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# Navy & Army Illustrated

(PUBLISHED WEEKLY.)

A  
PICTORIAL RECORD OF THE WORLD'S NEWS.



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EDITED BY  
Commander CHARLES N. ROBINSON, R.N.

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# Her Majesty's Ordnance Factories.

By FREDERICK G. ENGELBACH.

## WALTHAM ABBEY.—I.



Photo. Foster.  
MAJOR F. L. NATHAN, R.A.,  
Assistant Superintendent of Powder Factory.

A STRAGGLING dusty street, that seems miles long to the would-be sight-seer, stretches between Waltham Cross Station on the Great Eastern Railway and Her Majesty's Powder and Cordite Factory at Waltham Abbey. The mere mention of the word "factory" conjures up visions of ponderous machinery and of a quivering maze of leather bands; but how different is the reality. Instead, waving avenues of poplar trees, and the ever-graceful alder, grow luxuriously everywhere. Instead of vast buildings, tiny bungalows are dotted here and there by the side of cool-looking canals, which seem to invite the heated wayfarer to absolute

idleness. So peaceful, in short, is the scene that it is impossible to prevent an impression stealing across the mind that a mistake has been made in the locality, and that the Cordite Factory is miles away. In spite of all this, 23 tons of our Service explosive are floated down these placid weed-grown canals each week, a mass of latent energy of which the mind has hardly any conception. Many a shattered wreck of what once was a human being has been borne through the unimposing gateway during the past twenty years, the grim royalty paid by man to the giant forces of Nature.

Year by year, as knowledge increases, these accidents become of rarer and rarer occurrence; but they cannot be banished altogether. In every manufactory of explosives the managers are always prepared for unavoidable catastrophes, which in most cases are due to the inherent "cussedness" of the material. To provide for the safety of the 870 men and boys employed in the works, the most stringent rules are laid down and enforced. The possession of matches or of a pipe is a criminal offence, and rightly so, for one maniac may in this way imperil the lives of hundreds of innocent men. On entering and

on leaving every employé is searched, and compelled to change his home kit for a suit of sober black, which, together with a black cap, gives the men a decidedly criminal appearance. No pockets grace these suits, and hence the temptation inherited from boyhood to carry contraband is necessarily removed.

To avoid all risks, the various processes of manufacture are carried on in separate buildings, which are made as flimsy as possible, so as to offer practically no resistance to an explosion should one occur. Of these corrugated iron or wooden huts there are no less than 290, scattered over the 302 acres of the factory in such a way that a considerable distance intervenes between each. To serve these tiny manufactories there are four miles of navigable waterway, which enables the explosive to be transported with a minimum of danger.

The boats, of which a picture is given, are painted black, and when manned by their sombre crew appear strangely out of place in the sylvan picture. The chief of this all-important



Photo. Hughes & Mull.  
LIEUTENANT W. B. ANLEY, R.A.,  
Officer in Charge of Danger Buildings, Waltham.

department of the I. G. O. F.'s command is Colonel John Beecher Ormsby, R.A., who has had a wide experience in the Ordnance Factories. He entered the Royal Artillery as lieutenant in 1860, became major February, 1881, lieutenant-colonel in April, 1887, and colonel in September, 1891, retiring from the Army in January, 1896. His official connection with the Ordnance Department began in 1876, as Captain Instructor Royal Carriage Factory, where he remained until 1881. In 1885 he became an Inspector of Warlike Stores at Cork, a post he vacated on being appointed, in 1896, Assistant Superintendent Royal Carriage Factory, Woolwich.

In 1889 he served as Chief Assistant to the Director-General of Ordnance Factories, and in 1890 was appointed Superintendent of the Royal Carriage Factory. After four years



HEADQUARTERS OF THE STAFF, WALTHAM.



Photos. Copyright.

"ANY MATCHES OR KEYS?"  
Police Sergeant Searching a Man at Entrance.

Navy &amp; Army.



in this important post he was transferred to Waltham as Superintendent of Powder Factories.

Whilst the country can secure the services of officers with experience of this kind, it is not likely that any agitation will arise for undoing the present arrangements for the officering of these great factories on which so much depends. His staff consists of two officers—Major Frederick Lewis Nathan, R.A., and Lieutenant William Bower Anley, R.A. Major Nathan, who has just been appointed Assistant Superintendent at Waltham, was gazetted July, 1879. He obtained his company in October, 1887, and his majority June, 1897. In 1886 he became Captain Inspector Royal Laboratory, Woolwich, a post he held until 1888, when he was appointed Second Assistant to the D.G.O.F. He has acted since October, 1892, as Senior Officer in charge of Danger Buildings at Waltham. Lieutenant Anley entered the Royal Artillery July, 1891, and was appointed Officer in Charge of Danger Buildings November, 1897.

Up to within the last few years gunpowder was the great staple product of Waltham, but now the manufacture of this explosive has been much reduced, for, save for some few guns, it is practically obsolete. It is a curious fact that the making of cordite involves far less danger than the manufacture of powder. The arch-enemy "grit," although still potent to wreck, through its agency, buildings and human beings, is not so dangerous as it used to be when charcoal and saltpetre entered into the composition of the finished article.

Although costing but a small sum compared with its sister factory at Woolwich, Waltham still figures very

respectably on the Army Estimates. Its wage-bill amounted to £57,000 last year, whilst the ubiquitous policeman was responsible for another £2,617 per annum. In material alone, excluding new buildings, the factory cost £112,000, a fact which speaks well for the reserve of cordite now accumulating in our magazines. Now what is the material concerning which so much preamble is necessary? It is a brown cord-like substance, having as its base nitro-glyce-



Photo. Copyright.

A PLACID SCENE.  
Waltham Lock—Loaded Boats Going Down Stream

"Navy &amp; Army."



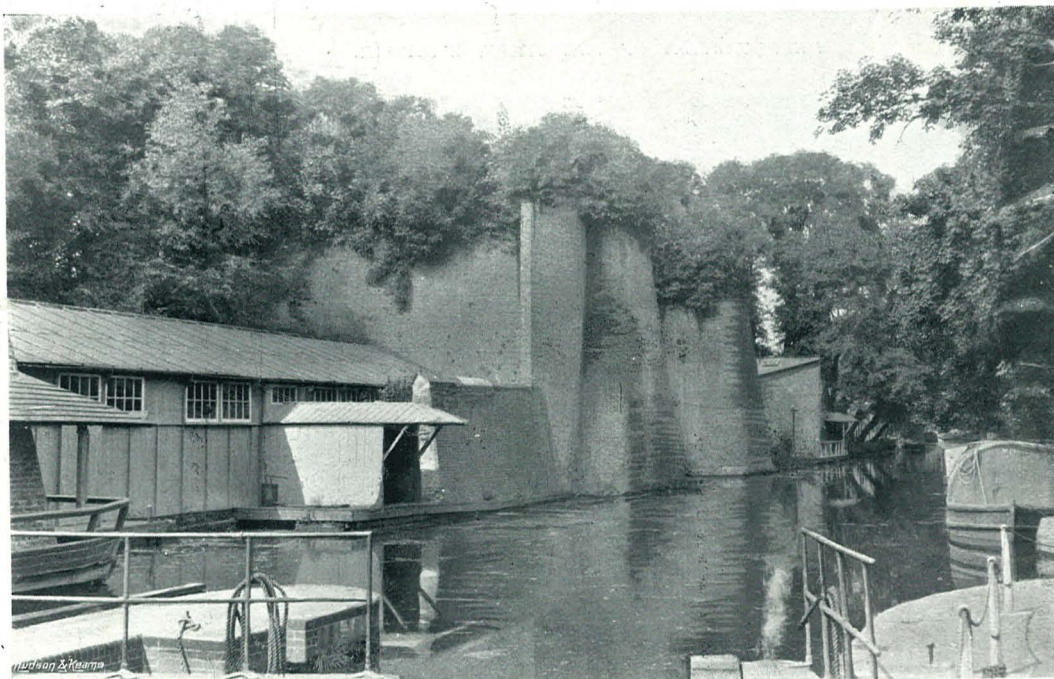
Photo. Copyright.

THE WALTHAM UNIFORM.  
Showing Boots Used in Buildings.

"Navy &amp; Army."

men are given which range from the pistol cordite measuring 1/4 in diameter to the 5/8 "rope" used for the charge of the 12-in. breech-loading wire gun. The larger sizes are for containing black powder primers in certain cartridges. As far as possible the factory is self-containing, but the acetone at present used comes from private manufactories. Arrangements will shortly be complete for remedying this, and then the establishment will be an ideal one, since every constituent of its product will be under official control. To the intelligent onlooker there are some quaint sights to be seen at Waltham. First the bicycle, which has been the greatest boon to some of the officials in charge. The paths are so good, and the distances so great, that much more work can be done now it is in use.

Another curious feature is the sight of yellow-haired men from the Picric Powder Works. Lyddite, of which picric acid is the chief constituent, stains everything a bright yellow, and hands and hair equally suffer. War abounds in incongruities, and hence picric acid, which on the one hand is a formidable explosive, also is of great value in the treatment of burns, a fact only now beginning to be appreciated. The ground on which the factory is laid out is marshy, and it is extraordinary what rapid growth the trees planted there have



Photos. Copyright.

A SELF-PLANTED SHRUBBERY.  
Brick Traverse Separating Mixing House from other Buildings on Lower Island.

"Navy &amp; Army."

rine and gun-cotton, forced into a temporary union by means of a chemical substance, or rather fluid, known as acetone. The resulting compound from this amalgamation is of a brownish colour, and of a soft horn-like consistency. Undertreatment (described later on) it becomes "string" of various sizes.

In the illustration on page 107 which shows cordite of all

calibres, specimens are given which range from the pistol cordite measuring 1/4 in diameter to the 5/8 "rope" used for the charge of the 12-in. breech-loading wire gun. The larger sizes are for containing black powder primers in certain cartridges. As far as possible the factory is self-containing, but the acetone at present used comes from private manufactories. Arrangements will shortly be complete for remedying this, and then the establishment will be an ideal one, since every constituent of its product will be under official control. To the intelligent onlooker there are some quaint sights to be seen at Waltham. First the bicycle, which has been the greatest boon to some of the officials in charge. The paths are so good, and the distances so great, that much more work can be done now it is in use.

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ground on which the factory is laid out is marshy, and it is extraordinary what rapid growth the trees planted there have made in the course of the last twenty years. It is now generally understood that a wide belt of living trees forms a far better traverse than masses of brickwork. There used to be a theory that the effect of an explosion could be greatly minimised by placing solid traverses of varying shapes in the lines likely to be taken by explosions should they occur.

Time, however, soon removed this impression, for it was found that under the influence of the



explosion masses of masonry were detached from the barrier and driven in every direction with a force and destructive effect hardly inferior to the original shock. On the other hand, the thick belt of trees presents an elastic resistance to the explosive energy, and hence, by bending to it, breaks its force whilst not sustaining severe damage itself.

