

WASC 2282

Extracts from
RGF Annual Reports
1900-1907

(a) Experiments were made to ascertain the effect of passing the spark from a powerful Ruhmkorff's coil through an inflammable mixture of acetone vapour and air. It was found that the spark produced by a current of this high potential ignited the mixture.

(b) Considerable quantities of electricity being generated in the driving belts of the incorporating machines, a spark gap in an inflammable mixture of acetone and air was so arranged that the one terminal was in connection with a metallic comb placed in proximity to the belt, while the other was connected to earth. The sparks of low potential thus formed failed to ignite the inflammable mixture.

3. Estimation of acetone vapour in the atmosphere of cordite drying stoves.

Various estimations of the atmospheres of different stoves, under different conditions, gave the percentage by volume of acetone present at from 0.2 per cent. to 0.95 per cent. It is evident therefore that the general composition of the atmosphere in cordite stoves, under the worst conditions, is well under the low limit of inflammability of acetone vapour and air, though it would, of course, be possible to get a much higher and doubtless inflammable proportion in small quantities of air surrounding freshly pressed warm cordite.

Explosion
in cock of
nitrating
apparatus.

A small explosion took place on the 8th January, 1901, in the drowning cock of the nitrating apparatus in No 2 House, Quinton Hill; the apparatus was empty at the time. The cock was destroyed. The explosion was probably due to the lodgment, in a depression in the key, of a trace of acid nitro-glycerine from the previous charge. The drowning arrangements have been altered to enable this cock to be done away with.

Machinery
accidents.

The following are the chief machinery accidents during the year:—
No. 6 G/C Press, 6th April, 1900.—Column broken whilst pressing. No. 2 G/P Granulating Machine, 6th July, 1900.—Breakage of main driving shaft. No. 3 G/P Cam Machine, 30th October, 1900.—Fracture of bottom crosshead. Sulphur Mill, 26th November, 1900.—The teeth in driving and crown wheels stripped. This was one of the very old water-mills with wooden gearing. The gear was not worth repair, and has been dismantled.

Barges and
boats.

The barges are all in good condition, and four of those used for the transport of explosives to Woolwich and Purfleet have been docked and examined, and repaired, when necessary, by an outside barge builder. The old "Lady of Lorne" has continued to be used for the transport of acids, coke, &c., between different parts of the Factory.

Owing to the opening of the naval cordite magazines in the Plumstead marshes, all naval cordite has been sent to Woolwich, instead of to Purfleet, since the 20th June, 1900. Now that the output of cordite has so much increased, this has resulted in a considerable saving in the time of transport. I have had occasion, however, to bring repeatedly to notice the long delays which occur in the unloading and reloading of our barges at Woolwich, due, as I gather from the correspondence, to insufficient pier accommodation. This question, now that our output of cordite has so largely increased, is a serious one, as our magazine accommodation here is very limited, and, unless I can get rid of explosives rapidly, manufacture would of necessity have to be suspended for want of storage accommodation.

The boats used in the Factory are all in good repair. To meet the additional traffic caused by the manufacture of cordite paste at Quinton Hill, three new covered boats have been obtained, at a total cost of £510. A new open boat, which cost £60, was got for the Mill Head floating fire engine to replace one worn out.

Fire
hydrants
and
engines.

The removal of the cordite plant to the Upper Works made it highly desirable to lay down a fire hydrant main, as an accident, in the incorporating machines especially, would almost certainly be of the nature of a fierce fire rather than of an explosion. Owing to the long range of buildings in which

plug, a small black charred spot was found in the cordite close to the inner surface of the plug, and at about its centre. The ignition had evidently started there, from what cause could not be discovered, had found its way out through the two die holes, and extinguished itself.

Ignition of cordite in the Tray Magazine.

