up powder mills at Long Ditton and at Godstone, Surrey.

"The works at Faversham, afterwards for so many years the Government gunpowder factory, date from Elizabeth's reign; but they were then secondary in importance to those at Godstone. There seems reason, however, to suppose that powder-mills existed at Waltham Abbey as far back as 1561, for in that year we find John Thomworth, of Waltham, in treaty, on behalf of Elizabeth, for the purchase of saltpetre, sulphur, and staves for barrels. Fuller also refers, in his "*Worthies*," to the powder mills of Waltham Abbey, of which he was appointed vicar in 1641. In 1787 these mills



were sold to the Crown by John Walton, and reorganised under the superintendence of the famous Sir William Congreve. The old royal factory at Faversham was given up after the Peace of 1815, being let, and afterwards sold, to the well-known firm of John Hall & Co. . . . The

Waltham Abbey works have been greatly enlarged in recent years, and no expense has been spared to render them, by the introduction of new and improved machinery, the most complete, as well as the safest, in the world.\*

Henceforth our travels will be in Essex.

## CHAPTER XLIII.

### WALTHAM ABBEY.

*Situation of the Town—Its Etymology—Foundation of the Abbey by Jovi—Its Re-foundation by Harold—The Legend of the Holy Cross—Gifts bestowed on the Abbey—Harold's Tomb—The Church despoiled by William the Conqueror—Its Recovery under subsequent Sovereigns—Disputes between the Abbot and Townspeople—Henry III. and the Abbot's Dinner—An Incident touching the Reformation—Income of the Abbey at the Dissolution—Fuller, the Historian—The Conventual Estate passes into Secular Hands—Description of the Abbey Church—Sale of the Church Bells—Present Condition of the Remains of the Abbey—Rome Land—The Abbey Gateway and Bridge.*

WALTHAM ABBEY, or Waltham Holy Cross, as it was once called, must be carefully distinguished from its neighbour in Hertfordshire, which is described in a previous chapter.\* It is a large, irregular town, and evidently one of considerable antiquity, as is shown by the variety of projecting gables, and the quaint carved figures which still stand in bold relief at the corner of more than one of its streets, like those with which one meets at Ipswich, Saffron-Walden, and many other towns of the eastern counties. The town is situated on low ground near the river Lea, which here forms a number of small islands, and is skirted by fruitful meadows, that have long been famous for the succulent and nourishing qualities of the grass. The spot was originally part of the Forest of Essex, and it derived the name of Waltham from the Saxon words *weald-ham*, the dwelling or hamlet on the weald, or open forest.

The town is twelve miles north-east from London, and about three-quarters of a mile eastward from Waltham Station on the Cambridge line of the Great Eastern railway. The road thither from the railway station, however, is by no means attractive: it is straight as an arrow, and is little more than a raised causeway between low-lying green meadows, with a deep ditch on either side. The river Lea, which we cross—the Lea of quaint old Izaak Walton—here separates into a variety of streams, and we pass no less than four bridges before we find ourselves at the end of a narrow street, with gabled tenements on either side, and close under the shadow of the tower which has been our beacon.

Waltham appears to have been a place of note long before the Norman Conquest. It is first

mentioned in a document dated as far back as the time of Canute the Great, at which period its then owner, Tovi, or Tovius, standard-bearer to that monarch, founded on the outskirts of the forest here a church and a village, placing in the former two priests, and erecting in the latter some tenements for his "villains," and placing in them "threescore-and-six dwellers." After his death, Athelstan, his son and heir, a prodigal young man, squandered his inheritance, and Waltham appears by some means or other to have reverted to the Crown. The religious establishment of Tovi, however, continued, and probably with some augmentation, till the reign of Edward the Confessor, who bestowed certain lands here on his brother-in-law, Earl Harold, son of Godwin, Earl of Kent; but the grant was made upon the condition that Harold should build a monastery in the place, "where *was a little convent*, subject to the canons and their rules." The "little convent" mentioned in the Confessor's charter, evidently alludes to Tovi's foundation, which might have been augmented by casual donations previous to this mention of it.

In 1062, the year in which the grant was dated, Harold refounded or enlarged the original establishment of Tovi, endowing it as a convent, doubling the number of its canons, settling on them ample estates, and founding hard by a school of religious and useful learning. Farmer, in his "History of Waltham," says that each of the canons had one manor appropriated for his support, and that the dean had six: making in all seventeen. From the charter of confirmation granted by Edward the Confessor, it appears that

\* See *ante*, p. 392.

† Encyclopædia Britannica.

‡ "Dugdale's Monasticon," Vol. vi., pt. i. p. 56.



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ESSEX PAST AND PRESENT

N.B. PICTURE OF POWDER MILLS  
WALTHAM ABBEY <sup>SIMILAR PHOTO</sup> ~~DELETED~~

IN GREATER LONDON P397

(THE ENFIELD LIFE AT  
TOP OF PAGE)

BUT TITLED THE POWDER MILLS  
WALTHAM.



WASC 515

Philips' County Readers.

# ESSEX

## PAST AND PRESENT

BY

GEORGE F. BOSWORTH. F.R.G.S.

AUTHOR OF "KENT—PAST & PRESENT." "LIFE OF KING ALFRED THE GREAT," &c.



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POWDER MILLS, WALTHAM ABBEY.



and profit to many cottagers: and the growing of flowers for seeds is carried on at Coggeshall, Kelvedon, Witham, Dedham, and St. Osyth. At the last place there are large Seed and Flower Farms covering acres of land, which glow with dazzling colours, for flowers of all kinds are seen in every direction, and the air is laden with their fragrance. The showy gladiolus and sunflower vie with the rich but formal dahlia: while mignonette literally carpets the ground. Myriads of petunias, stocks, and pansies greet the eye, while no less than a score of varieties of phlox are grown. In the autumn, men and women may be seen threshing the pods with flails, and passing the seeds through sieves, to rid them of dirt. The seeds are then winnowed in huge wicker fans, and finally packed and sent to London.

On the east coast, several of the towns are engaged in the fish trade, and at Harwich, in particular, many fishermen gain a livelihood. Fish of all kinds is sent from here to London; but shrimps are specially abundant, and no less than 500 tons are despatched from Harwich to London in the season. Essex has always been famous for oysters, even as long ago as the time of the Romans. The breeding of the oyster is carried on in the water near Burnham and Brightlingsea, and thousands of pounds are annually realised by the sale of the Essex "natives."

Compared with Lancashire and Yorkshire, the manufactures of Essex are not so important; but every year, in the south-west of Essex, new industries are introduced, and so employment is given to thousands of people in and around West Ham. Several thousand men are employed in the extensive workshops of the Great Eastern Railway at Stratford; and the Thames Iron Works at Canning Town, and the Victoria and Albert Docks constantly give work to enormous numbers of men.



POWDER MILLS, WALTHAM ABBEY.



The Thames Iron Works front the River Thames and extend some distance up Bow Creek. They are the growth of more than half a century and cover an area of over 30 acres on the Essex side. The various departments comprise Ship Building, Civil and Marine Engineering, the Foundries and Electrical Works, and the Dry Docks. The most important ship built at these works was the Japanese battle-ship, "Fuji," which was of 14,000 horse-power, and was launched in 1896. There are generally from three to four thousand men employed at these works.

The Victoria and Albert Docks are two and three-quarter miles long, with a water area of 175 acres and about 7 miles of quays. The entrance lock is 500 feet long by 80 feet wide, and has four pairs of wrought-iron gates. The walls of the docks are 40 feet high; and the sheds for the reception of goods are numerous and spacious.

The Beckton Gas Works at North Woolwich supply a large part of London with light, so that the number of hands at work is very large. At Silvertown there are manufactures of waterproof clothing, indiarubber, gutta-percha, and telegraph cables; while at Barking there is an extensive jute factory. Machinery connected with electric lighting is made at Chelmsford; and agricultural implements are made at this town and Maldon. Chemicals of all kinds, especially quinine, are prepared at Stratford; and here are manufactured soap, candles, matches, and bone manure.

Malting is carried on at Bishop Stortford and Mistley: boats and yachts are built at Wivenhoe; and bricks are made in nearly every part of the county—owing to the abundance of clay. Xylonite, a patent imitation of ivory, is produced in large factories at Manningtree and

Walthamstow. Gunpowder and percussion caps are manufactured at the Government works at Waltham Abbey on the Lea: and cement is made at Dovercourt and Saffron Walden. At Walton-on-the-Naze there is a large Foundry where bells are cast. Photographic plates and notepaper are made at Ilford.

The once celebrated woollens of Essex are no longer made, and the only textile fabrics now manufactured are silk and crape at Braintree and Bocking, where many hundreds of people are employed by the well-known firm of Courtauld and Co.



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POWDER MILLS, WALTHAM ABBEY.