On page 106 there is an excellent view of one of these fast disappearing heaps of brick and earth. This was placed between two powder houses, and its size enables the mind to realise the enormous energy that gunpowder on the least provocation was wont to exhibit. One very curious feature in the picture is the luxurious growth of wood and undergrowth



Photo. Copyright. SPECIMENS OF CORDITE AND PRIMERS. "Navy & Army."

(Previous articles of this series appeared on July 15 and July 29.)



Photo. Copyright. LANDING ACETONE ON ARRIVAL AT FACTORY. "Navy & Army."

on the top of the traverse. This certainly was not planted by any human agency, but has nevertheless resulted from perfectly natural causes. The top layer of brick became disintegrated, and the birds constantly roosting there have planted this unique shrubbery. Every small house in the factory, whether devoted to cordite or to powder manufacture, is kept during the winter at one even temperature. This necessary work is carried out by large steam pipes which circulate throughout the works. These are carried upon high uprights, and it requires a knowledge of their immense value to become reconciled to their exceeding ugliness.

## Scenes of Naval and Military Life.



Photo. Copyright.

THURSDAY ON BOARD SHIP.

R. Ellis.

Thursday has been in the Navy, ever since King William IV., in the twenties of the present century, as Duke of Clarence and Lord High Admiral, first instituted the practice, regularly observed as "make and mend" day. Wherever, the wide world over, a British man-of-war may be, the usage is the same, and observed in the same way as our photograph shows.

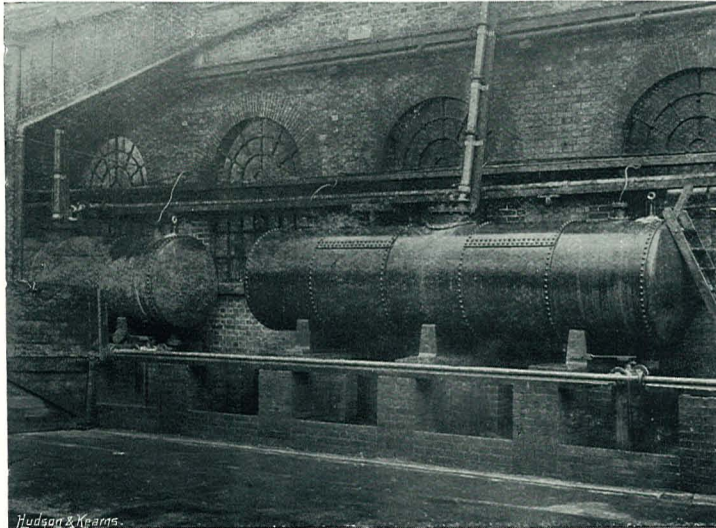


# Her Majesty's Ordnance Factories.

By FREDERICK G. ENGELBACH.  
WALTHAM ABBEY.—II.



THE GENESIS OF GUN-COTTON.  
*The Acid Mixing Shed.*



MIXING ACIDS BY COMPRESSED AIR.

BEFORE describing the working-up of the new product, it is as well to closely examine the manufacture of its chief constituents. Taking 90 as the whole, the proportions are as follows:

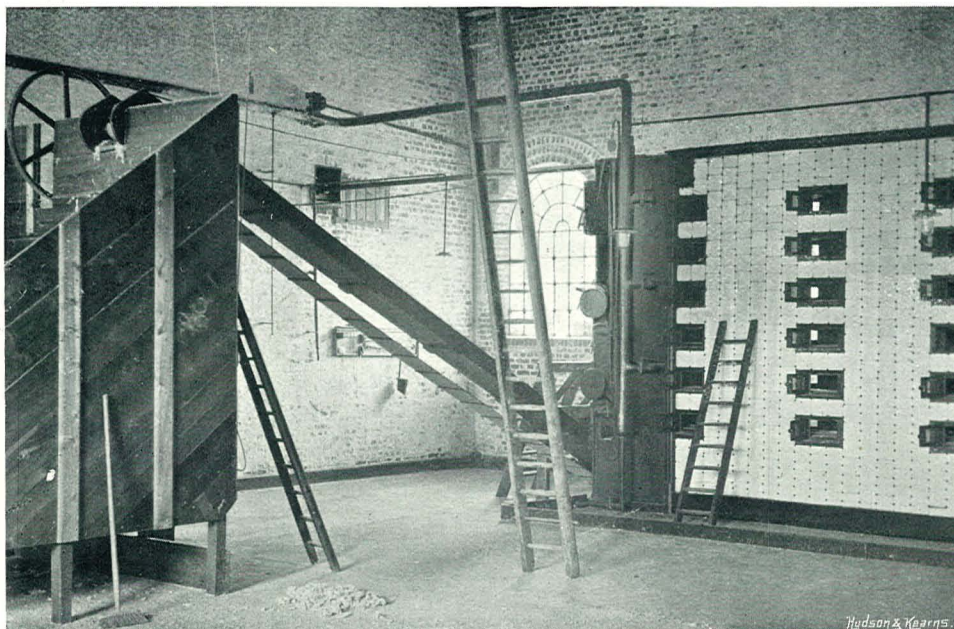
Nitro-glycerine 43.5  
Gun-cotton . . 27.75  
Acetone . . . 15.1  
Mineral jelly . 3.75

As regards the mineral jelly or vaseline, this is used simply to render the resulting mass softer and more readily moulded. It takes no part in the explosive force, and acts quite mechanically. The acetone, mentioned in the preceding article, is derived by the destructive distillation of acetate of lime. Its function is to dissolve and to amalgamate the gun-cotton and nitro-glycerine for the purpose of moulding. This object achieved, the manufacturer gets rid of the solvent by drying under gentle heat.

The exigencies of space require nitro-glycerine, or N.G., as it is familiarly known at Waltham, to stand over until the next article, and hence gun-cotton, although second in point of proportion, is taken first. This powerful explosive can be watched in all its processes, being altogether most amenable to treatment. It is pro-



A STUDY IN THE COTTON-PICKING ROOM.



Photos. Copyright.

OVEN FOR DRYING COTTON.  
*The Cotton Passes into the Oven on the Right of the Picture.*

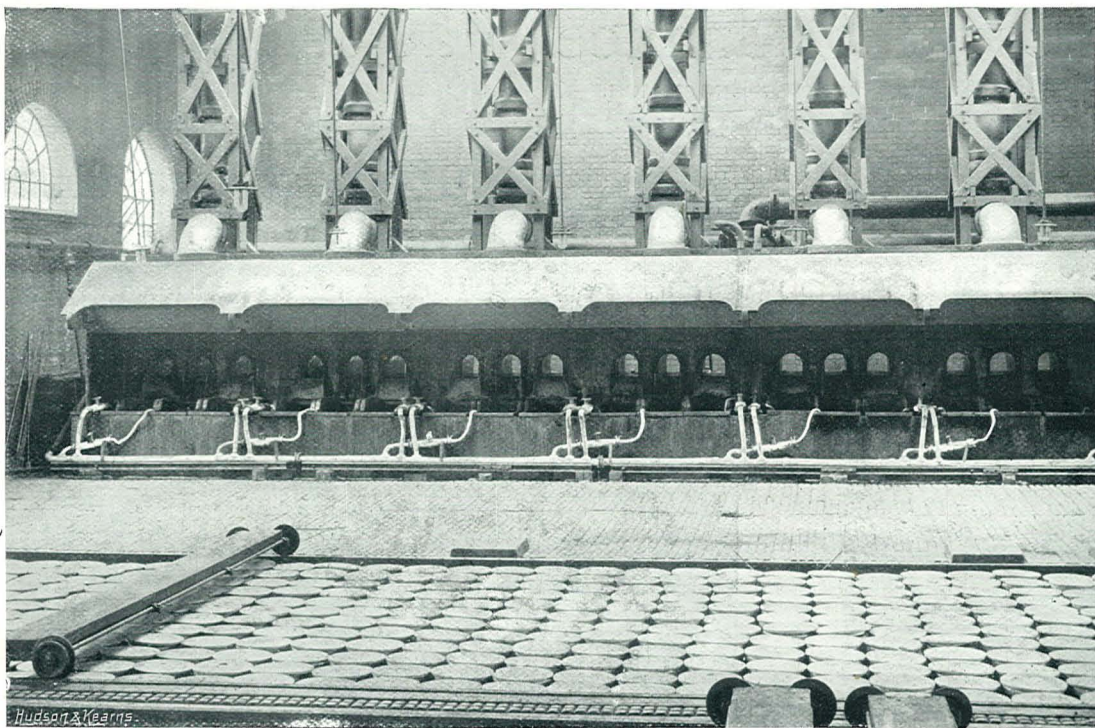
"Navy & Army."

duced by the action of nitric and sulphuric acids upon cotton, a chemical process sufficiently marvellous, seeing that it converts that innocuous material into an explosive second only to nitro-glycerine in its power.

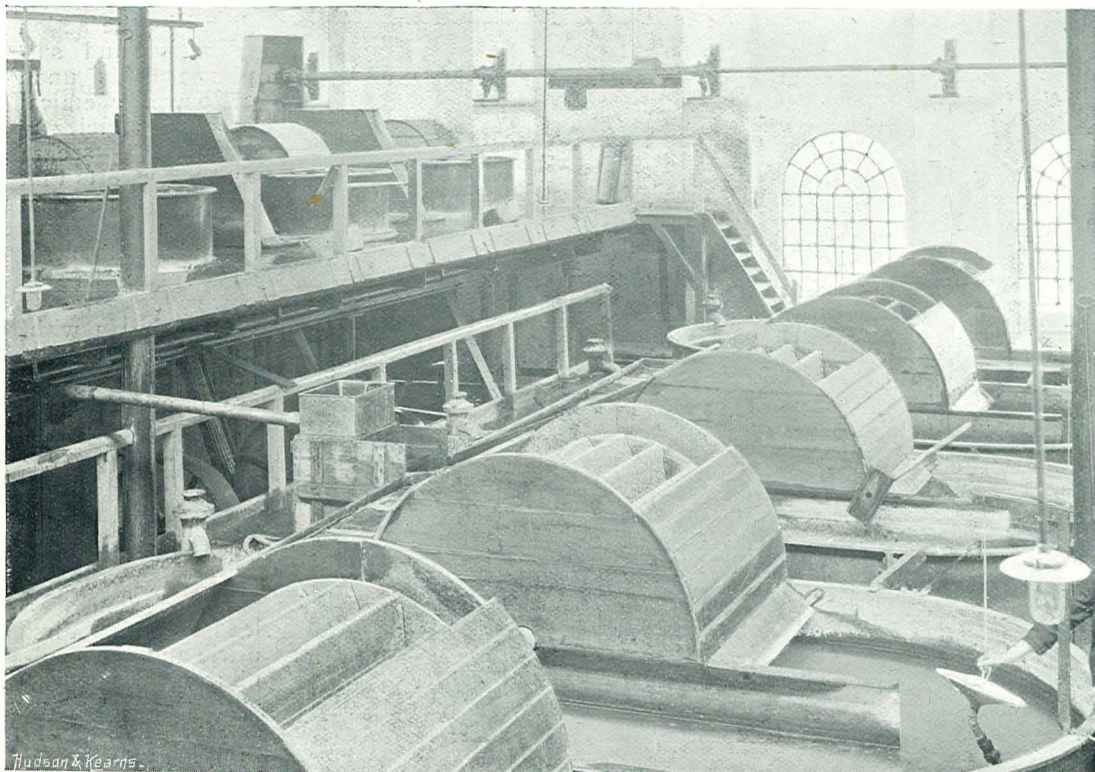
To begin with, carboys of acids made in the factory are brought into a huge shed, where they stand in batches ready for use. By means of a lift, shown in Ill. 1, the carboys are hoisted up some 10-ft. and tipped into a lead conduit. First nitric and then sulphuric acid is poured out, the corrosive stream flowing into large cylindrical boilers (Ill. 2).