At 2.15 p.m. on the 27th November, 1902, some small pieces of cordite on the floor of the Tray Magazine under the steam radiator used for heating, caught fire. A man who was packing empty trays in the magazine, threw a bucket of water over the burning cordite and extinguished it. The ignition was probably brought about by long continued exposure of the cordite to the heat from the radiator. All radiators have been removed from cordite buildings, which are now, without exception, heated by means of steam pipes placed high up in the buildings so that it is impossible for cordite to come in contact with, or near them.

Explosion of cordite M.D. Paste in an incorporator.

An explosion of cordite M.D. paste occurred at 12.3 p.m. on the 15th December, 1902, in an incorporating machine in Bay 3, Group G. Three men were killed, one by the force of the explosion, the other two by falling debris. The bay was completely wrecked and serious structural damage was done to the adjoining two bays, Nos. 2 and 1, and to the Engine House. Minor structural damage was done to Groups D, E and F. I submitted a full report on the accident on the 21st December, 1902, 74/Gen. No./3991. A Court of Enquiry assembled on the 22nd December, 1902, and recorded the following opinion :—

“ The Committee are of opinion that a charge of 57 lb. cordite M.D. paste was in the machine at the time of the explosion, and that the machine had just been started.

“ The possible causes of the explosion are—

“ (1) The presence of some fairly large foreign body (a) introduced in the paste, or (b) which had fallen into the machine.

“ (2) The sudden fracture of one of the blades.

“ (3) The absence of acetone in the machine, which might allow of sufficient friction to ignite the guncotton and lead to explosion.

“ The explosion was due to accident and not to malice. In the absence of any clear indication it is impossible to say which or what combination of these causes led to the accident.”

Explosion of a B primer of guncotton in a hydraulic press.

At 9.2 a.m. on the 27th February, 1903, a 9-oz. B primer of guncotton, exploded in No. 1 Hydraulic Press, No. 1 Press House, Guncotton Factory. The full pressure had just been put on. The man working the press, who was behind the rope mantlet, was not hurt. The bouche block and two bouches were broken, also 34 glass window panes out of 101. No definite cause could be assigned for the explosion. Three previous similar explosions have occurred.

Machinery accidents.

The only accident of any importance to machinery and plant during the year was the breaking up of one of the earthenware exhaust fans at the Guncotton Factory on the 3rd June, 1902. The fan had been in use continuously since the 11th May, 1900.

Barges and boats.

Two of the six barges used for the transport of explosives to Woolwich and Purfleet have been thoroughly overhauled and repaired by F. Hitch, of Ware, who tendered lowest for the work. The “ Lady of Lorne ” is still in use for transport of acids, &c., in the Factory. Two covered barges and two small covered boats were taken over from the Royal Laboratory for a very small sum. The Factory boats are all in a good state of repair, two boats and three barge dinghies, unserviceable and past repair, have been broken up.

Fire arrangements.

Mr. Tozer, Chief Officer of the Birmingham Fire Brigade, visited the Factory on the 11th July, 1902, as Inspecting Officer appointed

All cordite for cutting into $\frac{20}{\text{s.c.}}$ is now strained through wire gauzes twice, before it is pressed.

A new house has been designed and is in course of construction, built entirely of non-inflammable material, and in which the compartments are completely isolated.

On the 6th February, whilst the nitro-glycerine was being extracted from some low-heat-test cordite in the Laboratory, the nitro-glycerine exploded, blowing a hole through the slate bench and breaking some glass apparatus in the vicinity.

Explosion of nitro-glycerine in the Laboratory.