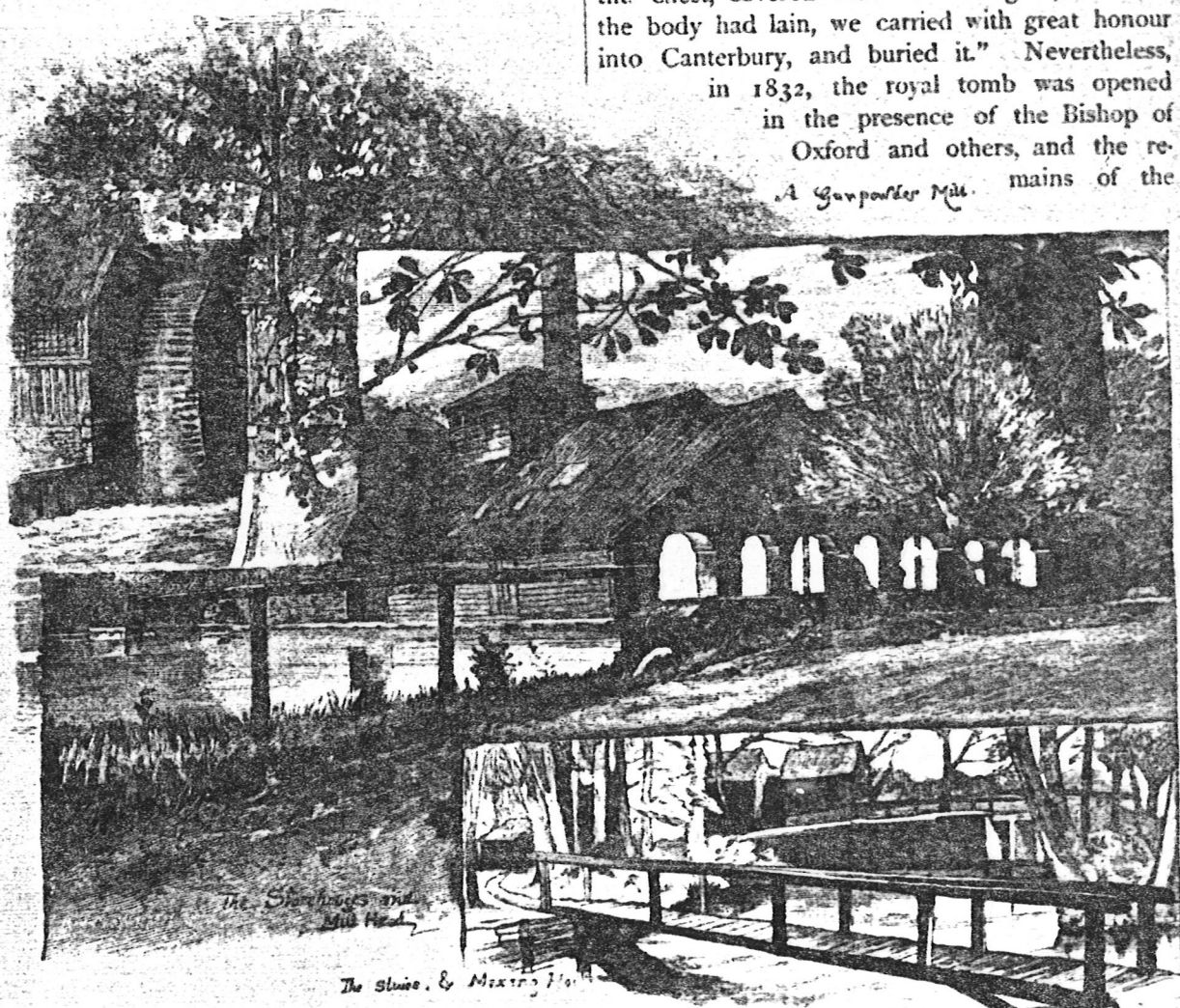
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The village, or town, of Hounslow, as stated in the preceding chapter, is situated partly in the parish of Isleworth; it is also partly in that of Heston. The place was called in "Domesday

came a certain man of his household to the house of the Holy Trinity at Hundeslaw for refreshment, who confessed that he was "one of three men who threw the corpse [of the king] into the river between Barking and Gravesend," whilst it was being conveyed from Westminster towards Canterbury for interment; and adds, "but the chest, covered with cloth of gold, in which the body had lain, we carried with great honour into Canterbury, and buried it." Nevertheless,

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*A Gunpowder Mill. mains of the*



THE POWDER-MILLS, HOUNSLOW, 1886. (See p. 68.)

Book" Honeslowe, and later on it was spelt Hundeslawe and Hundeslowe. In the thirteenth century a priory, dedicated to the Holy Trinity, was founded here, the peculiar office of the brethren being to solicit alms for the redemption of captives. It is spoken of by Cobbett, in his "History of the Reformation," as "a friary."

One Clement Maydestone, a friar of this house, wrote a history of the martyrdom of Richard Scrope, Archbishop of York, to whom he had been a retainer, in which it is stated that within thirty days after the death of Henry IV., there

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In 1296 a weekly market was granted to the brethren of this priory, to be held on Wednesday, and an annual fair on the eve and feast of the Holy Trinity, and to last a week. The market has long been discontinued, but fairs are still held on Trinity Monday, and on the Monday after Michaelmas Day. At the dissolution the revenues of this priory were valued at £78 8s. 6d. In Cooke's "Topography of Middlesex," published early in the present century, it is stated that "the only remain-



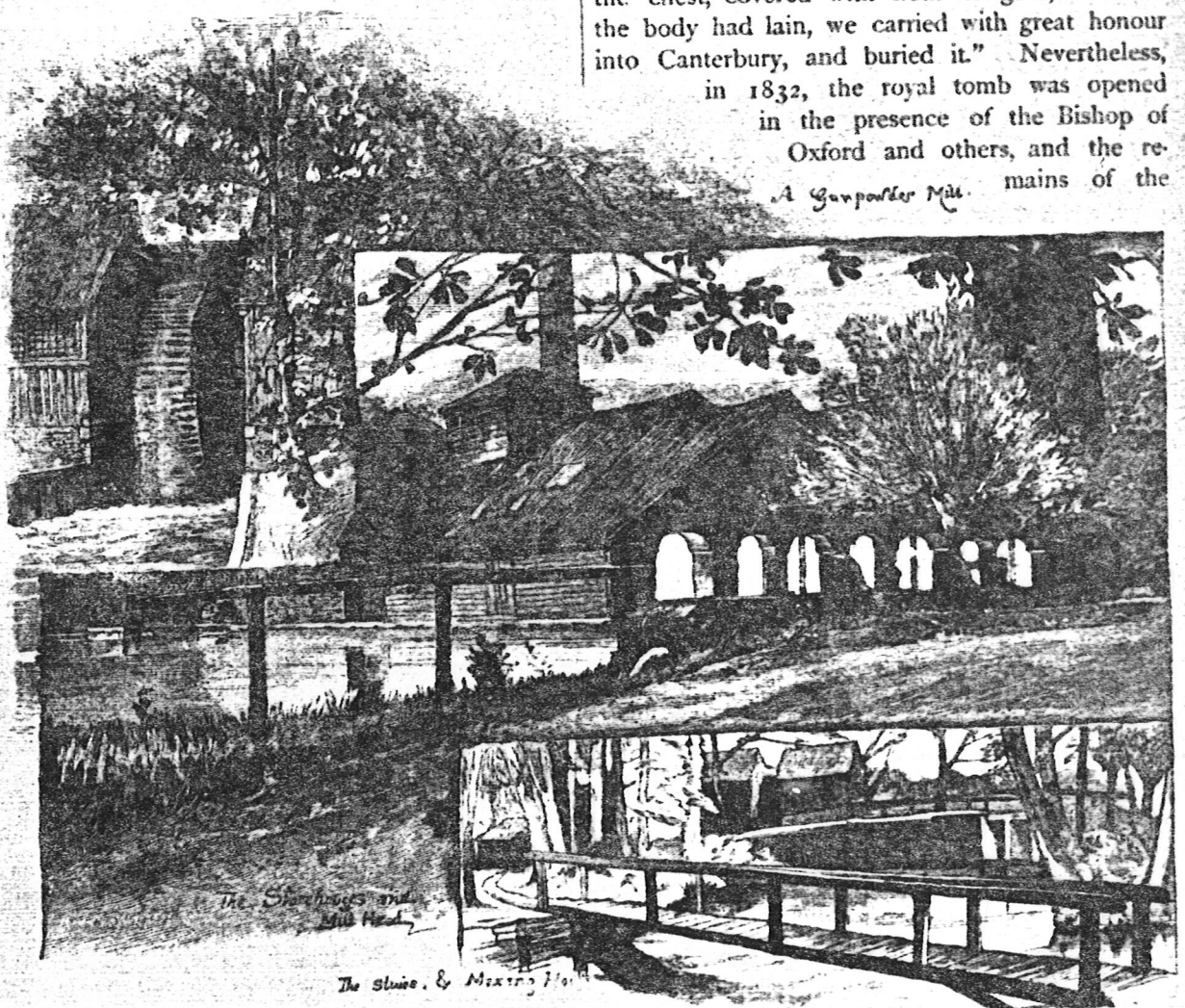
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*ITS HISTORY ITS PEOPLE AND ITS PLACES*

BY

EDWARD WALFORD M.A.

JOINT-AUTHOR OF "OLD AND NEW LONDON"

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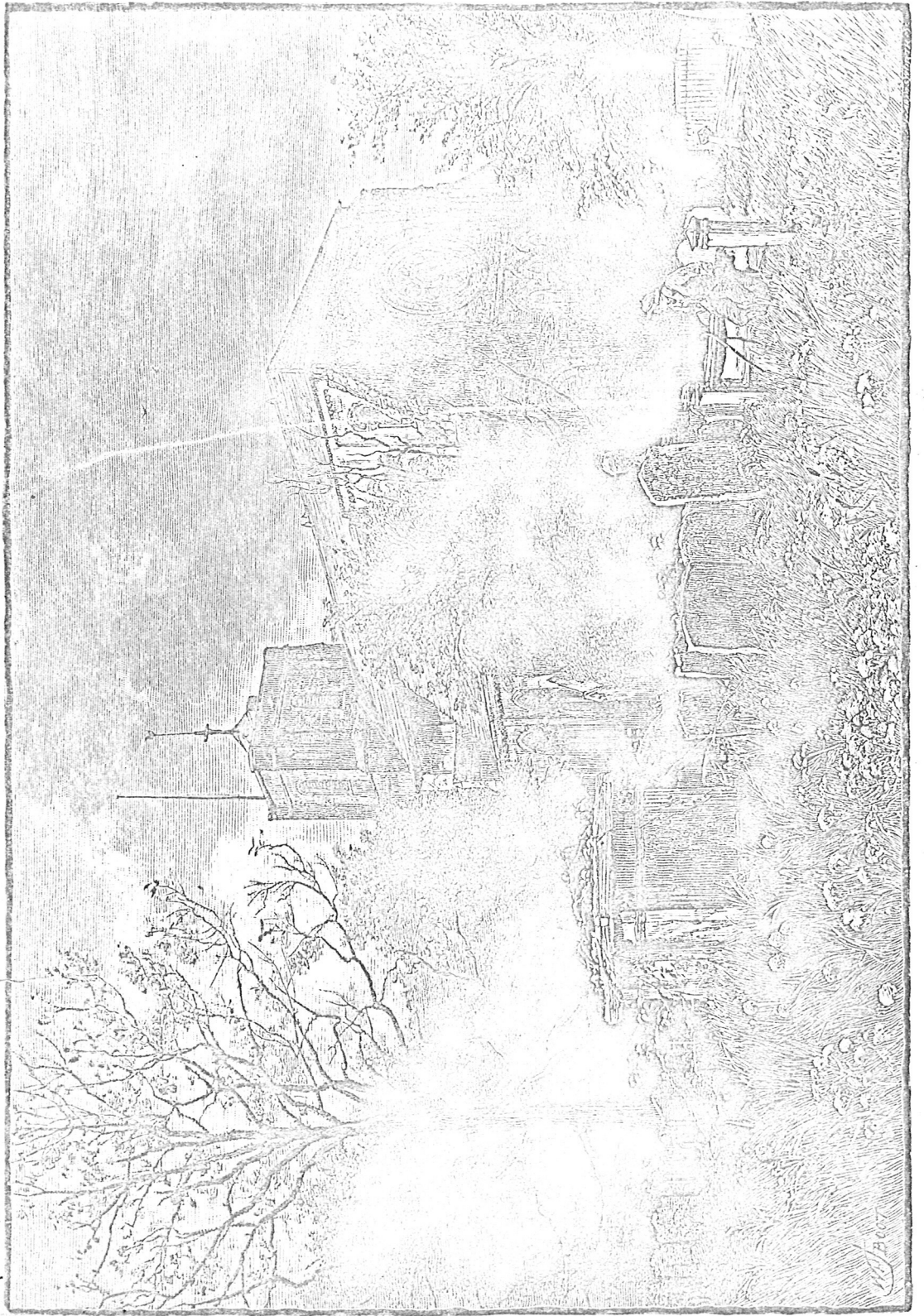
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WALTHAM ABBEY.