By means of tiny tubes seen at the extremity of the boilers, a jet of compressed air bubbles through the acids, making their union complete. For the manufacture of gun-cotton, the finest cotton waste is bought in Manchester, and arrives in bags weighing 1-cwt. In spite of great care in packing, various foreign bodies get into the cotton, and hence it has to be hand-picked and teased. This essentially feminine occupation falls to the lot of nine women, who are either the widows or relatives of men employed in the factory. When picked

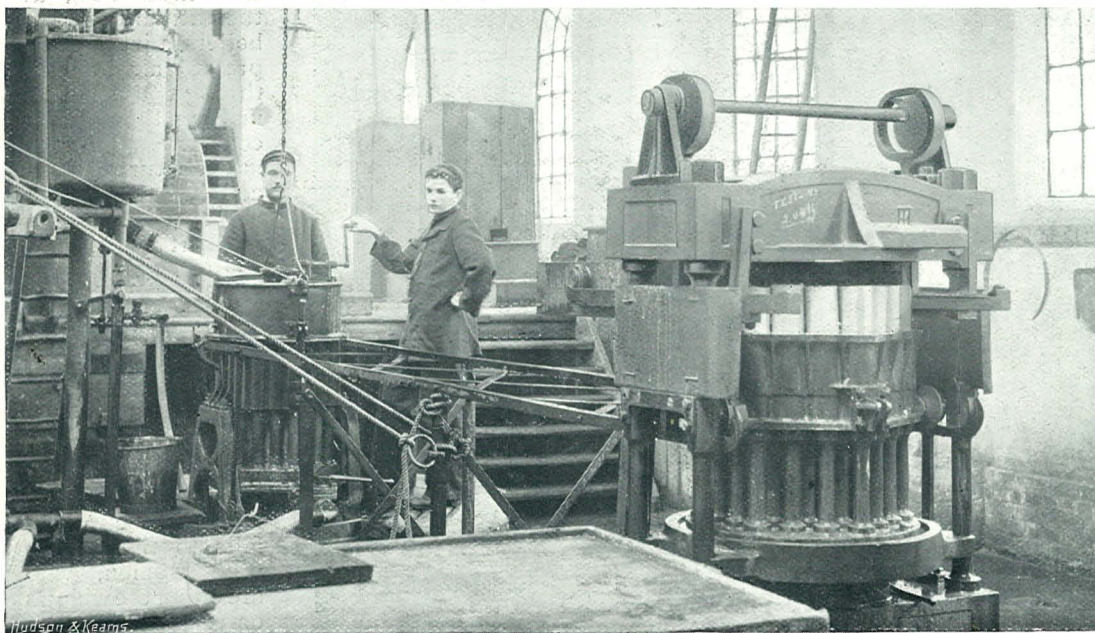




NITRATING SHOP.  
In the Dinner Hour.



POACHING MACHINE FOR "WASHING" GUN-COTTON.



MOULDING GUN-COTTON DISCS.

and teased (Ill. 3), the cotton is thrown on to a wide revolving band, which carries it through a species of window into the drying-room. Here is a vast oven with a multitude of tiny doors (Ill. 4), each one of which opens on to the cotton as it passes through. In the oven is arranged an endless band, which, as it passes backwards and forwards, carries the cotton from the top to the bottom of the drying chamber. The journey takes 20-min., and the heat is kept up to 180-deg. before the charge is considered absolutely dry. Finally, when at the lowest tier, it passes out, still on the band, up an inclined shoot and drops into a bin. From this receptacle it is weighed into tins, each holding 14-lb., and is sent forward for the nitrating process in the next shop.

It must be understood that these buildings are only subdivisions of one large factory, and are thus side by side, a fact which reduces the handling of the charge to a minimum. In Ill. 5 small tunnels will be noticed under the chimneys, and it is through these that the dried picked cotton is thrust to fall into the bath of acid below. The 14-lb. of waste soaks up nearly 14-lb. of the fuming acid, some of which has to be removed. The workmen, armed with iron wringers, squeeze the free acid from the cotton and place it, after 5-min. immersion, in covered pots, which can be seen standing in water in the foreground of Ill. 5.

At this stage innocent cotton makes its exit and "explosive" enters, and the normal care has to be increased or explosions will inevitably occur. The fumes given off by the acids in this airy shop are very corrosive, and men working long in the nitrating-house find that their teeth suffer. Worn-out Army clothing is served out for use in the factory, as the acid plays havoc with cloth of any kind, and this produces a most bizarre effect upon the visitor. After a due period of cooling, the contents of six pots are placed in a centrifugal wringing-machine, and in it the bulk of the superfluous acid is removed. The much-harassed cotton is then washed by machinery, until almost every trace of the acid is removed. The washing finished, there remains the boiling, which takes place in huge vats closely resembling elephantine casks in appearance. In all, twelve different waters are used in this process, and the boiling takes seventy-two hours to complete.

When wrung out, the cotton is placed in bags and carried to the pulping-machine shop, where rapidly-revolving knives so mince it that it forms an impalpable powder, rendering milky white the water with which it is flooded. The paddle-wheel machine, or poacher, as it is called, shown in Ill. 6, is used for thoroughly washing every particle of



the powdered gun-cotton, and by the rapid revolution of the paddles this purpose is completely achieved. Then with a funnel, shown to the right of Ill. 7, the workman draws off the supernatant water, leaving the explosive as a white precipitate. From these machines the gun-cotton is carried into a large receiver styled the "stuff-chest." From this, smaller tanks are filled, called gauge-tanks, seen in Ill. 7 (high left), which hold enough to fill the moulder shown in the same illustration. Then by means of rails the soft mass is carried to the press, where, under a pressure of 34-lb. to the square inch, it is moulded into discs of gun-cotton.

These still contain far too much water, and after being drilled like so many wooden blocks they are carried to another press (Ill. 8). There, under a pressure of six to seven tons per square inch, the disc is reduced in size to half, and the moisture brought down to about 14 per cent. The workman is guarded from injury by a heavy rope mantlet, which protects him far more than thin iron or steel would do. Fortunately for the comfort of the visitor, gun-cotton requires lighting and confining in a closed space to develop its terrific power, otherwise the pressing-room would be a trying one to visit.

The gun-cotton intended for cordite manufacture is, of course, *not* compressed, but is dried and sent to the N.G. factory, where in the next article its progress can be watched.

(Previous articles of this series appeared on July 15 and October 14.)

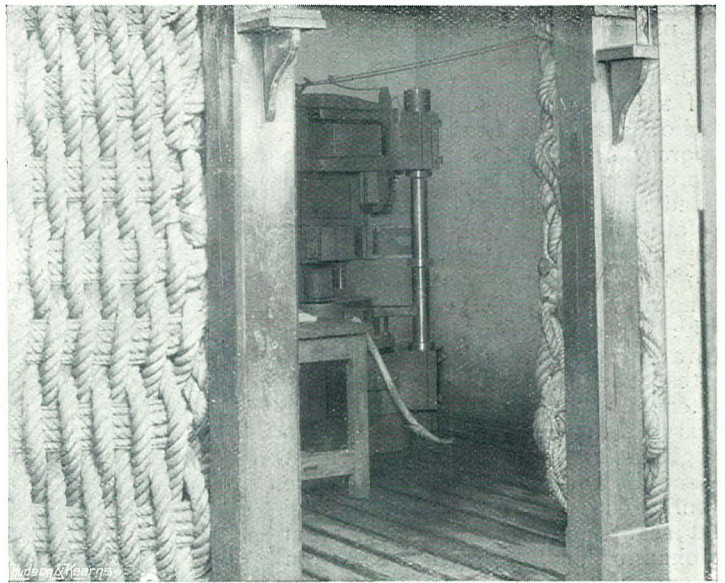


Photo. Copyright.

A SILENT GIANT.  
Machine for Pressing Gun-cotton Discs.

"Navy & Army."

## Durban and the War.

WHEN this war is over Natal will have owing to her by the Empire a very deep debt of gratitude. It would be hard to over-estimate the splendid services that its colonists have rendered to the Imperial cause. They have seen their country overrun by the enemy, and their property destroyed, without a murmur or complaint, and the gallant little colony has put the cream of her manhood into the field to fight the Empire's battle. Truly they "come of The Blood; slower to bless than to ban; little used to lie down

at the bidding of any man." And the Empire will never forget Natal's work for it in the hour of stress. Although Pieter Maritzburg is the capital and seat of the Government, Durban is by far the largest and most important town; doubly important in that it is the only port in the colony, whose coast-line extends along 170 miles of the Indian Ocean. It is a wonderfully well-watered country, for in this small stretch of coast-line no less than twenty-three distinct rivers debouch into the sea. Two of our pictures illustrate a couple