The new cotton waste drying machine supplied by John Petrie & Co., of Rochdale, was started on the 30th December, 1901, and worked very satisfactorily until the 8th February. At 8.7 a.m. on that date, on the 13th February, and again on the 10th March, the cotton waste in the machine caught fire. On all these occasions the fire was promptly extinguished by the hydrants in the cotton waste drying room, assisted by the outside hydrants, all of which were very smartly got to work by the fire brigade. Only slight damage was done to the wooden ventilators in the roof on the first two occasions. The machine, which is entirely constructed of iron, was not damaged. The cause of the fires was, of course, overheating of the cotton waste in the machine, for which no apparent cause existed in the first two instances. The third fire was no doubt due to a breakage in the machine, discovered afterwards, which prevented the proper feeding through and consequent lodgment in the machine, of a portion of the cotton waste. After the second fire, a steam pipe with jets playing on the cotton waste in the machine was fitted up, and at the third fire the steam was promptly turned on and much reduced the fire. I have been in communication with Nobel's Ardeer Factory, where similar machines are in use, and with their assistance and advice, rules for the working, cleaning, &c., of the machine, which have been effectual in preventing fires at Ardeer, have been drawn up.

Fires in the cotton waste drying machine

There have been no accidents of any importance to the machinery or plant throughout the Factory during the year.

Machinery accidents.

The six barges are all in very good condition, and three of those used for the transport of explosives to Woolwich and Purfleet have been docked and examined, and repaired where necessary by outside barge builders. To obtain competition for this work, arrangements were made with the P.O.O. for one of the barges requiring repairs to be docked and examined by his master shipwright at Woolwich, and this officer prepared the necessary specification. Tenders were then invited for the work from three firms. The most advantageous one was received from F. Hitch, of Ware, who for some time past has always carried out the work satisfactorily.

Barges and boats.

The old barge "Lady of Lorne" is still in use for the transport of acids, coke, etc., between the different parts of the Factory.

At the request of the N.O.O., made on the 15th May, 1901, the issue in the same barge of mixed freights of land and naval explosives has been discontinued as far as possible.

The delay in unloading and reloading my barges at Woolwich, to which I drew attention in my report of last year, still continues to a certain extent. The reason given is that of insufficient wharf accommodation, but I understand that additional wharves will probably be ready before very long.

The boats used in the Factory for explosives and general work are all kept in a good state of repair by the two shipwrights. The wear and tear on the boats is very heavy.

A new fire engine station has been erected at a lean-to to the dining room at the north end of the Factory. One of the fire engines no longer required at the main station, owing to the introduction of hydrants, has been placed there. The small manual engine has been removed from the Group A engine shed to the main station. Hydrant hose has been removed from the main machinery shop to the Group A engine shed. These changes have been

Fire engines and hydrants.

extended use showed that this was not so. A belt dressing called "Beltine" was subsequently introduced for leather belts and proved to be very fairly satisfactory, although it was not an absolute preventative, especially in dry, frosty weather, and notwithstanding the fact that the incorporating machines themselves were carefully earthed. The matter was again brought prominently to notice recently. On the night of the 16th February, a man, in replacing the aluminium cover on the small incorporating machine of Bay 5, Group D, touched the top of the machine with the cover, and reported that he saw a spark at the point of contact. Although "Beltine" was used freely, investigation showed that this particular machine developed more electricity than the other two in the same compartment, or, in fact, apparently more than any of the other incorporators. No reason for this could be discovered.

These electrical phenomena have always been more marked in dry and cold weather, in fact in summer they do not show themselves at all, and it was thought that water sprinkled on the belts or pulleys might prevent the electricity being generated. This was tried, but the effect was very transitory. A mixture of two parts glycerine to one of water was next tried; about 30 c.c. of this mixture sprinkled on the belts entirely prevented the generation of electricity for from five to six hours, when it again commenced to show itself.

There is very little doubt that the presence of water on the belts was the reason why no electricity was generated, the glycerine materially helping to prevent the evaporation of the water. Glycerine, moreover, has a great capacity for absorbing moisture, and it was thought that if a somewhat considerable quantity of glycerine was present in the belts it would, by constantly absorbing moisture from the atmosphere, prove a cure. Belts were therefore soaked in a mixture of five parts glycerine to one of water for 24 hours, the surplus liquid being then drained and wiped off. These belts, after being well stretched, were put on to the small incorporating machine of Bay 5, Group D, and the machine has been running since the 15th March, 1904, without the least development of electricity, and without any further treatment of the belts.