side of the parish there are some extensive brick-fields, and the excavations of the hills to the south of the town, commonly known as the Ballast Pits, where sand is dug for ship ballast and iron castings, have given to that portion of the locality a somewhat peculiar appearance. Many interesting geological remains, including the fossil tusks and bones of elephants, have been disinterred in these excavations. About half a mile further southward on the road to Crayford, is another great excavation, called the Erith Brick Pit. This pit, according to Mr. Thorne, in his "Environs of London," is even more interesting in a geological point of view than the pit above mentioned. "It lies," writes Mr. Thorne, "in the ancient bed of the Thames, and exposes a portion of the steep bank. Here the Thanet beds, which are sixty feet thick in the Ballast Pit, are only fifteen feet thick. They overlie the chalk, which here rises to a height of forty-five feet above the Ordnance datum line, both chalk and sand having been sharply cut, and the latter partially denuded, by fluvial action. A good section is here shown of the chalk and sand, the ancient bank of the Thames, with the gravel not merely resting conformably on the top of the sand, but following the denuded surface of the chalk, and filling up the hollows. In this gravel will be noticed many detached masses of unarranged Thanet sand and bull-head flints. The brick-earth beds over the gravel contain bones of fossil elephants, tigers, wolves, oxen, and horses—*Elephas antiquus* and *primigenius*, *Bos longifrons* and *primigenius*, *Equus fossilis*, *Canis lupus*, and *Felis spelæa* (the great cave tiger); but the brick-pit, about a mile farther, on the left of the Crayford road, is far richer in these remains, Mr. Dawkins enumerating no fewer than sixteen species of mammalia found there.\* The *Cyrena* (*Corbicula fluminalis*) abounds in these pits."

The Erith Marshes stretch away westward from the town to Plumstead, and as they lie below the high-water level, the Thames is only prevented from flooding them by the great river wall, of which we have already had occasion to speak, both in the preceding chapter and in describing other portions of the Thames banks. The marshes form rich grazing-ground for cattle. Some portion of the land, too, has been utilised for factories and other works which have been built here. Of the southern outfall of the Metropolitan Main Drainage at Crossness Point we have already spoken.† At a

short distance from these works are some large powder-magazines. A terrible disaster occurred here on the 1st of October, 1864, when two of these magazines, containing upwards of fifty tons of gunpowder, exploded with terrific force, killing ten persons, wounding many others, and carrying consternation among the inhabitants for miles round. Although the scene of the catastrophe is about fifteen miles from Charing Cross, the explosion\* was heard and felt more or less throughout the whole metropolis. The larger of the two magazines was about fifty feet square, and consisted of two floors; and the other was forty feet by thirty feet, and also consisted of two storeys.

When the explosion occurred it was a most fortunate circumstance that the tide was low; but there were only about four hours wanting to the time of high water. The explosion had forced into the river the greater portion of the materials of the embankment, in the 300 feet of length acted upon, only throwing up on the foreshore a low mound, not capable of affording any protection. In the 300 feet gap which was formed, the space which had been occupied by the foundation or base of the embankment wall was filled with broken and shapeless masses of earth and clay, which had formed part either of the consolidated mass of the wall or of the site of the magazines. All the available force of the neighbourhood was soon brought to work in stopping up the breach; but being found insufficient for the task, detachments of Sappers and Artillery, to the number of about 1,500, were set to work. Within a few hours the work was sufficiently advanced to withstand the force of the rising waters; but as it had been so hurriedly executed, the embankment sank several feet in the course of the following night. During the next day the military and navvies were again actively occupied, backing up and ramming the work, with the result that it was soon made as secure as the original wall.

Much damage was done to the houses of Erith and Belvedere by the explosion; indeed, for miles round the houses were sensibly shaken, and the shock, it is stated, was felt at places fifty miles distant.

The hamlet, or village, of Belvedere, with a railway-station on the North Kent line close by, is situated on the southern side of the marsh, and on the slope of the hill almost immediately opposite the powder-magazines. Belvedere is an ecclesiastical district, formed in 1861 from the civil parish of

\* Professor Boyd Dawkins "On the Age of the Lower Brick-Earths of the Thames Valley," *Quarterly Journal of the Geological Society*, vol. xiii., p. 97.  
† See ante, p. 40.

\* For some account of the interior of a gunpowder factory and store and the precautions taken to prevent explosions, the reader may refer to our account of Waltham Abbey, in Vol. I., p. 399.



decision (writes Dutton Cook) he added courtesy and a spirit of forbearing generosity, he seemed to be almost a man who merited public encouragement." For it might be urged plausibly that his profession was sure to exist, and that if he were removed, a successor might arise who would carry on the business in a less liberal spirit. Indeed, De Quincey seems to think that a shade of disgrace had fallen upon England in a previous generation, inasmuch as the championship of the road had passed for a time into the hands of a Frenchman like Claud Duval.

Notwithstanding the bold front which the highwayman was in the habit of assuming, he was occasionally outwitted. "Stand and deliver!" were the words addressed to a tailor travelling on foot by a highwayman, whose brace of pistols looked rather dangerous than otherwise. "I'll do that with pleasure," was the reply, at the same time handing over to the outstretched hands of the robber a purse apparently pretty well stocked; "but," continued he, "suppose you do me a favour in return. My friends would laugh at me were I to go home and tell them I was robbed with as much patience as a lamb; s'pose you fire your two bull-dogs right through the crown of my hat: it will look something like a show of resistance." His request was acceded to; but hardly had the smoke from the discharge of the weapons passed away, when the tailor pulled out a rusty old horse-pistol, and in his turn politely requested the thunder-struck highwayman to give up everything about him of value, his pistols not omitted.

The locality of Hounslow and its Heath is at best anything but a haunt of the Muses; but still it has inspired at all events one poem, for the Rev. Wetenhall Wilkes, who was minister of the Chapelry in the reign of George the Second, dedicated to the Duke of Argyll a poetical epistle, in verse, after the style of Pope, entitled "Hounslow Heath." The lines are turgid and bombastical enough, but they give us some particulars which would else have escaped notice. And a modern reprint of the poem, by Mr. W. Pinkerton, F.S.A., contains some interesting notes, on which we have drawn considerably. For instance, we learn that a century and a half ago the Heath was a frequent meet for the royal stag-hounds and fox-hounds, and that the King, the Prince of Wales, and the Princess Amelia were frequently seen here pursuing the pleasures of the chase. In the early part of the last century, horse-racing of a more plebeian character was here indulged in; to use the bombastic phrase of Mr. Wilkes in his poem,

"Near to the town behold a spacious course,  
The scene of trial for the sportive horse."

The site of Hounslow Racecourse is laid down on Rocque's Map (1754). It was on the left of the road to Staines, a short distance from the Bell public-house. Many notices of these races are to be found in the newspapers of the time; for instance, in the *Evening Post* of July 20 and 23, 1734, when seven horses started, and one broke its leg in the last heat. The names of the horses and of the owners are given; but they evidently were not of the same stamp as those of which we read as figuring at Newmarket.

"Houses and inhabitants," writes the Honourable Miss Amelia Murray, "now occupy that part of Hounslow Heath where the grim gallows once stood within my recollection;" and Mason thus celebrates the place—

"Hounslow, whose heath sublimer terror fills,  
Shall with her gibbets lend her powder-mills."

Large gunpowder-mills stand on the banks of a small stream about two miles to the south of the village. The powder-mills here, like those at Faversham, in Kent, and at other places, have been subject to accidental explosions at different times. One of the most serious which has occurred here took place on the 6th of January, 1772, when damage to a very great extent was done, the effects of the explosion being felt for many miles round. In November, 1874, another explosion occurred here, when five lives were lost. Every precaution is now taken, by the separation of the buildings, &c., to localise the effects of such accidents as far as possible, should any occur. It is said that the first gunpowder manufactured in England was probably manufactured on Hounslow Heath; and at a very early date, indeed; for we are told that one William of Staines was employed by Edward III. in 1346 to make the gunpowder which enabled him to gain the victory of Crecy, the first battle in which powder was used. We shall have more to say on the subject of gunpowder manufactories when we reach Waltham Abbey.

In 1793 extensive cavalry barracks, capable of accommodating above six hundred men, were erected by the Government on that part of the Heath which is in Heston parish. There is an exercising-ground, about three hundred acres in extent, which is used for reviewing troops. Several battalions of militia have their headquarters here, and there is also an arsenal.

Mr. Wilkes celebrates in his poem the song-birds of Hounslow, and also the game which was to be found in the neighbourhood. His "Philomela" may still be heard here in summer nights; but it is to be feared that his "Moorcocks," his



the centre, and graced with "delightful gardens and walks, and sundry other pleasant and necessary devices.\* Sir Samuel Pennant, who was Sheriff of London in 1745, died at Nynn House in 1750, during the year of his mayoralty. In 1774 a Mr. John Granger, who assumed the name of Leman on coming into possession of the manor, pulled down the old house, and destroyed the gardens. The materials of the building were used in the erection of the present Northaw House, which stands about half a mile distant from the site of the old mansion.