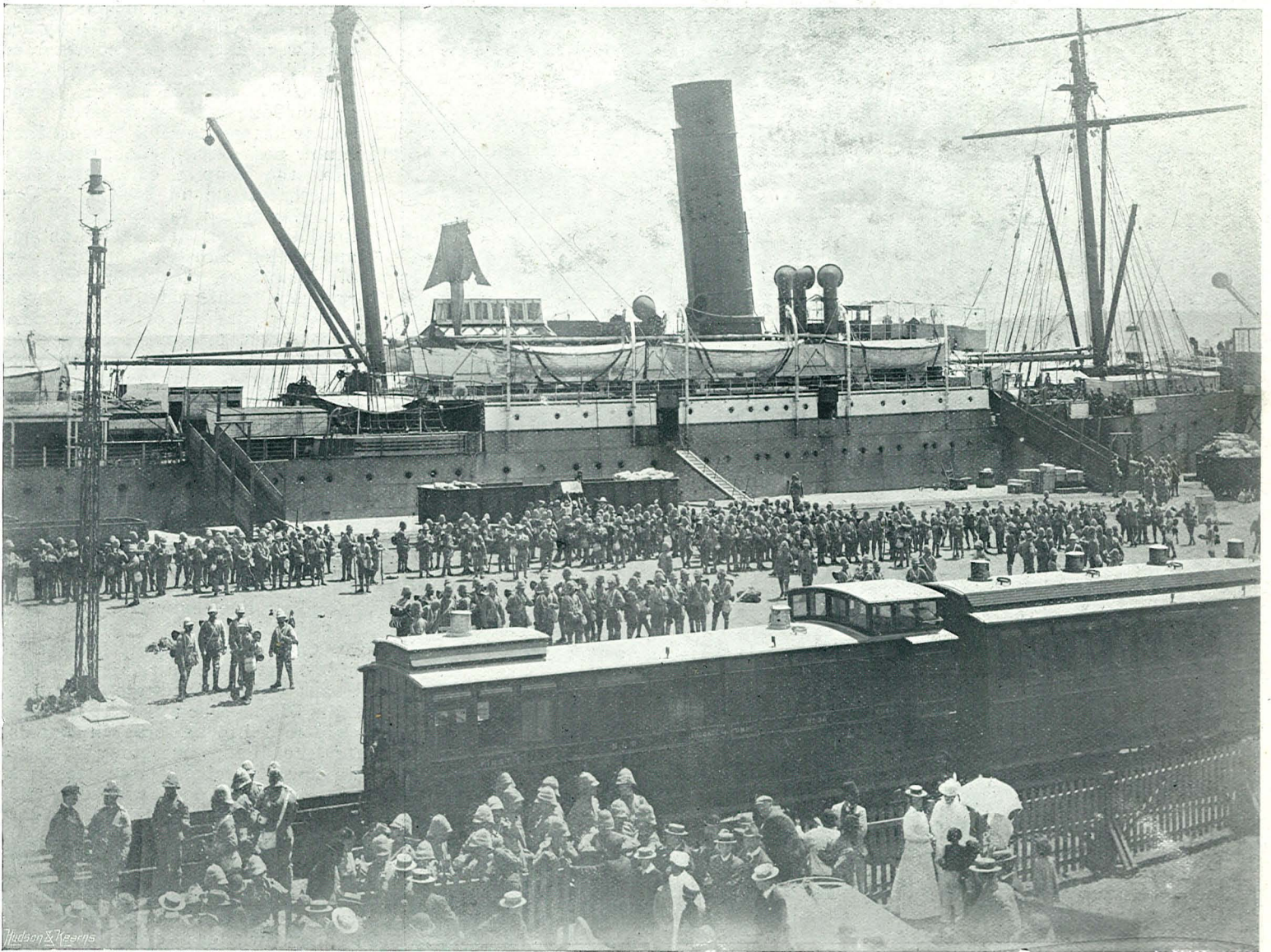


Photo. Copyright.

THE LATEST ARRIVALS FROM ENGLAND—TROOPS DISEMBARKING FROM A TRANSPORT.

"Navy & Army."

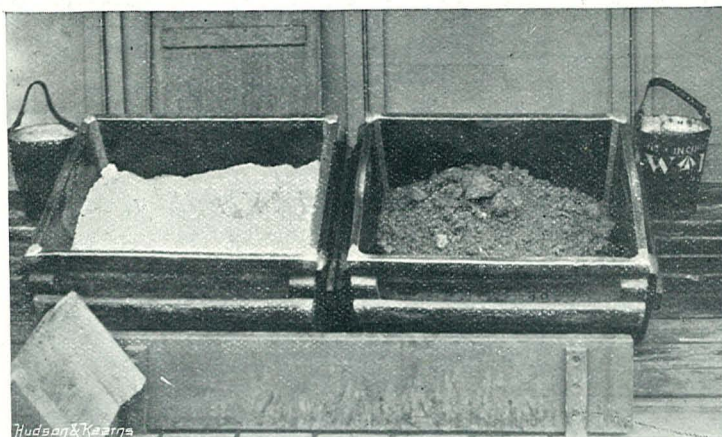


# Her Majesty's Ordnance Factories.

By FREDERICK G. ENGELBACH.  
WALTHAM ABBEY.—III.

THE greatest constituent by bulk of cordite is nitro-glycerine, one of the most powerful explosives known. It is obtained by the action of nitric and sulphuric acids upon glycerine, the resultant being a heavy, oily fluid, straw-like in colour. N.G., as it is familiarly known, is exceedingly sensitive to concussion, and an explosion may occur at any moment.

Prior to 1894 its manufacture was carried on in flimsy buildings, surrounded by massive brick traverses, but a disastrous explosion which occurred in May of that year caused a different plan to be adopted.



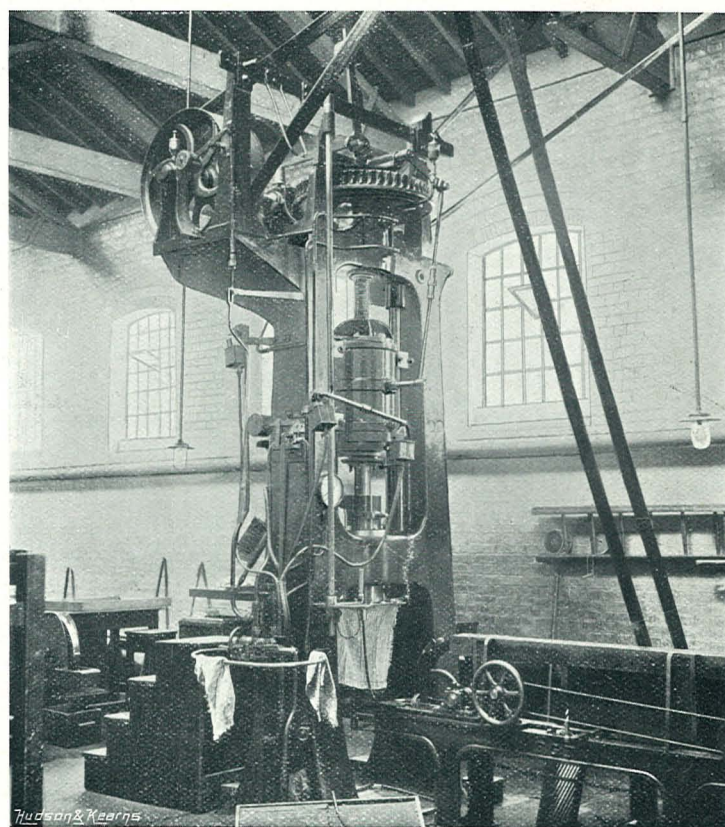
BEFORE AND AFTER INCORPORATION.  
Two Charges of Cordite, one of which consists merely of N.G. and Gun-cotton, the other being a Mixture of N.G., Gun-cotton, Acetone, and Vaseline.

house. In appearance the cordite at this stage resembles damp china clay, showing white against the same material when ready for pressing into cordite. The incorporating machine is one of a type used nearly universally by bakers for mixing their dough. It consists of a number of spiral knives which so cut abroad the mass of crude cordite that in  $3\frac{1}{2}$  hours it presents quite a different aspect.

The 15-lb. 10-oz. of acetone is mixed with it before incorporation and renders this process feasible. Then  $3\frac{3}{4}$ -lb. of mineral jelly is added and the mass sub-

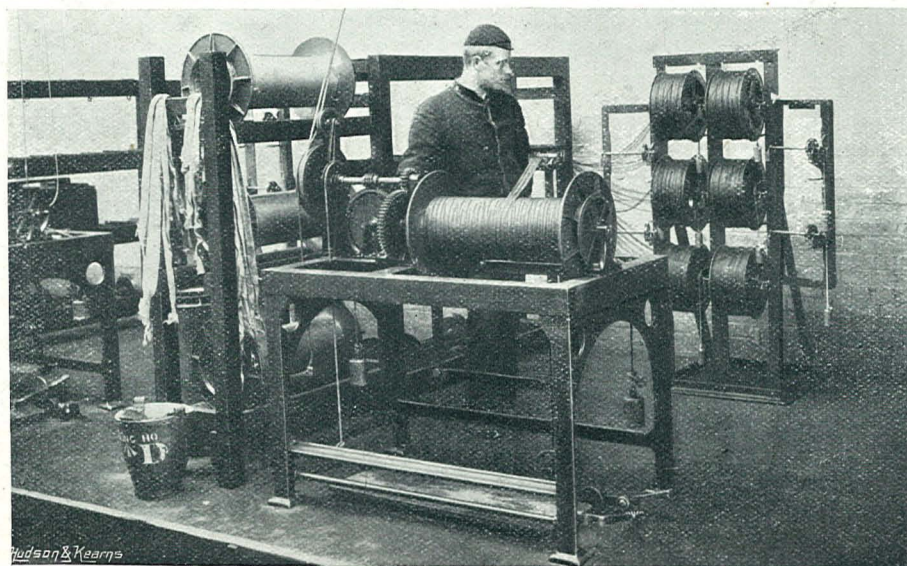


A MACHINE IN ITS TIME PLAYS MAN'S PARTS.  
Baker's Dough Incorporator Used for Cordite Mixing.



GENTLE PERSUASION.  
Cordite being Forced into Cords under Enormous Pressure.

The pictures which were taken shortly after the catastrophe, show the crater characteristic of this explosive, hardly one brick being left on top of another. Now, in lieu of masonry, huge banks of earth are piled up round the N.G. houses, which are also slightly sunk below the surface of the ground. The illustrations give a good idea of these typical danger buildings. The nitro-glycerine, by bulk  $43\frac{1}{2}$ -lb., is mixed with  $27\frac{1}{2}$ -lb. of gun-cotton in the N.G. houses, and the charge is carried in tubs to the incorporating



Photos. Copyright.

BLENDING—CORDITE!  
Winding Sixty Strands into One Rope.

jected to  $3\frac{1}{2}$  more hours of mixing. The jelly gives a ductility to the cordite and renders it fit for pressing.

The men in these "shops" work eight-hour shifts, and, work being continuous, a large amount of the explosive is manufactured weekly. About 50,000-lb. can be dealt with in the various incorporators, and yet, in spite of these quantities, not one precaution is neglected. The most scrupulous cleanliness reigns everywhere, and the mop and pail are perpetually in evidence, removing dirt

"Navy & Army."



invisible to the ordinary eye.