It would, therefore, appear that the glycerine treatment of the belts has been completely successful in preventing the generation of electricity in the driving belts of cordite incorporating machines.

Another instance of belt-generated electricity, and the first of its kind, occurred on the evening of the 7th April, 1904. The belt driving the fan which supplies hot air to No. 17 guncotton stove, became highly electrified and began to emit sparks. The engine was stopped at once and the belt thoroughly wetted with glycerine and water, the run was then continued with no further evidence of electrification. The belt had been unused for some time and was very dry. All guncotton stove fan belts are being treated with glycerine solution, and the engines, fans and heaters are being earthed.

Machinery Accidents.

When the new cordite high-pressure hydraulic presses and gears were first taken into use in September, 1903, there were several minor accidents and breakages, mainly in connection with the cylinder lifts and cradles. The parts which thus proved defective have all been strengthened, or the patterns modified, and everything is now working very satisfactorily.

An earthenware exhaust fan at the Guncotton Factory broke up on the 11th March, 1904; this fan had been in use continuously since 16th September, 1901.

There have been no other machinery accidents or breakdowns of any consequence.

Barges and Boats.

The barge "Sir William Congreve" was placed on the gridiron at Woolwich in August, 1903. After inspection, the P.O.O. proposed to carry out the necessary repairs, to which I agreed. The repairs required during the year to the other Factory barges were of a minor nature, not entailing docking, so they were carried out by the Factory shipwrights, who have also done all the repairs to the Factory boats. No boats have become unserviceable during the year. The old barge "Lady of Lorne" is still in use for transport of acids, &c., in the Factory.

BARGES.

Repairs to barges.

The barges "Charles" and "Sir W. Congreve", were repaired and painted in the Factory. The "Izaak Walton" and the "Earl de Grey and Ripon" were placed on the gridiron at Woolwich, and the specifications of the repairs required were prepared by the C.O.O. The repairs were carried out by Mr. J. R. Piper, at East Greenwich, and Mr. F. Hitch, at Ware, respectively. The "General Askwith" and the "Lady of the Lea" were repaired and painted above the water line in the Factory, and afterwards placed on the gridiron at Woolwich. The minor repairs found necessary below the water line were carried out by the C.O.O.

FIRE ARRANGEMENTS.

Fire arrangements.

Mr. A. R. Tozer, Chief Officer of the Birmingham Fire Brigade, visited the Factory on the 20th October, 1904, and made his annual inspection of the fire arrangements. He reported as follows:—"The various buildings and fire appliances were exceedingly clean, and the latter in first-class working order. The additional hose carts will prove of great advantage. Jets were attached to the hydrants, and a splendid supply of water was obtained. The connecting up of the water mains, additional hose boxes and hydrants, are a great improvement. The new iron cases for cleaning materials reduce the risk. The sprinkler installation (at the Guncotton Factory) is a great safeguard."

The following alterations, new services, &c., some of them made in accordance with Mr. Tozer's suggestions, have been carried out during the year:—

An extra fire squad has been constituted for the Edmondsey Nitroglycerine Factory, by which a full squad of nine men is always available.

An extra hose cart for the Guncotton Factory has been provided.

Three extra hydrant hose houses on Cob Mead and one on Cob Field, have been built and equipped.

Extra stop valves have been inserted on the East London Water Mains, as follows:—(a) To enable each row of hydrants on Cob Mead to be independently shut in, in case of a break; (b) To allow of the Cob Field and Cob Mead main to be shut in without interfering with the supply to Quinton Hill; (c) To render the hydrants on either side of the Guncotton Factory independent of a burst main on the opposite side; (d) To enable the Upper Works Cordite Factory hydrants to be fed either from the Main Gate or Great Hoppit mains, or from both.