The manor, on the death of the Countess of Warwick, in 1603—4, passed by deed of settlement to her brother, Lord William Russell, and it was a few years later sold to the Lemans, with whose family it remained for several generations, down to the middle of the last century, when it was bequeathed to the above-mentioned John Granger. About 1822 the property passed into the hands of the Rev. Dr. Trenchard, on whose death it was inherited by his son, Mr. Ashfordby-Trenchard. This family held the manor till 1876, when it went into the market and found a purchaser in Mr. John Pearson Kidston, who greatly improved and enlarged the house. The grounds are extensive, beautifully laid out, and contain an ornamental lake about five acres in extent.

There are a few other good houses in the parish, notably "The Hook," a substantial mansion of the old-fashioned type, on the south side of the village; and Northaw Place, which stands a little to the west of the church, built towards the end of the seventeenth century.

The parish itself, although of considerable extent, embracing no less than 3,000 acres, contains only some 582 inhabitants, showing but a slight in-

crease since the census of 1871. The parish is wholly agricultural.

The village green occupies a central position in the parish. It stands on a hill some three miles north-east from Potter's Bar Station on the Great Northern Railway. On one side of the green stands the parish church, a new building, of Early English architecture. It is built of stone, and consists of chancel, nave, south aisle, transepts, and a square tower at the south-west corner. The church, dedicated to St. Thomas à Becket, was erected in 1882, in the place of one destroyed by fire in the previous year. The predecessor of the present building—a pseudo-Perpendicular structure—was a comparatively modern edifice, dating from the beginning of the present century. It was built in the place of an older church, probably Late Norman or Early English. It was a commonplace cruciform building, covered with a coating of cement.

At Lower Cuffley, a valley lying about midway between the villages of Northaw and Cheshunt, is a chalybeate spring, which, at the time when the royal court was held at the neighbouring Palace of Theobalds, was much resorted to; but it shared the fate of the spring at Barnet\* and other similar places, and its medicinal qualities seem to have lost their virtue as soon as the spring ceased to be fashionable. Mr. Cussans, in his "History of Hertfordshire," says that "the water contained a large quantity of iron, and a favourite diversion of the inhabitants was to induce strangers to make tea with it. Though perfectly colourless, as soon as the boiling water was poured on the tea, the iron combined with the tannin, and formed ink—as much to the astonishment of the tea-makers as to the delight of the practical jokers."

## CHAPTER XLII.

### THE ROYAL FACTORIES AT ENFIELD LOCK AND WALTHAM ABBEY.

"Fire answers fire."—SHAKESPEARE: *King Henry V., Act IV.*

The History of the Rifle—Situation of the Royal Small-arms Factory—Particulars of its Establishment—Extent of the Buildings, &c.—Perfection of the Machinery and Plant—The Government Powder-Mills—Situation of the Buildings—Description of the Works—The Composition of Gunpowder—Quantities produced—The Gun-cotton, Nitro-glycerine, and Cordite Factories.

BEFORE we leave Hertfordshire and Middlesex for the towers of Waltham Abbey and the green glades of Enfield Forest, we must pause, and devote a chapter to two public manufactories lying close together on the banks of the Lea, the one being the Royal Small-arms Factory, Enfield Lock, the other the Royal Gunpowder Factory, Waltham,

where also are works for the manufacture of gun-cotton and cordite. Practically they belong to no parish or county, so we make them a connecting link between the district that we have visited and the county of Essex, on which we are about to enter.

The Enfield Factory is the establishment through which most of the small-arms of every

\* Chauncy's "Hertfordshire," Vol. II. p. 335.

\* See ante p. 332.

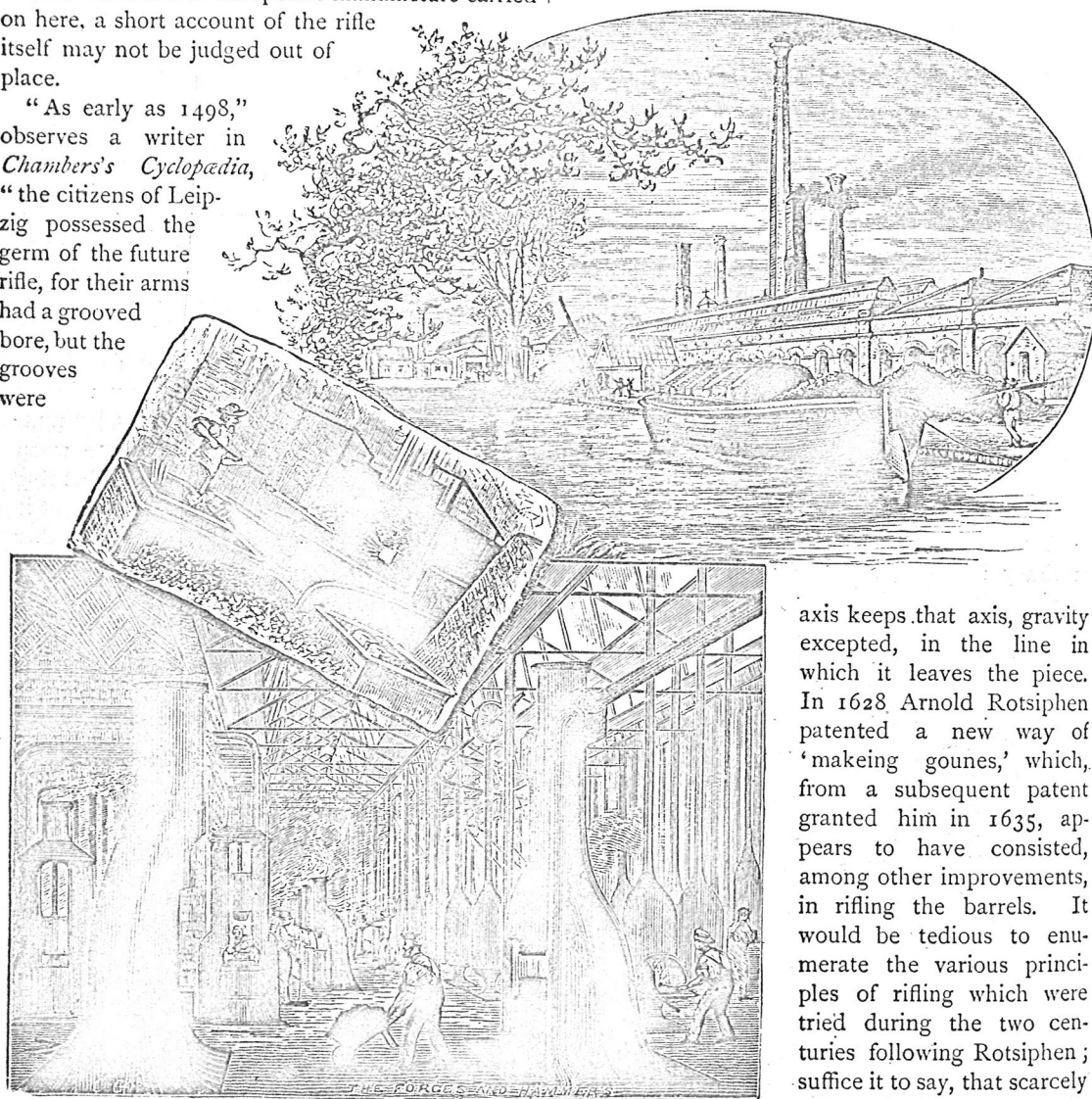


description have been supplied—at all events, since the Crimean War—to the regular army, the militia, yeomanry, and volunteers. Its long ranges of buildings and tall chimneys are conspicuous objects from whatever side they are viewed.

With reference to the special manufacture carried on here, a short account of the rifle itself may not be judged out of place.

"As early as 1498," observes a writer in *Chambers's Cyclopædia*, "the citizens of Leipzig possessed the germ of the future rifle, for their arms had a grooved bore, but the grooves were

vidual skill of the marksman. The spiral groove gives to the bullet, if it fits into the grooves, a rotation rapid in proportion to the force of the explosion and the sharpness of the twist in the spiral. This revolution of the bullet on its own



THE ROYAL SMALL-ARMS FACTORY, 1884.

straight. Not many years after, in 1520, Augustin Kutter (or Koster), of Nürnberg, was celebrated for his rose or star-grooved barrels, in which the grooves had a spiral form. It took its name from the rose-like shape of the bore at the muzzle; and, setting aside superiority of workmanship subsequently developed, Kutter's arm was the veritable rifle, and to him, therefore, so far as history shows, is due the invention of this terrible weapon, which reduces the flight of the projectile to a question of the indi-

axis keeps that axis, gravity excepted, in the line in which it leaves the piece. In 1628 Arnold Rotsiphen patented a new way of 'makeing gounes,' which, from a subsequent patent granted him in 1635, appears to have consisted, among other improvements, in rifling the barrels. It would be tedious to enumerate the various principles of rifling which were tried during the two centuries following Rotsiphen; suffice it to say, that scarcely a form of rifling now prevails

but had its prototype among the old inventions. The difficulty of mechanical appliances making the rifling true deferred, however, their general introduction, and the cost of rifled arms limited their use to the purposes of the chase. The revolutionary government of France had rifles issued to portions of their troops, but they met with so indifferent a success that Napoleon recalled them soon after he came to power. In the Peninsula, however, picked companies of sharpshooters practised with rifles with deadly effect on both the English and



French sides. During the American War—1812-14—the Americans demonstrated incontestably the value of rifles in warfare, but many years were yet to elapse before they were definitively placed in the hands of soldiers, many of those of every nation in the Crimea having fought with the ineffective and almost ridiculous 'Brown Bess.' Soon after the French invaded Algeria they had armed the Chasseurs d'Orleans with rifles, to counteract the superior range of the Arab guns. The inutility of the old musket was shown in a

right, however, to state that this contrivance is claimed for Mr. Greener as early as 1836.) Notwithstanding the many advantages of the Minié system, it was found defective in practice. Experiments were set on foot in all directions, and resulted in 1853 in the production of the 'Enfield rifle,' which had three grooves, taking one complete turn in seventy-eight inches, and fired a bullet resembling the Minié, except that a wooden cup was substituted for one of iron. From 1853 to 1865 this was the weapon of the British army.