Incorporation complete, the cordite is carried to the pressing-room, and a charge of 20-lb. is loaded into a cylinder and the inlet closed down firmly. Immediately this has been done, a heavy piston descends, exerting by hydraulic power a force of 600-lb. to the square inch on the soft mass below it. According as 5 or 10 cordite is required, so the exit available for the escape of the mass is large or small. In the picture half-inch cordite is being made, and it can be seen emerging from the lower part of the machine, against the background of a towel. As it is driven out it can be seen passing on to the grooved block to the right, where it is cut into lengths of 16½-in. Of these a trayful has been arranged at the lower edge of the picture.

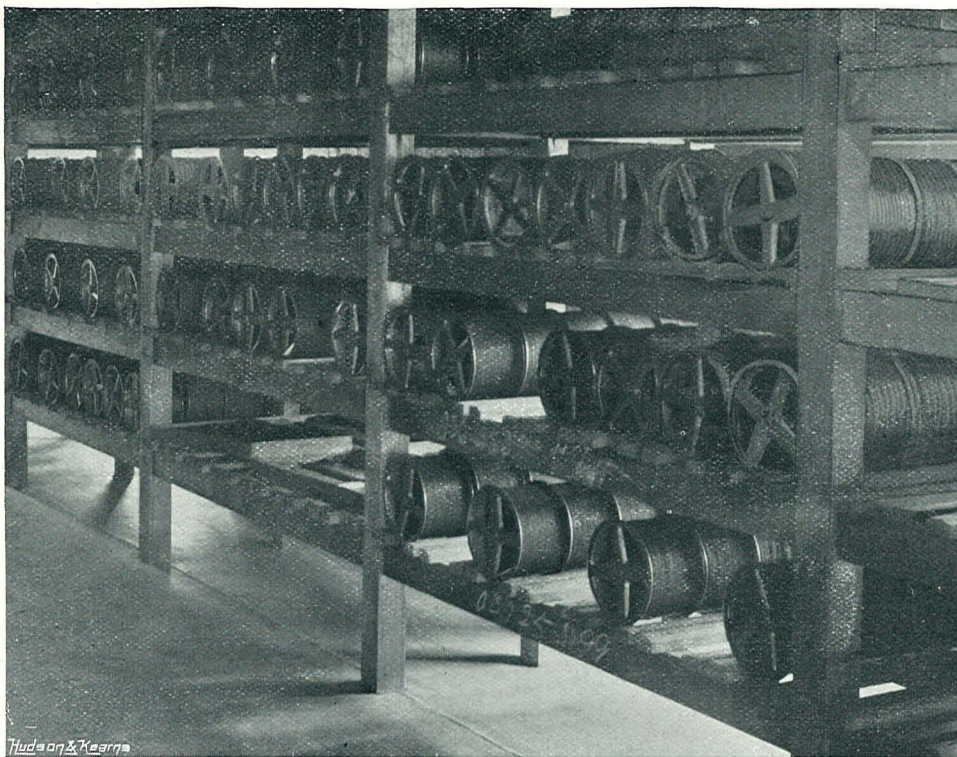


Photo. Copyright.

BAKING CORDITE.  
Drying Out the Acetone at 100-deg. F.

"Navy &amp; Army."

days, the Webley pistol size only two. When dried, the reels — I refer to rifle and pistol cordite — are taken to the blending factory, where one of the most interesting processes takes place. There, Ten reels of the dried cordite are placed on a machine and the ten strands twisted or blended into one string on a fresh reel.

Six of these reels are again blended, as the picture shows, into one rope, consisting of sixty separate filaments. When finished, this rope is cut into lengths of 1½-in., and these sections furnish the charge of 30-gr. for a round of ball cartridge. Records are kept of each reel, so that if a batch of ammunition goes

wrong at any time its life history can be traced back with accuracy, even although months may have intervened. Every care is taken that no dust or grit gets on to the reels in



Photos. Copyright

A RUINED N.G. HOUSE.  
Showing a Partially Destroyed House.

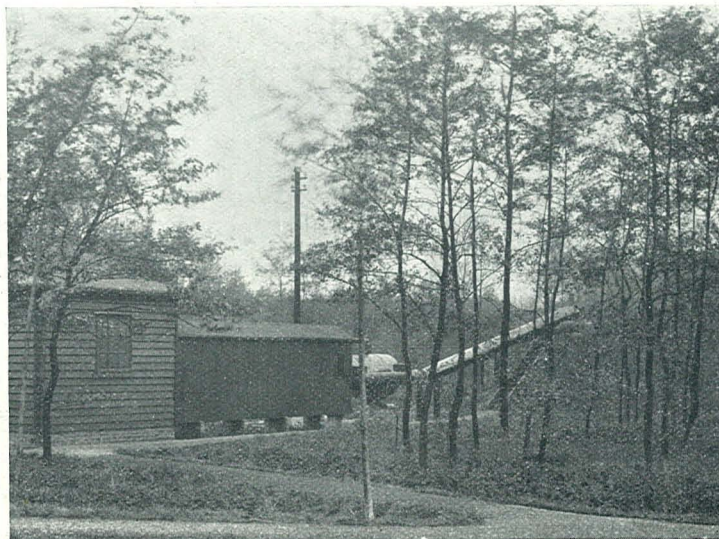
At this stage the acetone used as a solvent requires to be eliminated, and the cordite, large or small, is carried into a large drying-room, where it is exposed to a heat of 100-deg. F. for varying periods. Half-inch requires fifteen

Colonel Lockyer, R.A.  
"THE CRATER OF THE VOLCANO."  
Showing Pulverised Brick and Stone.

transit; and until they are handed over to the Woolwich ammunition authorities, they are kept in small closed vans. No cutting is done at Waltham Abbey, that process being deferred until the last possible moment.



Photos. Copyright.

A NITRO-GLYCERINE LIFT.  
Showing Earth Banks round N.G. House.A DANGER BUILDING.  
A Process in the Manufacture of N.G.

"Navy &amp; Army."



1899-1900

Engelbach, Frederick G. HMOF. Waltham Abbey. The Navy and Army Illustrated. Copies of 3 Articles  
 14.10.1899 30.12.1899 13.1.1900 (2 files original & photocopies) (Photos: Hudson & Kearns)

- 1 Major F L Nathan RA, assistant superintendent of powder factory
- 2 Lieutenant W B Anley RA Officer in charge of danger buildings, Waltham
- 3 Headquarters of the staff, Waltham
- 4 "Any matches or keys" Sergeant searching a man
- 5 A Placid Scene - Waltham Lock - Loaded boats going down stream
- 6 The Waltham uniform showing boots used in buildings (and uniform made from lasting material)
- 7 A self-planted shrubbery - brick traverse separating mixing house from other buildings on Lower Island (showing Lower Island Lock)
- 8 Specimens of cordite and primers
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- 10 The genesis of guncotton - acid mixing shed
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- 13 Oven for drying cotton
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- 15 Poaching machining for washing guncotton
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- 23 A ruined NG house - Quinton Hill Explosion
- 24 The crater of the volcano - showing pulverised brick and stone - Quinton Hill Explosion
- 25 An NG lift - showing earth banks round NG house
- 26 A danger building - a process of manufacture of NG





*Photo.*

*Foster.*

*MAJOR F. L. NATHAN, R.A.,  
Assistant Superintendent of Powder Factory.*





*Photo.*

*Hughes & Mull.*

*LIEUTENANT W. B. ANLEY, R.A.,  
Officer in Charge of Danger Buildings, Waltham.*





HEADQUARTERS OF THE STAFF, WALTHAM.









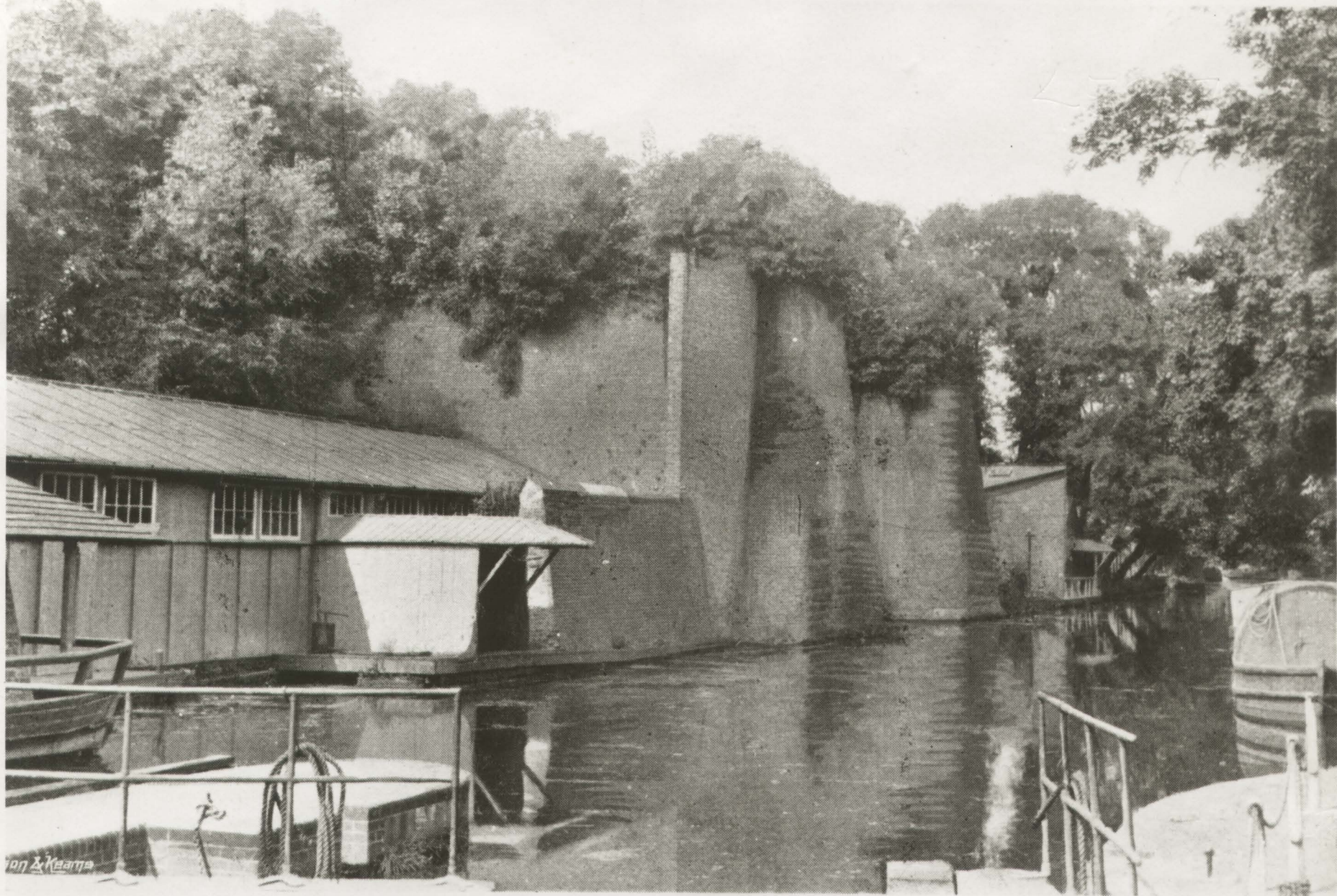
*Powder mills and boats on the Millhead Stream.  
Royal Gunpowder Factory, Waltham Abbey, 1899.*





THE WALTHAM UNIFORM.  
*Showing Boots Used in Buildings.*





*A SELF-PLANTED SHRUBBERY.*

*Brick Traverse Separating Mixing House from other Buildings on Lower Island.*





SPECIMENS OF CORDITE AND PRIMERS.