The hydrants have been classified into three groups, viz.:—Upper Works, Quinton Hill, and Cob Mead and Cob Field. They have been re-numbered, and their positions, and those of all East London water-stop valves, plainly indicated by lettered posts.

The cotton-waste stores, and the teasing and drying rooms at the Guncotton Factory have been fitted throughout with the Grinnell sprinkler and fire-alarm system. No occasion has arisen of testing its efficacy as a fire extinguisher, but the alarm bell is not quite satisfactory, as it rings for a moment on any sudden fluctuation of pressure of water.

Drenching gear has been fitted to all cordite press houses, with a separate attachment to each press which can be actuated from inside by the man working the press, or from outside the house.

An improved system has been introduced of issuing authority for, and ensuring proper supervision in the lighting and extinguishing of, fires required for repairs, &c., in any part of the Factory.

All unnecessary gas fittings have been removed, and all movable gas brackets fixed.

built for other purposes. The 'Lower Store, too, was inaccessible to vans bringing deliveries from Contractors, so that much time and money was spent in handling goods. Now that the Stores are centralized, much time formerly lost in transport is saved, and Storemen have so much less distance to traverse in the execution of their duty that they are enabled the better to concentrate their attention upon their immediate work. The plan on which the new Stores have been arranged has been found, in working, to be so well adapted to requirements as to conduce greatly to good order in the work of the Section. There is no doubt that the better conditions now prevailing have inspired the Storemen with more pride in their work. The War Office Stock-taker remarked that his work here had been facilitated by the disposal of the Stores in the new Store Buildings.

The heavy reduction in the orders for manufacture led to a review of the work of the Stores Section, which includes the crews of the R.G.P.F. barges. It was in these crews that it was found necessary to make a reduction proportionate to the diminution in the number of voyages required to be made. The older bargemen were discharged, and some of the younger ones who were willing to remain in the Factory were dealt with in conjunction with other members of the Stores Section. In the result four persons were discharged, three were transferred to fill vacancies as they occurred in the Factory, and six were reduced in class or rating. The saving thus effected in wages alone for the Stores Section amounted to £612 19s. per annum.

Reduction of hands in stores section.

Now that the Coal Elevating and Conveying Plant has been in use for a complete financial year, it is interesting to note the savings that have been effected in the piece-work earnings of the Labour gang. The former piece-work rate for unloading and turning over coal for the Guncotton Boiler House was 1s. per ton. With the introduction of the mechanical elevator this rate was reduced first to 6d., and then gradually, as the men became more accustomed to the work, and as Cobbin's Brook was widened and deepened, so as to admit barges to come into the Brook unlightened, to 4d. The total payment at the reduced rates to 31.3.1906 has been £295 0s. 10d. for 14,124 tons. As the payment for this quantity at the old rate would have been £706 4s., there has been a saving to date, on unloading alone done by the Elevator, of £411 3s. 2d.

Unloading coal by elevator.

The necessary minor repairs and painting to barges, "General Askwith," "Lady of the Lea," "Earl de Grey and Ripon," "Izaak Walton," and "Charles," have been carried out in the Factory.

Repairs to barges.

The barge "Sir William Congreve" was placed on the gridiron at Woolwich for examination, and the minor repairs found necessary below the water-line were carried out by the A.D.O.S.'s shipwrights. The repairs and painting above the water-line of this barge were carried out in the Factory.

The barge "Lady of Lorne," built in 1871, which, since 1898, when it ceased to carry explosives, had been used as a Store barge, and for carrying acids in the Factory, became quite unserviceable, and was disposed of by local sale.

OUTPUT. BALANCE SHEET PRICES.

Table G gives the outputs of Gunpowder, Cordite, Guncotton for both Cordite and Service, and of Nitro-glycerine for the last nine years. It also gives the average prices for the years 1897-98 to 1904-05 inclusive.