THE ROYAL GUNPOWDER FACTORY, 1834.

battle during the Kaffir War, where our men discharged 80,000 cartridges, and the damage to the enemy was twenty-five men struck. After experiments with the old musket, it was found that its aim had no certainty whatever beyond 100 yards. It was soon discovered that a spherical ball was not the best missile, one in which the longer axis coincided with the axis of the gun flying truer—the relative length of the axis and the shape of the head being matters of dispute. In England no improvement took place until 1851, when 28,000 rifled muskets to fire the Minié bullet were ordered to be issued. The Minié bullet, being made smaller than the bore of the piece, could be almost dropped into the barrel. (It is

In 1865 the adoption of breech-loading arms caused the Enfield to be converted into a breech-loader by fitting the 'Snider' breech mechanism to the Enfield barrel. This arrangement was, however, only temporary; and after a most exhaustive series of trials before a special committee on breech-loading rifles, the Henry barrel was in 1871 adopted, in conjunction with the Martini breech, for the new small-bore rifle for the British army, now known as the Martini-Henry rifle. No fewer than 104 different kinds of breech-loading small-arms were submitted to this committee, who decided that the Henry '45-inch bore barrel 'was the best adapted for the requirements of the service,' on account of its 'superiority in point of



accuracy, trajectory, allowance for wind, and penetration, and also on account of its great durability. The Henry system of rifling is the invention of Mr. Alexander Henry, gunmaker, Edinburgh, and its essential peculiarity consists in the form of the rifled bore. . . . The length of the Henry barrel is  $32\frac{1}{2}$  inches. The mean diameter of the bore is  $\frac{1}{50}$  of an inch, and the rifling takes one complete turn in 22 inches. Its bullet is solid, with a slight cavity in the rear, and weighs 480 grains, the charge of powder being 85 grains."

Since this account was written, the Martini-Henry rifle has, in turn, been superseded, first by the Enfield-Martini, in which the Martini action was preserved, but the calibre of the barrel reduced. Of this arm several thousands were made; but before they were supplied to the troops the Enfield-Martini itself became obsolete. The supplanter this time was the Magazine rifle, which is provided with a magazine containing four or more cartridges fed into the barrel by mechanism which is set in motion by the breech-action, so that the arm may be fired several times in succession without the necessity of re-loading from the pouch. There are now several varieties of the Magazine rifle in use in different countries; the one with which the English soldier is armed is the Lee-Metford, which has no corners nor angles to hold the fouling.

The factory at Enfield Lock, on the narrow strip of land between the River Lea and the waterway known as the "Lea and Stort Navigation," about a mile and a quarter from Enfield Wash, dates its erection from 1855-6. It is true that a small factory was established here by the Government early in the present century, where a few thousand muskets were laboriously forged by hand each year; but when the sudden introduction of the rifle and the demands of the Russian war called for a supply of arms, which the trade, not only of Birmingham, but of all Europe and America, was unable to meet, the Government determined to erect machinery for the fabrication of arms on its own account. For this purpose the factory at Enfield was entirely re-modelled, but the successive adoption of the Snider, Martini-Henry, Enfield-Martini, and Lee-Metford rifles, as above shown, has been the means of producing a great change in the plant.

In 1854 a Parliamentary committee was appointed to inquire into the desirability of the Government manufacturing its own *matériel* of war. While it was sitting, a deputation of practical men, previously sent out by the Board of Ordnance to make inquiries in the United States

of America as to the mode of manufacturing small-arms there, and having extensive powers to purchase machinery to be applied to their fabrication in this country, was pursuing its mission; and on the report of the committee, the House of Commons voted a sum not exceeding £150,000 towards the experiment. It should be mentioned here that down to this date most of the small-arms used by our soldiers were manufactured at Birmingham and in other parts of the kingdom, and purchased by the Government.

Since the above period extensive ranges of buildings have been constructed here. They occupy three sides of a square, are built of brick, in a good substantial manner, but quite devoid of ornamentation. About forty acres of ground describes the extent of the factory premises, including the land used as butts for testing each piece that is turned out. Machinery for the manufacture of rifles was imported from America, and was placed under the supervision of Mr. Perkins, as manager. The factory was subsequently taken in hand entirely by the Government, the first superintendent being Colonel Manley Dixon, R.A., who had charge of the works till 1872, when he was succeeded by Colonel Fraser. He was followed by Colonel H. T. Arbuthnot, R.A.; at the present time the factory is carried on under the superintendence of Mr. John Rigby, M.A., with a staff of military and civil officers, the whole being under the direction of the War Department. The machinery here is probably the most perfect of any gun-making establishment, whether private or Government, at home or abroad; and as the manufacture proceeds it produces the various parts which are ultimately brought together to produce the gun with such accuracy of finish, that if a number of such guns were taken to pieces, and each part thrown together in a heap, the parts could be taken up indiscriminately, and be fitted together to make up guns without the slightest alteration or re-adjustment of either. This great nicety of finish is of immense importance, with regard to both convenience and economy, for if any part of a rifle becomes damaged or rendered unserviceable, the regimental armourer has merely to remove the injured portion, take the corresponding piece from his repository, and at once fit it into its place without trouble or loss of time.

Ten years ago the number of rifles turned out at the factory in the course of a year was about forty thousand, in addition to pistols and rifle-swords; now upwards of 100,000 Lee-Metfords are manufactured annually, besides a large number of machine guns such as did such deadly execution



among the Matabele in the expedition of 1893-4; and the plant and general facilities of the factory are in such condition that under great pressure this number, large as it is, might be very greatly exceeded.

The interior of the factory consists of a series of large work-rooms, while several buildings are occupied as stores of stocks, barrels, &c., which are kept constantly in readiness for use as may be required. The factory is open to visitors, even without previous application, on Mondays and Thursdays; but the proof-house, immediately to the south of the factory, is not usually shown. Every "piece" manufactured here is *tested* in the meadows close by.

The Royal Gunpowder Factory at Waltham Abbey stands between two branches of the River Lea, which, as already stated, here is divided into several channels. The mills are screened from sight by groves of poplars and willows, mostly planted in long rows diagonally, after the fashion described by Virgil, in his "Georgics," under the name of a "quincunx."\* This shelter is useful to keep away all grit and dust, and also, as already noticed, in order to counteract the violence of an explosion. These are the only powder-mills belonging to the Government, those at Faversham, Dartford, and Hounslow being in private hands. They employ about 800 hands, and they cover a long strip of land about 300 acres in extent, which runs along the banks of the river from south to north.

It is almost needless to add that these powder-mills are very closely guarded, and are shown only to such strangers as have a genuine object in view in inspecting them. There is no special day set apart for their inspection.

The appointment of superintendent of the powder-mills is made by the War Office, and is always held by an officer of the Royal Artillery. The present superintendent is Colonel W. McClintock.

The visitor who is allowed to inspect the works on entering the grounds passes along a very beautiful avenue of poplars, and finds himself at the gates of the superintendent's office. He is here warned that he must not carry lucifer-matches or other explosive articles about him, and that whenever he is required to put on leather-soled boots he will do so, as a single particle of grit from the high road, if it were to be driven into some parts of the mills, would cause an explosion.

The explosives made at Waltham are gunpowder, gun-cotton, and cordite. Dealing first

with gunpowder, it may be pointed out that wood used for making charcoal is to a great extent grown on the estate. It is either alder, willow, or dogwood; the latter comes chiefly from Germany, and each kind of wood is used in the composition of different sorts of powder, and is treated differently.

The wood is stacked about the grounds in every available corner, awaiting the time when it will be wanted, in order to be manufactured into that deadly combustible which renders the hearths and homes of soldiers desolate, and the necessity for which is a scandal to the Christian name. However, we must accept the actual state of things.

All the "hands" employed are bound to be steady and sober; no smoking is allowed on the premises; and each man on coming to work in the powder-mills puts on a suit of shiny black cloth. Many of the "hands" are the sons of parents who were employed here before them; and the fact that they carry their lives constantly in their hands, and work with death ever before their eyes, has a sobering effect on them, and even on their families at home.

The authorised visitor to the works, having been duly challenged at the gates by the police, and passed to the office of the superintendent, is placed in the care of an experienced guide, and thence conducted to the various "houses" where the several operations of gunpowder-making are carried on. These houses are separated by considerable spaces thickly planted with willow and alder wood. Thus if an explosion were to take place in one house the force would be broken by a screen of trees, and the other houses would not be likely to be affected by it.

The three ingredients of which gunpowder is composed are saltpetre, sulphur, and charcoal. For ordinary English gunpowder the proportions by weight are—saltpetre 75, sulphur 10, and charcoal 15 per cent. The processes required for the manufacture of one of the newest kinds of powder, called prismatic, are as follows:—1, refining the saltpetre; 2, refining the sulphur; 3, burning wood to produce charcoal; 4, mixing the ingredients for the "green" charge; 5, incorporating the "green" charge; 6, breaking down the mill-cake; 7, pressing the powder; 8, granulating; 9, dusting and glazing; 10, prismatic pressing; 11, stowing, to dry the powder; 12, blending prismatic powder.

1. The saltpetre arrives in bags from India, and is refined by boiling in a large quantity of water, and filtering the solution, which then runs into shallow receptacles, where it cools down, being kept in a state of agitation by wooden rakes. The



resembles snow. It is then shovelled into vats, where it receives several washings.

2. The sulphur is next refined by being placed in a retort, and heated until it first melts and then passes into a state of vapour. The vapour is led through a pipe kept cool by water outside it, and condenses into a treacle-like fluid, which passes into a receiver, and is then ladled out into tubs, where it sets into the beautiful yellow material which is known as refined sulphur. The impurities are, at the same time, left behind in the retort. Before being used for gunpowder, the sulphur has to be ground into a fine powder.