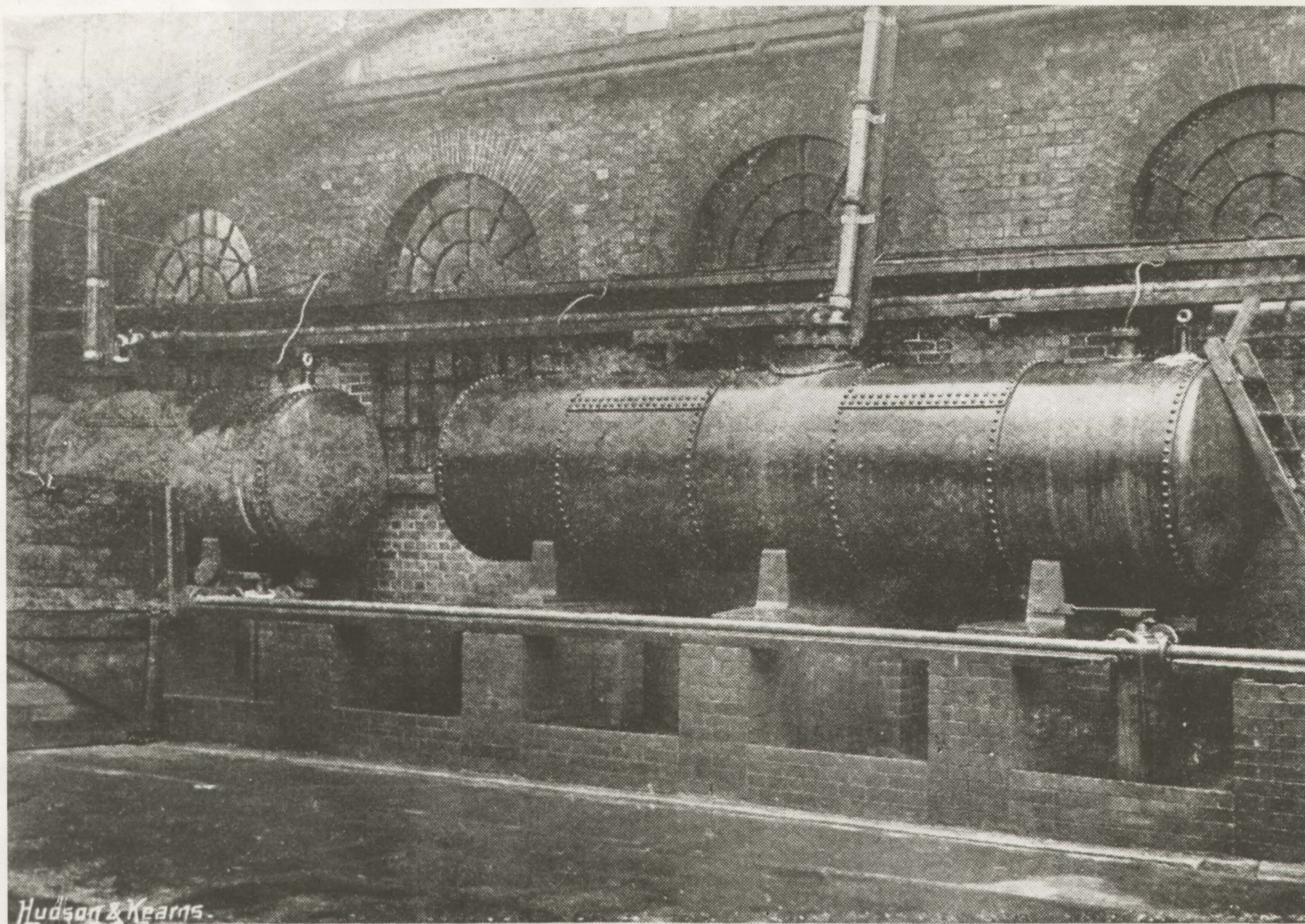






THE GENESIS OF GUN-COTTON.  
*The Acid Mixing Shed.*



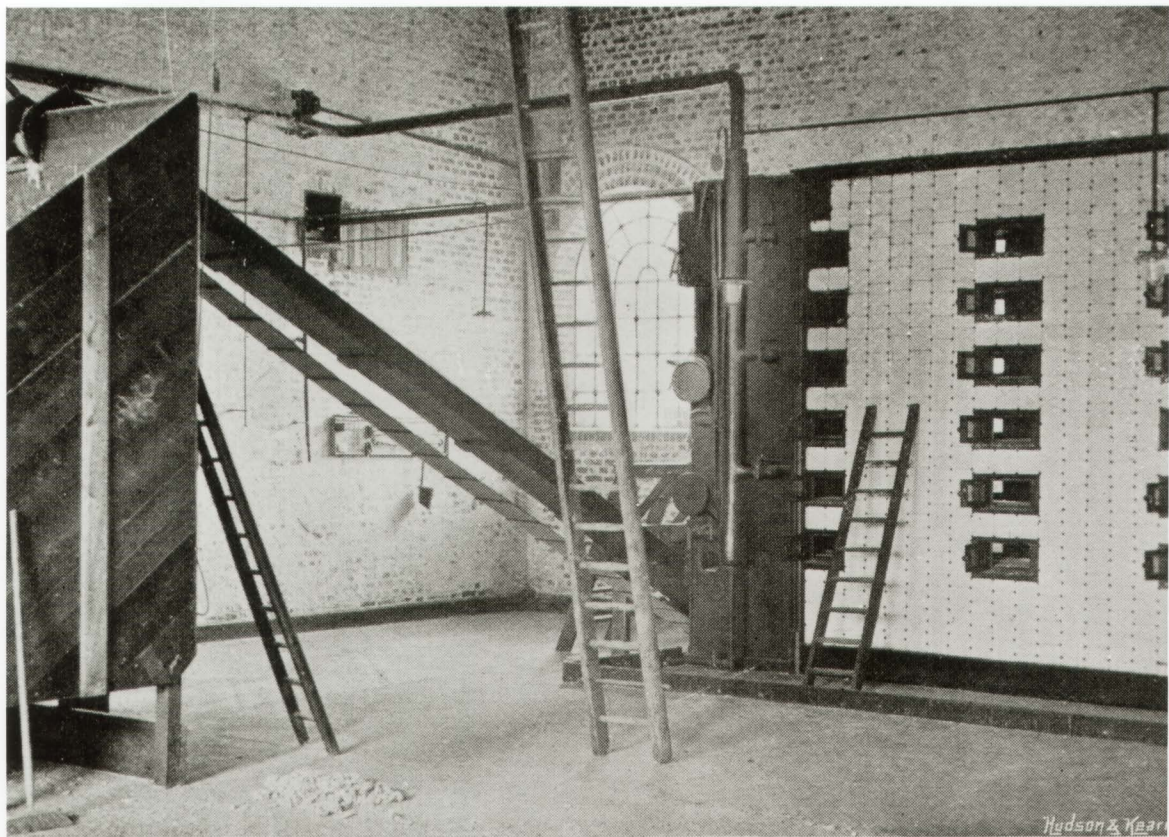


MIXING ACIDS BY COMPRESSED AIR.





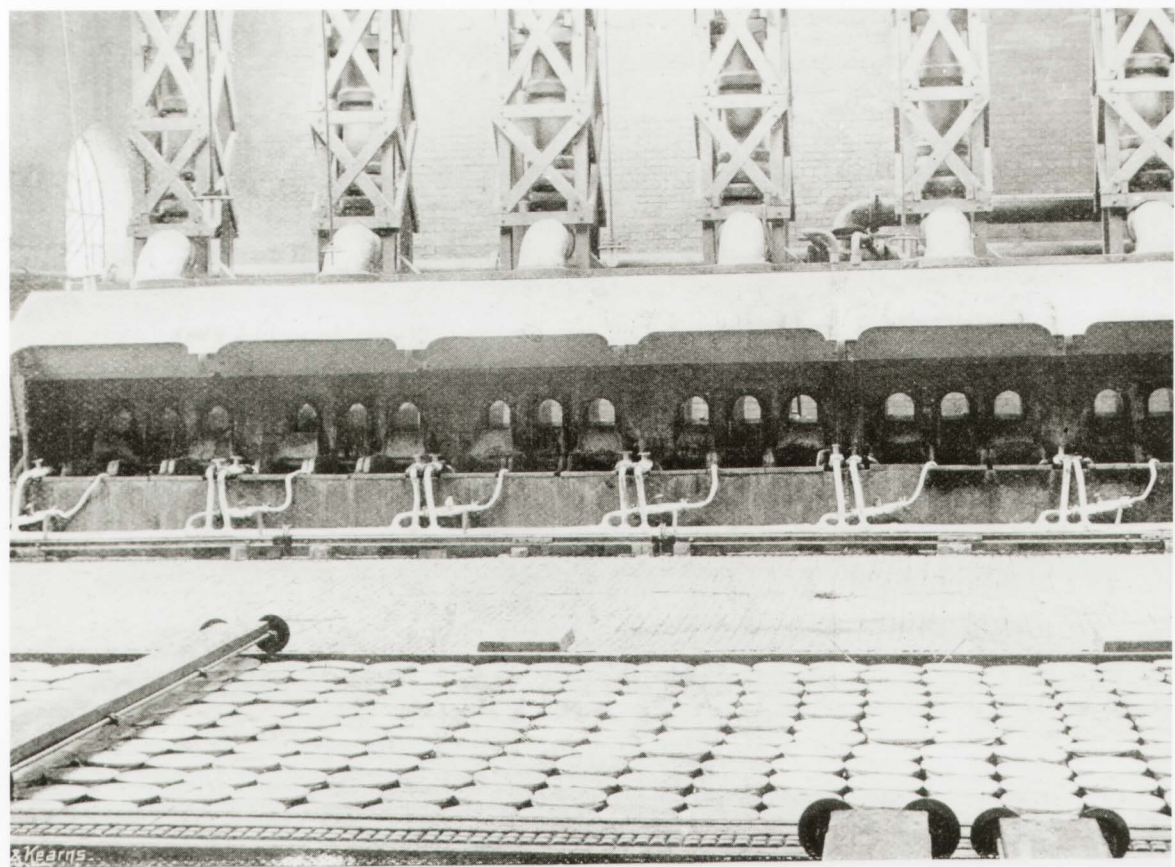




OVEN FOR DRYING COTTON.