Output tables.

The outputs for the last two years of Gunpowder, Picric Powder, Cordite, Smokeless Blank, Guncotton for Cordite and for Service, and of Nitro-glycerine, exclusive of semi-manufacture, are as follows:—

STORES SECTION AND STORE ACCOUNTS.

Purchase,
&c., of
stores.

A very close scrutiny still continues to be made of all demands for new stores of a general character, in order to prevent the purchase of articles in any way likely to be surplus to probable requirements in the near future owing to change of pattern, &c. Articles which are thrown out of use in the Factory owing to alterations, &c., are, if serviceable, either returned to store at a valuation, or are used up for some other job instead of new articles; if un-serviceable they are put on one side in appointed places for disposal periodically by tenders issued locally, or through the contract branch of the M.G.O.'s Department.

Audit of
store
accounts.

The store account for 1905-06 has been subjected to a complete audit by the finance branch (Woolwich Section) of the M.G.O.'s Department, and to a test audit by members of the Exchequer and Audit Department. No queries affecting the accuracy of the account in any particular have reached me. I have received, however, a few queries of a minor sort, principally enquiring for reasons as to the need for the existing stock of sundry kinds of stores, which, in the main, are desirable reserves.

Check
weighing of
nitrate of
soda.

In connection with the stocktaking referred to at page 44 of my Report for 1905-06, a question was raised by the War Office as to the possibility of any loss accruing to the public in regard to nitrate of soda, which by the terms of the contract for its supply, has to be accepted at dock weights. It was suggested that possible leakage might occur in the transit of the bags by barge from the docks to the Factory. The acceptance of dock weights was agreed to by the War Office in 7180/4194 of 1897. The nitrate of soda is imported in bags sewn up, and is weighed bag by bag at the docks as it is delivered from the ship to the contractor's lighters, in which it is conveyed from the docks to the Factory, the freights being protected by tarpaulins. I knew of no reason to justify the supposition that the Factory stock might differ from the balance shown on the ledger. But to reassure the War Office authorities, I have during the last year imposed a test on each consignment of nitrate of soda by weighing 50 bags identified by their numbers, and am pleased to note that the result is satisfactory, the balance being distinctly in favour of the public.

Unloading
coal at
elevator.

At page 13 of my Report for 1905-06, I called attention to a saving of 411*l.* 3*s.* 2*d.* which had been effected to 31st March, 1906, on unloading alone through the use of the coal elevator and the widening of Cobbin's Brook. During the year 1906-07, 12,387 tons of coal have been unloaded at the elevator at the piecework rate of 4*d.* per ton instead of the old rate of 1*s.* per ton for unloading and turning over. This amounts to a saving of 412*l.* 18*s.* in the year 1906-07, or a total saving of 824*l.* 1*s.* 2*d.* in the 2 years referred to.

Unloading
nitrate of
soda and
loading
nitre cake.

The widening of Cobbin's Brook, carried out during 1905-06, has done away with the turning over, formerly necessary, when unloading nitrate of soda and loading nitre cake, and has resulted in a saving of about 45*l.* in direct wages during the year.

Repairs to
barges.

The barges "Izaak Walton," "Earl de Grey and Ripon," "Charles," and "General Askwith" were placed on the gridiron at Woolwich for examination, and the repairs found necessary below the water line were carried out by the A.D.O.S.'s Department. The necessary repairs and painting above the water line were carried out in the Factory. Minor repairs to the barges "Lady of the Lea" and "Sir William Congreve" were also carried out in the Factory.

OUTPUT.

Output
tables.

Table G gives the outputs of gunpowder, picric powder, cordite, guncotton for both cordite and service, and of nitro-glycerine for the last 10 years. It also gives the average prices for the years 1897-98 to 1905-06 inclusive. The diagram in Table H shows the outputs of the different explosives from the year 1897-98 to the year 1906-07 inclusive. Last year's output is given in