3. The woods used for gunpowder charcoal are three, as mentioned above. The larger descriptions of powder are made of willow and alder, the willow giving a rather stronger powder than the alder; while the fine-grained powders for use in small-arms are made of dog-wood, which is more expensive, and has not hitherto been grown largely on English soil. The woods are packed in iron cylinders, called slips, and introduced into furnaces also lined with iron. The flame from the fuel plays round the outside of the iron furnace-lining, heating it and the slip within. The various juices of the wood begin to distil, and the gases so produced pass through two holes in the far end of the slip and corresponding holes in the back of the furnace, whence they are carried down into the fire and contribute to the fuel, so that after the process has once been established the wood helps to burn itself. When the work of burning is completed, the slip, with its heated charcoal within, is taken out of the furnace, and placed in an iron cooler for twenty-four hours, after which it is emptied out, but not used for several days, in order to avoid the possibility of any heat existing in it. The charcoal is then ground in an apparatus like a coffee-mill.

4. The next process is that of mixing the ingredients. Hitherto the visitor has entered the houses without any other precaution than the leaving behind of any dangerous material; but henceforth a new danger has to be provided against. The dust from powder flies about the houses, blackening the floor, and filling every cranny with explosive material, in spite of constant sweeping and washing. It is therefore most important that not a single particle of sand or grit should be introduced, lest the motion of a foot on the floor or any friction in the processes themselves should create heat enough to ignite the smallest atom of powder. All persons who enter the powder-houses are therefore obliged to have their feet encased in special leather boots, which never

touch the ground outside. A small threshold board, about a foot high, marks the division between the black powder-house, which is called "clean" in the parlance of the factory, and the beautiful outside world, with its waving trees and glittering streams, which are all classed under the one word "foul." If by inadvertence a visitor plants his outside feet within the charmed precincts, he is instantly obliged to withdraw them, and the spot which he touched is carefully purified with wet mops.

In the mixing-houses the air is full of dust, and we literally breathe powder. Fifty pounds of the three ingredients are placed in a drum, which revolves with great rapidity in one direction, while an orb armed with forks revolves within it in an opposite direction. In about five minutes the process of mixing is complete, and from that moment the three ingredients begin to be highly dangerous.

5. Though the "green" charge is explosive, it is not yet enough intimately mixed to make good gunpowder. It is accordingly next carried in bags to the incorporating mills, which are heavy iron or stone rollers, travelling round in pairs, each roller following its fellow in monotonous round upon its powder-bed, fenced from the rest of the incorporating house by the inclined sides of a sort of basin. The crushing and grinding motion thus produced brings each particle of the three ingredients into mutual contact, and produces, after a certain number of hours (which differ according to the powder to be produced), a soft cake, which is called the mill-cake. Before the runners are set in motion, the green charge placed upon the bed is sprinkled with distilled water, the quantity of which varies, according to the nature of powder sought and the condition of the atmosphere.

6. The mill-cake is then taken to the breaking-down house, where it is made to pass, carried on a canvas band, between a series of grooved rollers, which crush it into dust much more powerfully explosive than the "green" charge of the mixing-house.

7. The "meal," as it is now called, is next carried to the press-house. The press is a very strong box, containing a number of copper or gun-metal plates, so arranged that the meal can be filled in vertically between them, while they are kept separate by means of grooved plates. When the box is full, the grooved plates are withdrawn, and the spaces left by them filled up with meal, so that nothing now prevents the copper plates from coming together except the meal between them. The side of the box which has hitherto been open is now closed, and the box itself turned over, so



that the copper plates become horizontal. What is now the top of the box is then opened, and the whole placed on an hydraulic press. A ram rising from beneath thrusts the layers of copper plates and powder against a square block of wood above, which just fits into the box. The pressure is continued until the meal has become "press-cake" of the density required for the particular powder which is being made. The time is notified by the release of a spring when the box has risen high enough; this spring rings a bell in a smaller room, where the powder-men are now ensconced; for there are always some 800 pounds of powder in the press-box, and any atom of grit might possibly cause an explosion. A huge traverse of masonry stands between the press-house and the room where the men remain during the process. In addition to the lower growth of the willow and groves of alders, walnut and ash trees surround these terrible press-houses, which are thus mysteriously hidden, not only from the outer world, but even from the rest of the works. The dusky shade and the dark reflection of the green trees in the water, and the black powder-houses themselves, lend an air of mystery to these temples of the art of destruction.

8. The press-cake is carried by water, in black roofed boats, not unlike gondolas, to the granulating-house, where it enters a machine not unlike the breaking-down machine already described, but larger, and with toothed instead of grooved rollers. The cake is here cut by the rollers into "grain" of various sizes, and sorted by sieves kept in perpetual agitation under the stream of grain.

9. The dusting and glazing operations are carried on in long cylindrical reels and wooden barrels, of which different sorts are used, according to the work required. For some powders a little black-lead is introduced, to give them a glossy facing.

10. We now come to the prismatic press-house. The grain suitable for making prismatic powder is carried also in boats to the prismatic press-house, where stands an elaborate machine, consisting mainly of a huge iron circular block, which contains thirty holes. In each hole is put a cylindrical plug of phosphor-bronze, the interior of which is cut exactly to the shape of the prism required. A so-called "charger," with thirty funnels corresponding with the thirty holes in the block, moves backwards and forwards on rails. It is filled with the grain outside the machine, then pushed directly over the block; two motions of a handle then cut off exactly the quantity of grain required, and allow it to fall from the funnels into the phosphor-bronze moulds below. The charge is then withdrawn, the

top of the machine brought down to seal the tops of the holes, and then, by hydraulic pressure, thirty plungers, one for each hole, rise up and compress the charges of grain, so as to form them into prisms of the size and shape required. The top is then raised, and the pressed prisms are thrust out of their moulds by pressure from below. The skill required in powder-making may be estimated from the fact that the time necessary to press prismatic powder which will produce certain definite effects varies greatly, according to the state of the atmosphere. The variation at Waltham Abbey has been found to be as much as between twenty-five and sixty-five seconds.

11. All powders hitherto made here have in them a considerable amount of moisture; this is now to be expelled by means of heat. For this purpose the powder is placed on trays in drying-chambers, which are gradually raised to a heat differing according to the character of the powder required. For some powder it is as much as 125 degrees Fahrenheit.

12. But in spite of all the care taken, and though a series of scientific experiments follow the powder through all its stages, there always exists a certain amount of difference between quantities of powder, which are called "lots," made at different times and under different atmospheric conditions. It is, therefore, very important to bring the material to a certain average, so that the accurate shooting of artillery or of small-arms may be counted upon. For this purpose every "lot" of powder is proved by actually firing a charge of it. The lots which give the higher results are then mixed in strict proportion with lower lots, so that it is impossible, in making up a cartridge, to take an undue quantity of either the higher or the lower lot. This process is called "blending," and after it is gone through, a charge is again taken and fired, to secure the fitness of the powder for its destined use.

All sorts of strange stories are told about the experiences and hairbreadth escapes of employees in these interesting works. Thus, on one occasion a lucifer-match was found to have passed between the rollers of the granulating machine; and on another occasion a key was discovered in the same condition. It seems little less than a miracle that such a thing could have happened without causing an explosion.

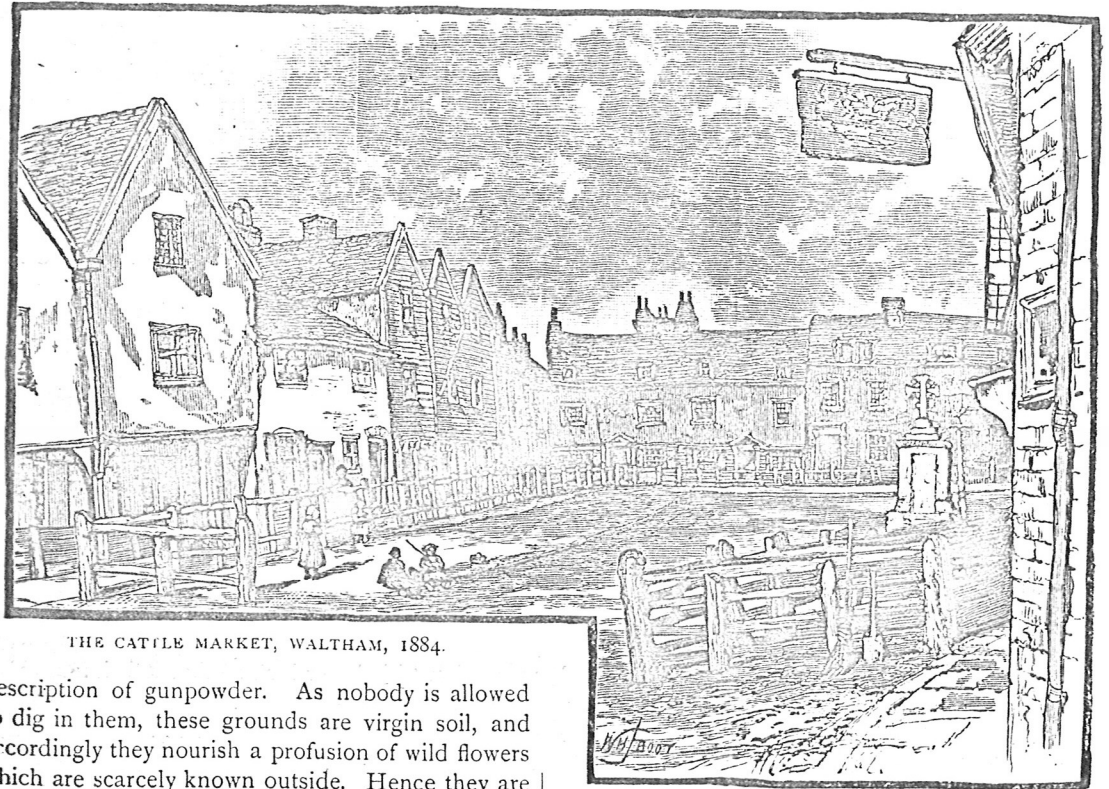
The works here can turn out about 30,000 barrels of powder in a year, or about 700 barrels weekly. It may be of interest to add that, including the sidings and canals, there are about ten miles of water on the estate, of which some five miles are navigable. In addition to the



trees, the more dangerous portions of the works are isolated by solid traverses of earth or brick, to minimise the effects of explosion.