*The Cotton Passes into the Oven on the Right of the Picture.*

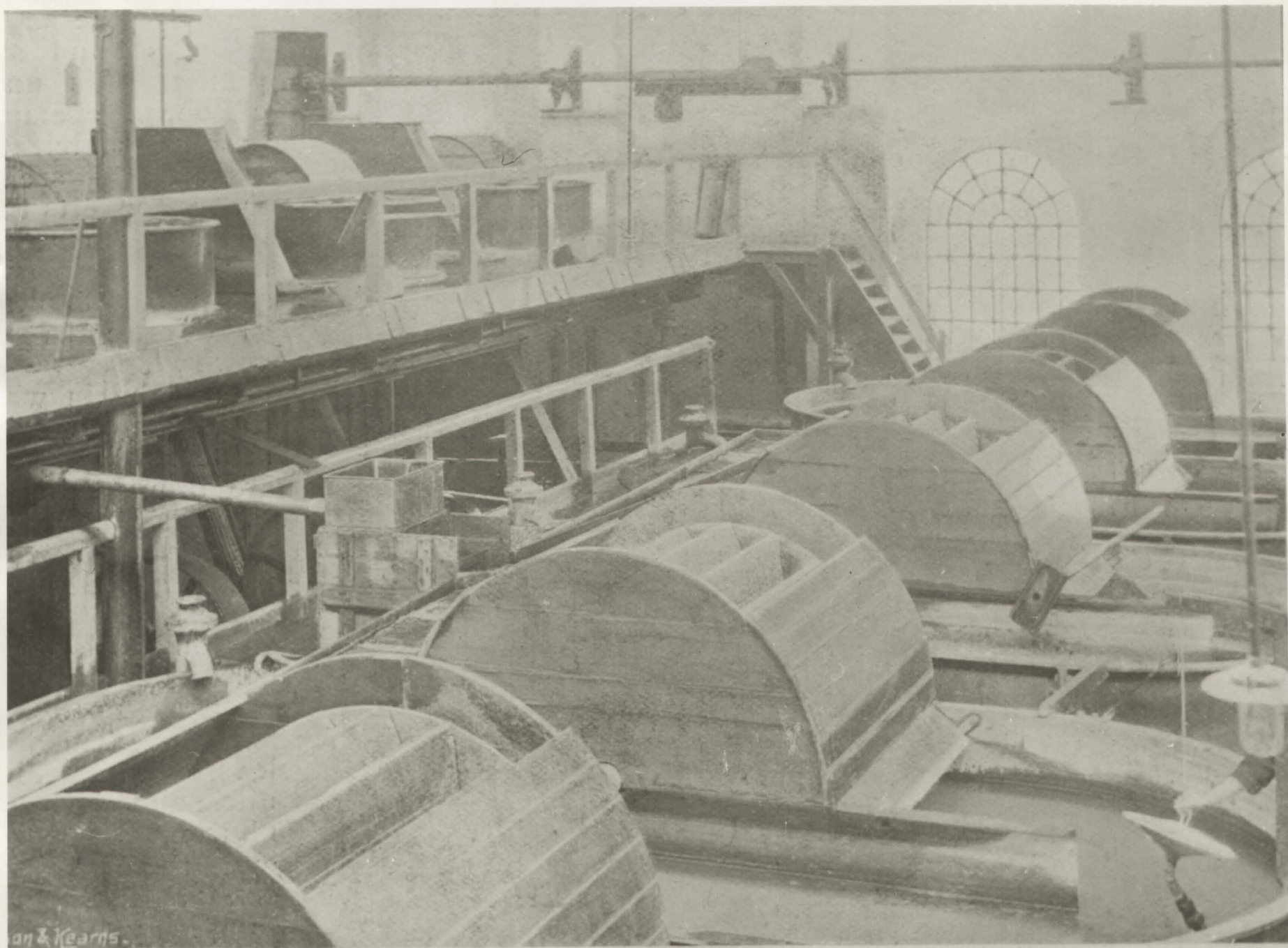




NITRATING SHOP.

*In the Dinner Hour.*

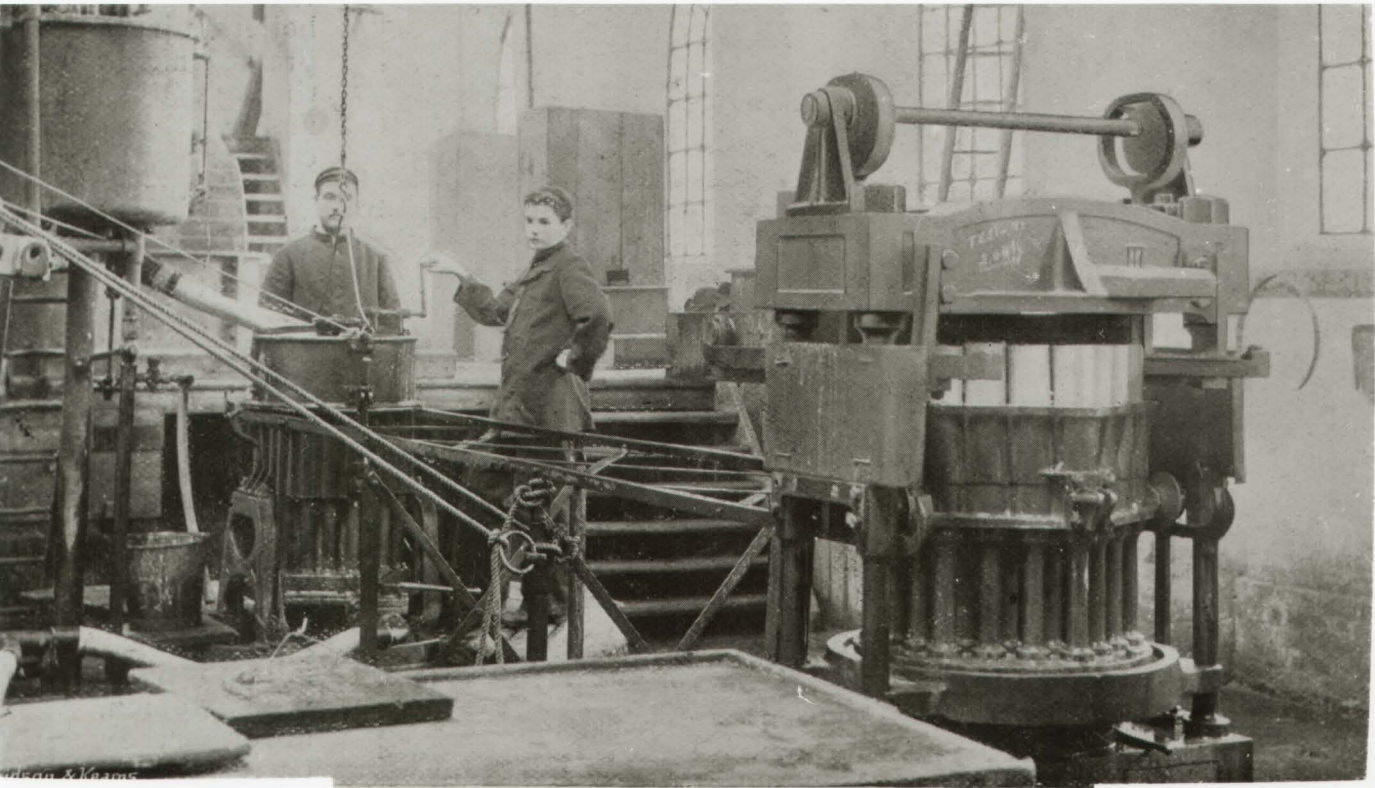




an & Kearns.

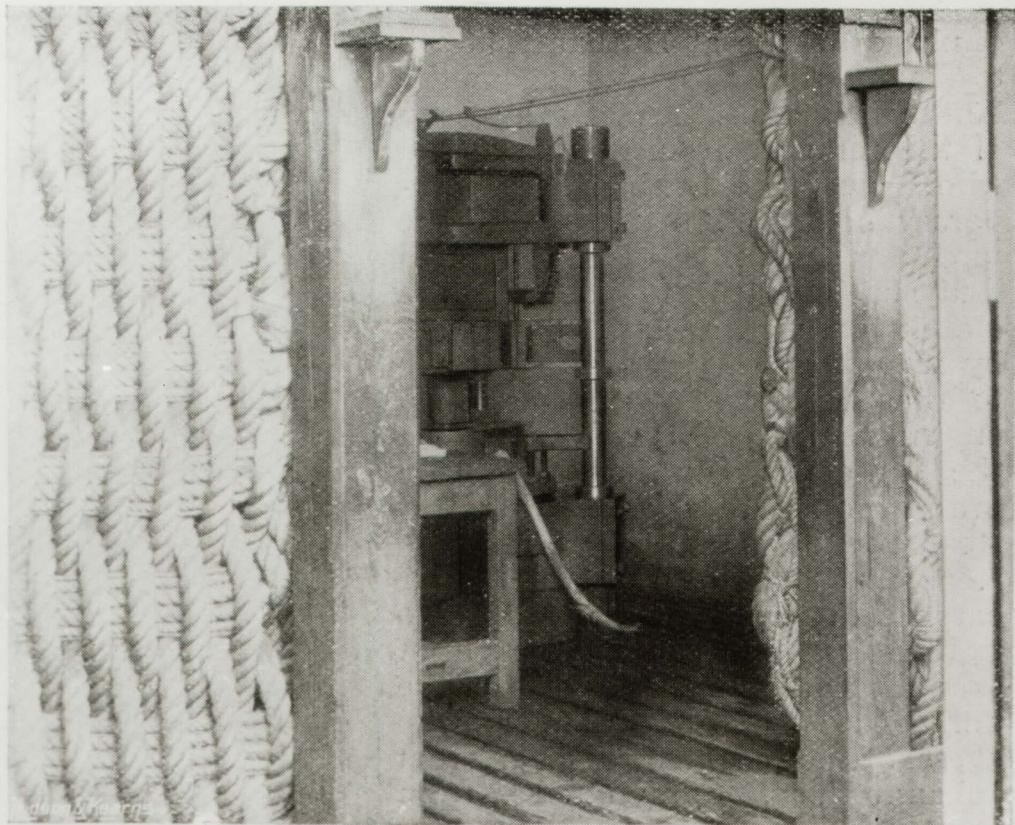
POACHING MACHINE FOR "WASHING" GUN-COTTON.





MOULDING GUN-COTTON DISCS.