The "works" which have so far been described can boast of almost a venerable antiquity. In the "*Anglorum Speculum*; or, *The Worthies of England*" (1684), it is stated that there were gunpowder mills "on the River Ley, between Waltham and London." In 1735 Farmer speaks of them, in his "*History of Waltham*," as being the property of a Mr. John Walter; and in the same book there is a delightful

as 1561, for in that year we find John Thomworth, of Waltham, in treaty, on behalf of Elizabeth, for the purchase of saltpetre, sulphur, and staves for barrels. Fuller also refers, in his "*Worthies*," to the powder-mills of Waltham Abbey, of which he was appointed vicar in 1641. In 1787 these mills were sold to the Crown by John Walton, and reorganised under the superintendence of the famous Sir William Congreve. The old royal factory at Faversham was given up after the Peace of 1815, being let, and afterwards sold, to the well-



THE CATLE MARKET, WALTHAM, 1884.

description of gunpowder. As nobody is allowed to dig in them, these grounds are virgin soil, and accordingly they nourish a profusion of wild flowers which are scarcely known outside. Hence they are a favourite haunt of botanists who can procure admission to them; but the favour is sparingly accorded.

The introduction of gunpowder into England is connected with the honoured name of Evelyn, as that family are said to have brought from Holland the secret of its manufacture. Mr. George Evelyn, grandfather of the author of "*Sylva*," received, about 1590, a licence to set up powder-mills at Long Ditton and at Godstone, Surrey.

"The works at Faversham, afterwards for so many years the Government gunpowder factory, date from Elizabeth's reign; but they were then secondary in importance to those at Godstone. There seems reason, however, to suppose that powder-mills existed at Waltham Abbey as far back

known firm of John Hall & Co. . . . The Waltham Abbey works have been greatly enlarged in recent years, and no expense has been spared to render them, by the introduction of new and improved machinery, the most complete, as well as the safest, in the world." \*

The gun-cotton and nitro-glycerine and cordite factories are situated in the south grounds.

The manufacture of gun-cotton was started here in 1872; the original factory abutted on High Bridge Street, in the town; some old saltpetre refining buildings having been adapted for the purpose. These having been found inadequate and otherwise unsuitable, land was purchased, and a

\* "*Encyclopædia Britannica*."



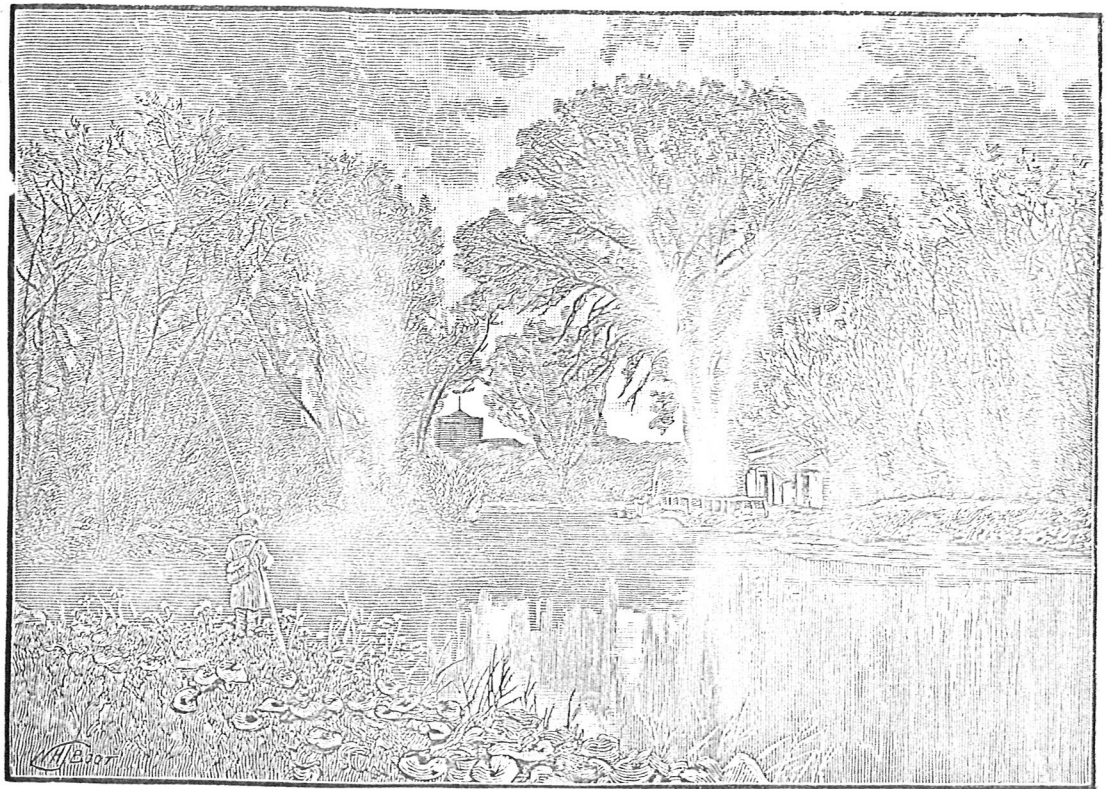
new factory built on what is known as Quinton Hill.

This gun-cotton, otherwise tri-nitro-cellulose, is known as Abel's gun-cotton, after the eminent chemist, Sir Frederick Abel, Knt., who improved upon the methods of the originator, Schönbein, and enabled it to be made, used, and stored with perfect safety.

The processes are briefly as follows:—Best white cotton waste (cellulose), freed from oil and other

The material is always sent away from the factory for storage or use in a damp condition, when it is perfectly safe; it can only be exploded by the detonation of some *dry* gun-cotton.

The gun-cotton pulp used in the manufacture of cordite is also made here in a like manner. Cordite is a smokeless explosive, or rather propeller, which is gradually superseding gunpowder. The factory for its manufacture is also situated on Quinton Hill, and was erected in 1891. It presents a very



ON THE LEA.

impurities, is first prepared in a teasing machine, dried, and then soaked and digested by small quantities in a mixture of strong sulphuric and nitric acids. After cooling in small pots, the excess of acids is removed by a centrifugal machine, and the gun-cotton quickly immersed in tanks of water; after a time it is again centrifugalled and boiled for a considerable time in wooden vats, to remove all traces of acid. The gun-cotton is then pulped by a process similar to that used in paper-making, and the pulp formed by hydraulic pressure into the various sized slabs, cylinders, and other shapes required for naval and military purposes, such as submarine and other mines, torpedos, fuzes, detonators, &c.

picturesque appearance when approached from the south, especially at night, when lighted by electricity.

The methods of production and the ingredients are entirely different from those used for the old black or brown gunpowders. Nitro-glycerine and high nitrated (otherwise Abel's) gun-cotton are combined, with a solvent, in a kneading machine, together with a small proportion of a neutral ingredient, the effect of this combination of powerful explosives being that they, so to speak, tame one another, and produce a product which is capable of being handled and fired without danger. The kneaded mass is then pressed or squirted through circular perforations, in continuous cords (hence



the name) ranging from '0375 inch to '7 inch : the cord is either wound on reels for transport or cut in lengths for packing, as may be required, and then stove-dried, the finished material having somewhat the appearance of catgut.

The nitro-glycerine for the purposes is also made in a special factory on Quinton Hill in small quantities, no stock of this dangerous substance being allowed to be kept.

Henceforth our travels will be in Essex.

## CHAPTER XLIII.

### WALTHAM ABBEY.

Situation of the Town—Its Etymology—Foundation of the Abbey by Jovi—Its Re-foundation by Harold—The Legend of the Holy Cross—Gifts bestowed on the Abbey—Harold's Tomb—The Church despoiled by William the Conqueror—Its Recovery under subsequent Sovereigns—Disputes between the Abbot and Townspeople—Henry III. and the Abbot's Dinner—An Incident touching the Reformation—Income of the Abbey at the Dissolution—Fuller, the Historian—The Conventual Estate passes into Secular Hands—Description of the Abbey Church—Sale of the Church Bells—Present Condition of the Remains of the Abbey—Rome-Land—The Abbey Gateway and Bridge.

WALTHAM ABBEY, or Waltham Holy Cross, as it was once called, must be carefully distinguished from its neighbour in Hertfordshire, which is described in a previous chapter.\* It is a large, irregular town, and evidently one of considerable antiquity, as is shown by the variety of projecting gables, and the quaint carved figures which still stand in bold relief at the corner of more than one of its streets, like those with which one meets at Ipswich, Saffron-Walden, and many other towns of the eastern counties. The town is situated on low ground near the river Lea, which here forms a number of small islands, and is skirted by fruitful meadows, that have long been famous for the succulent and nourishing qualities of the grass. The spot was originally part of the Forest of Essex, and it derived the name of Waltham from the Saxon words *weald-ham*, the dwelling or hamlet on the weald, or open forest.

The town is twelve miles north-east from London, and about three-quarters of a mile eastward from Waltham Station on the Cambridge line of the Great Eastern railway. The road thither from the railway station, however, is by no means attractive : it is straight as an arrow, and is little more than a raised causeway between low-lying green meadows, with a deep ditch on either side. The river Lea, which we cross—the Lea of quaint old Izaak Walton—here separates into a variety of streams, and we pass no less than four bridges before we find ourselves at the end of a narrow street, with gabled tenements on either side, and close under the shadow of the tower which has been our beacon.

Waltham appears to have been a place of note long before the Norman Conquest. It is first

mentioned in a document dated as far back as the time of Canute the Great, at which period its then owner, Tovi, or Tovius, standard-bearer to that monarch, founded on the outskirts of the forest here a church and a village, placing in the former two priests, and erecting in the latter some tenements for his "villains," and placing in them "threescore-and-six dwellers." After his death, Athelstan, his son and heir, a prodigal young man, squandered his inheritance, and Waltham appears by some means or other to have reverted to the Crown. The religious establishment of Tovi, however, continued, and probably with some augmentation, till the reign of Edward the Confessor, who bestowed certain lands here on his brother-in-law, Earl Harold, son of Godwin, Earl of Kent ; but the grant was made upon the condition that Harold should build a monastery in the place, "where *was a little convent*, subject to the canons and their rules." The "little convent" mentioned in the Confessor's charter, evidently alludes to Tovi's foundation, which might have been augmented by casual donations previous to this mention of it.

In 1062, the year in which the grant was dated, Harold refounded or enlarged the original establishment of Tovi, endowing it as a convent, doubling the number of its canons, settling on them ample estates, and founding hard by a school of religious and useful learning.† Farmer, in his "History of Waltham," says that each of the canons had one manor appropriated for his support, and that the dean had six ; making in all seventeen. From the charter of confirmation granted by Edward the Confessor, it appears that

\* See *ante*, p. 392.