*A SILENT GIANT.  
Machine for Pressing Gun-cotton Discs.*





*BEFORE AND AFTER INCORPORATION.*

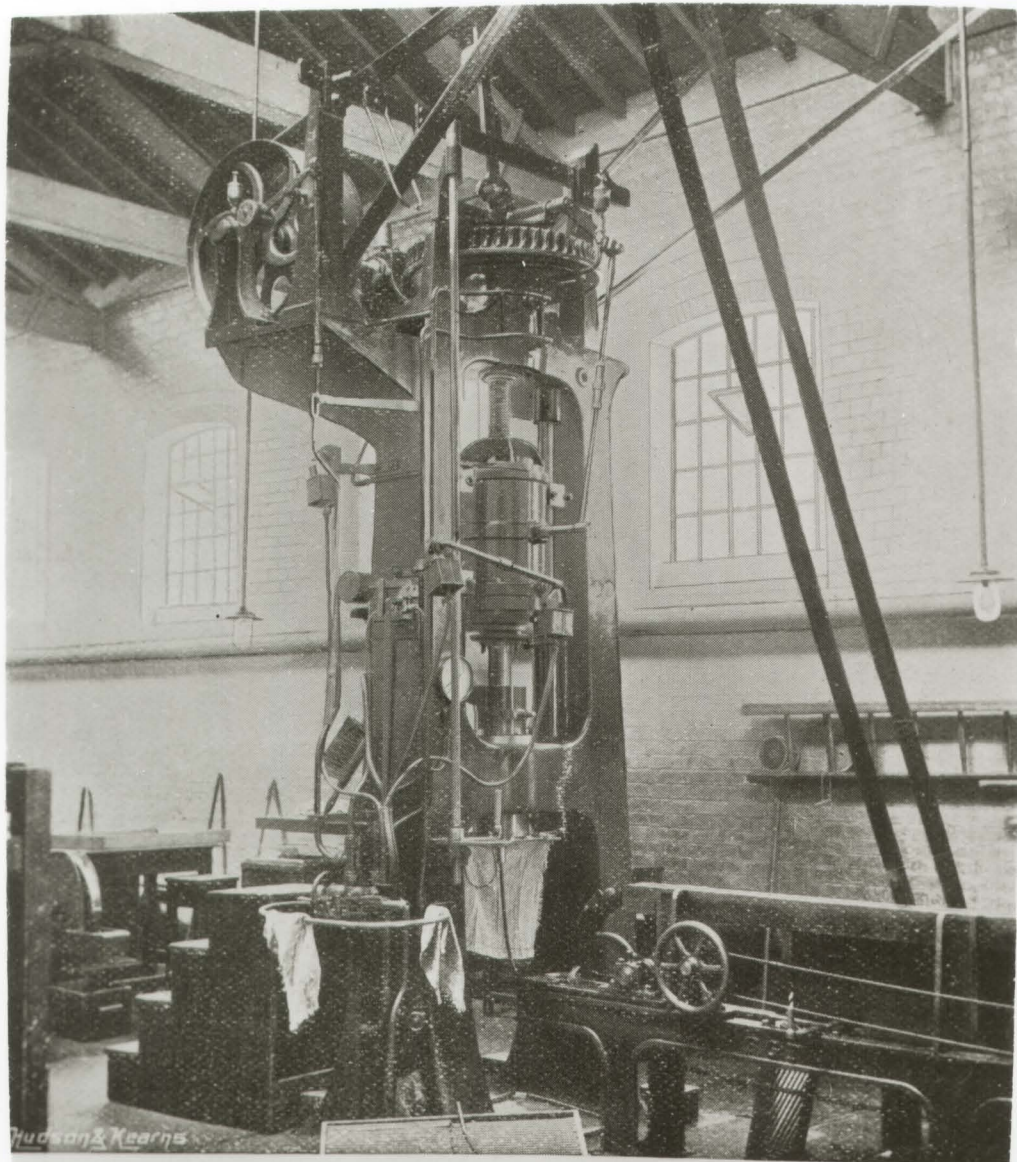
*Two Charges of Cordite, one of which consists merely of N.G. and Gun-cotton, the other being a Mixture of N.G., Gun-cotton, Acetone, and Vaseline.*





A MACHINE IN ITS TIME PLAYS MAN'S PARTS.  
*Baker's Dough Incorporator Used for Cordite Mixing.*

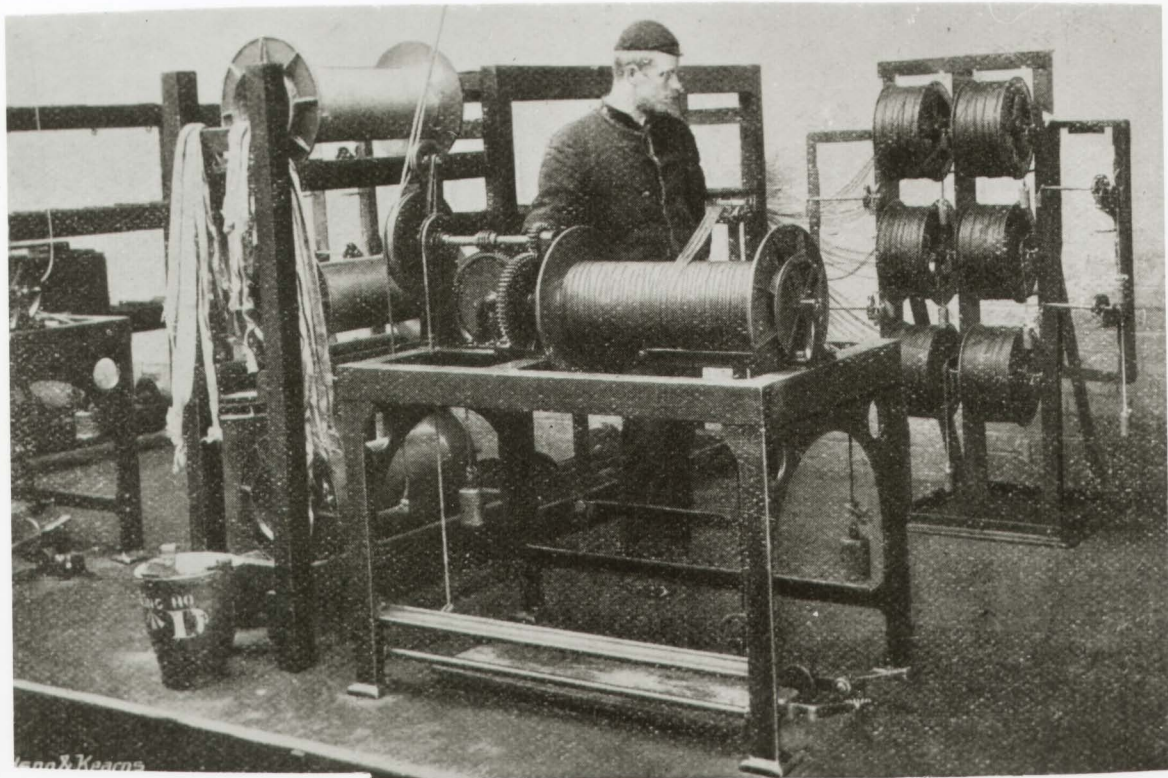




Hudson & Kearns

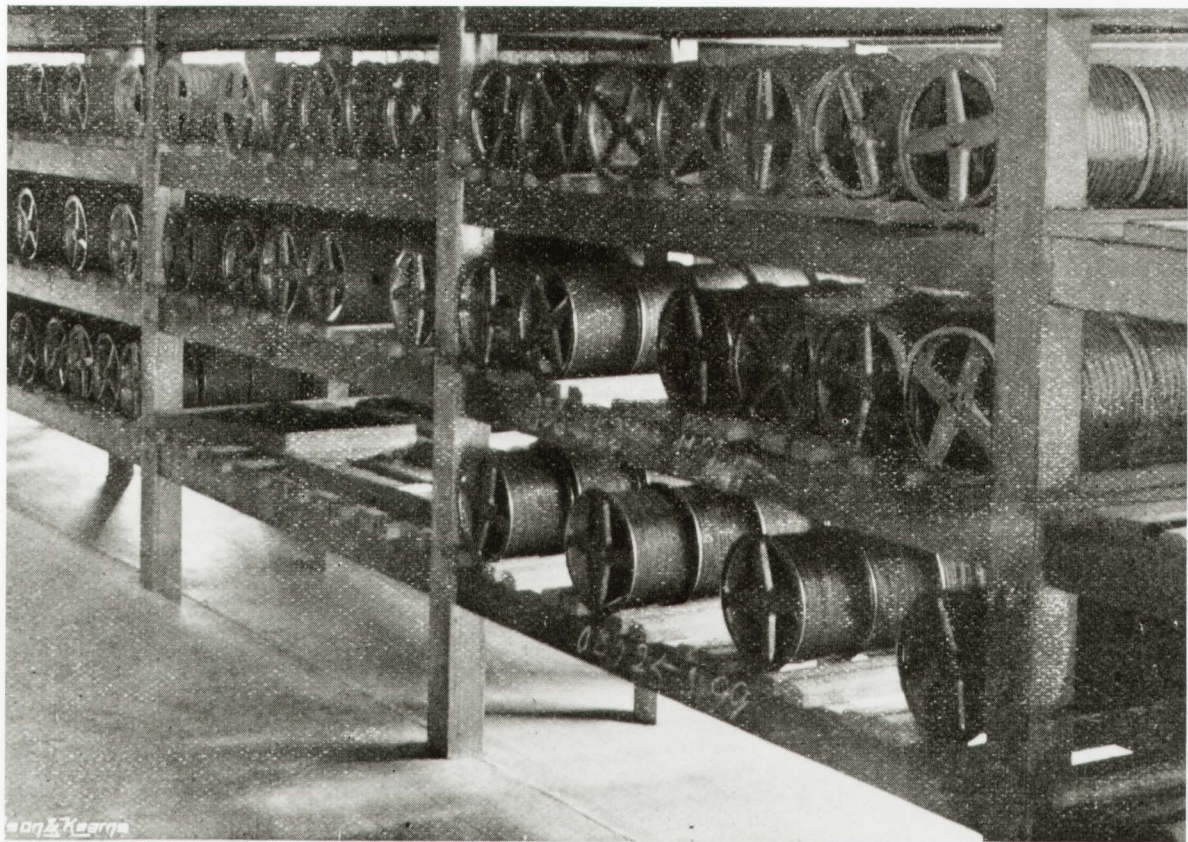
*GENTLE PERSUASION.  
Cordite being Forced into Cords under Enormous Pressure.*





*BLENDING—CORDITE!*  
*Winding Sixty Strands into One Rope.*





BAKING CORDITE.  
*Drying Out the Acetone at 100-deg. F.*





*A RUINED N.G. HOUSE.*





*"THE CRATER OF THE VOLCANO."*





*Photos. Copyright.*

*A NITRO-GLYCERINE LIFT.  
Showing Earth Banks round N.G. House.*





*A DANGER BUILDING.*