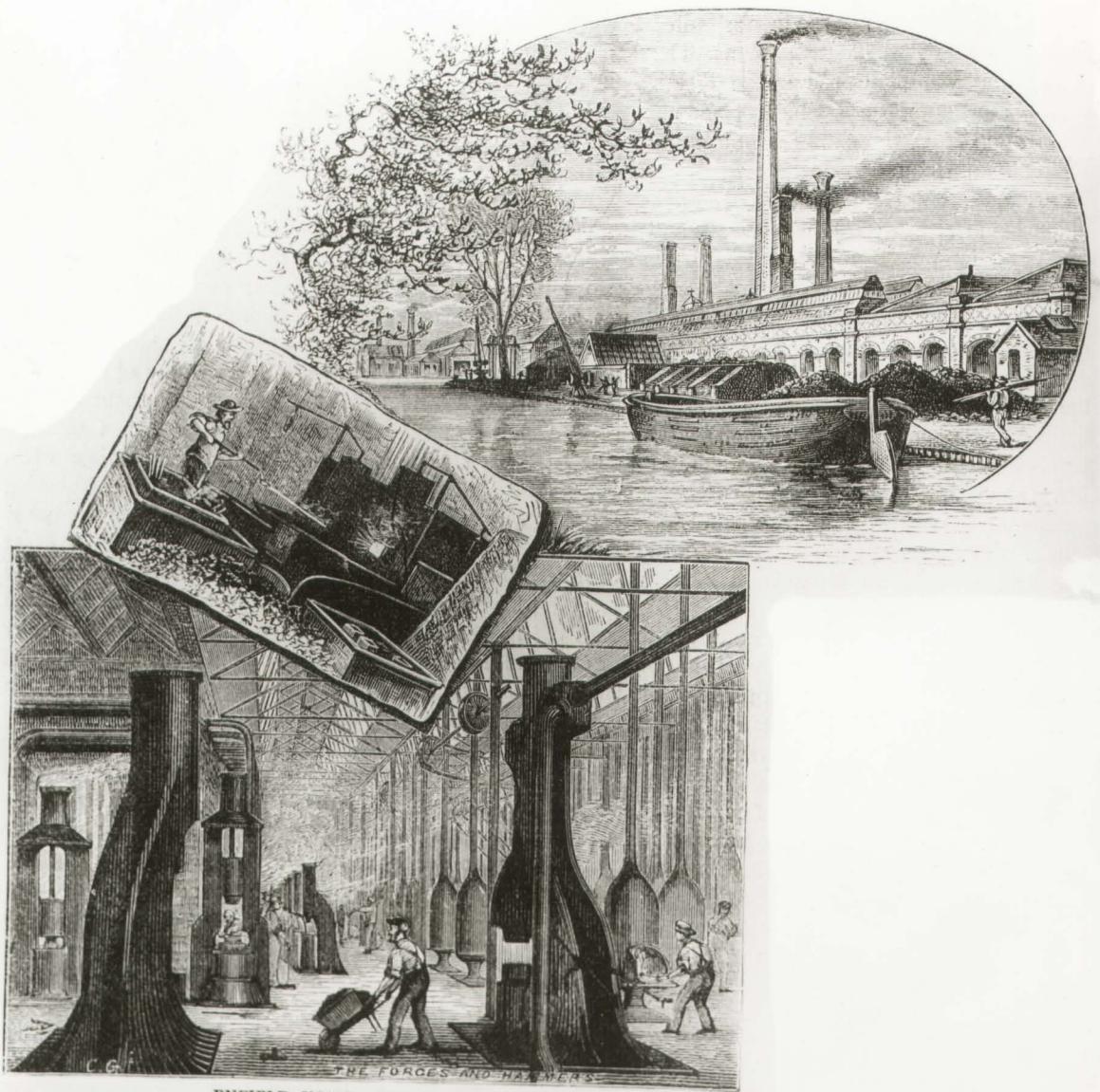
† "Dugdale's Monasticon," Vol. vi., pt. 1. p. 56.





POWDER MILLS, WALTHAM ABBEY.





ENFIELD SMALL-ARMS FACTORY.



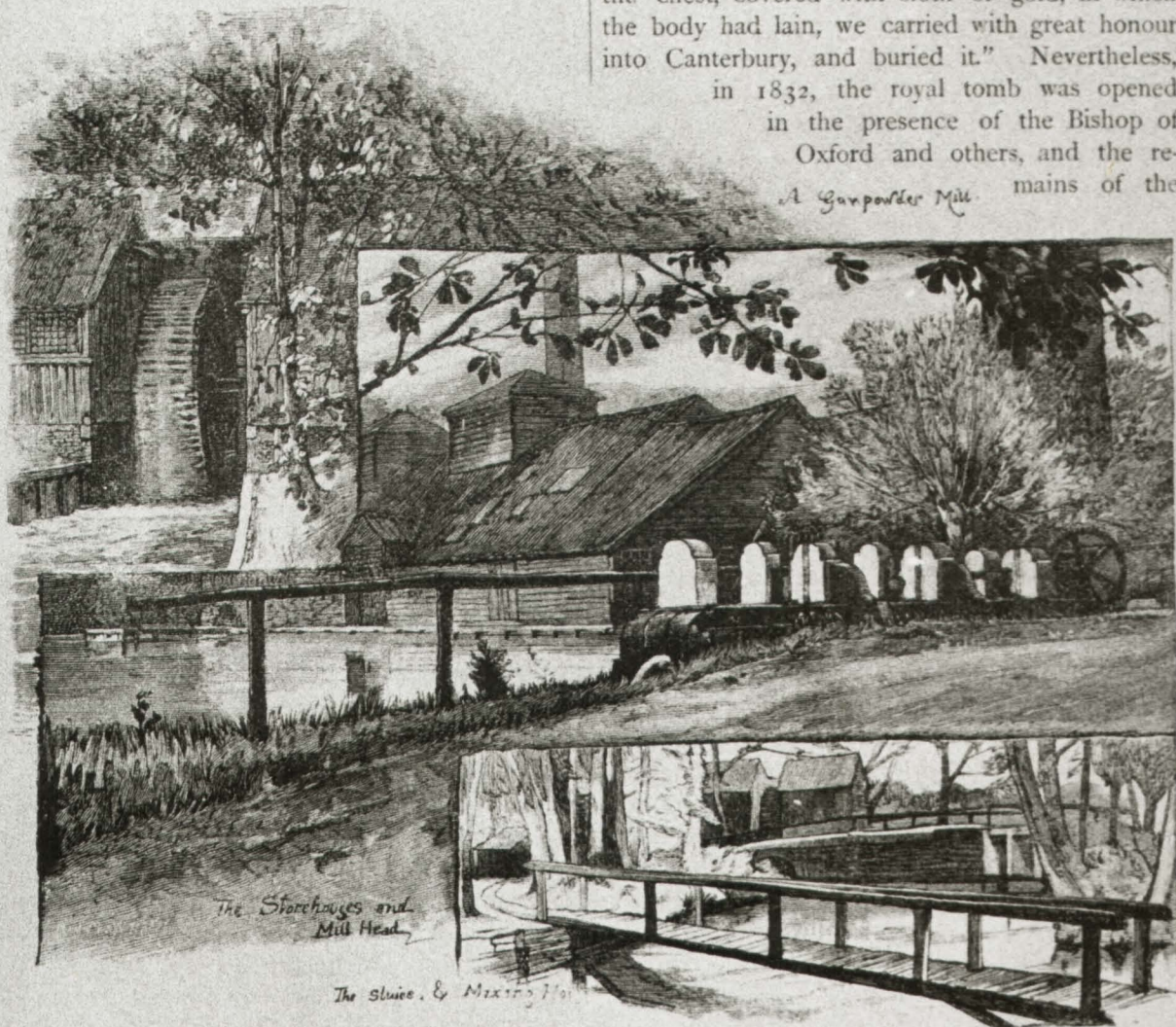
the hands of those "knights of the road" by whom it was infested during the seventeenth and eighteenth centuries.

The village, or town, of Hounslow, as stated in the preceding chapter, is situated partly in the parish of Isleworth; it is also partly in that of Heston. The place was called in "Domesday

came a certain man of his household to the house of the Holy Trinity at Hundeslaw for refreshment, who confessed that he was "one of three men who threw the corpse [of the king] into the river between Barking and Gravesend," whilst it was being conveyed from Westminster towards Canterbury for interment; and adds, "but the chest, covered with cloth of gold, in which the body had lain, we carried with great honour into Canterbury, and buried it." Nevertheless,

in 1832, the royal tomb was opened in the presence of the Bishop of Oxford and others, and the remains of the

*A Gunpowder Mill.*



THE POWDER-MILLS, HOUNSLOW, 1886. (See p. 68.)

Book" Honeslowe, and later on it was spelt Hundeslawe and Hundeslowe. In the thirteenth century a priory, dedicated to the Holy Trinity, was founded here, the peculiar office of the brethren being to solicit alms for the redemption of captives. It is spoken of by Cobbett, in his "History of the Reformation," as "a friary."

One Clement Maydestone, a friar of this house, wrote a history of the martyrdom of Richard Scrope, Archbishop of York, to whom he had been a retainer, in which it is stated that within thirty days after the death of Henry IV., there

king were found in his coffin. This at once, of course, disposed of the story told by Maydestone.

In 1296 a weekly market was granted to the brethren of this priory, to be held on Wednesday, and an annual fair on the eve and feast of the Holy Trinity, and to last a week. The market has long been discontinued, but fairs are still held on Trinity Monday, and on the Monday after Michaelmas Day. At the dissolution the revenues of this priory were valued at £78 8s. 6d. In Cooke's "Topography of Middlesex," published early in the present century, it is stated that "the only remain-



The inutility of the old musket was shown in a | 1865 this was the weapon of the British army.



THE POWDER MILLS, WALTHAM.

battle during the Kaffir War, where our men discharged 80,000 cartridges, and the damage to the enemy was twenty-five men struck. After ex-

In 1865 the adoption of breech-loading arms caused the Enfield to be converted into a breech-loader by fitting the 'Snider' breech mechanism



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Engraving from Walford, E.  
Greater London: a narrative  
of its history, its people  
and its places. Cassell.  
1898. Vol I.