

WASC 2202

FOLDERS ON SHELF

VARIOUS RGPE
ANNUAL REPORTS

1932-1933 Annual Report

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Picrite for RDN 15

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2147c 21412

R. G. P. G.
Annual Report
1932-33

Supply

5

(F.P. W 324/11)

W.O. Etc. NUMBERS

Slips will be inserted by the Registry as a guide in

Use only Departmental Minute Sheets (Form 98) for internal correspondence.

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W.324/12

D.O.F.,

Herewith Annual Report on the Royal Gunpowder
Factory for the year 1932-33.

(Sgd.) P. H. Evans

Superintendent,
R.G.I.F.

8th June, 1933.

W324/12

R.G.P.F. ANNUAL REPORT

for the

YEAR 1932/33.

- ✓ Directing Staff. No change has occurred during the year.
- ✓ Technical Staff. Mr A.S. Kentish, formerly a Technical Assistant has been established as a Chemist Class II during the year.
- Industrial Staff. The number of employees on 31/3/33 was 288 as compared with 274 on 31/3/32. Tables A₁, A₂ and A₃ shew these classified according to ages and categories.
- ✓ Maintenance. Maintenance of idle buildings & plant has received adequate attention during the year. The position with regard to steam and power plant in the Lower Works is however not satisfactory from an emergency point of view, and a scheme has been submitted with the assistance of C.S.C.F. to place this on a more satisfactory footing by taking power from the grid and disposing of obsolete plant.

✓ PRODUCTION.

ROSCOTTON SECTION.

Acids.

I. Plant.

Only normal repair work has been effected this year; a lead nitric acid collector and a cooler have been replaced and the lead lining of two steel eggs has been renewed. As an experiment, aluminium lids have been fitted to the coolers. This metal is at least as resistant as lead to the conditions encountered and it is proposed to construct a complete cooler of aluminium. One retort has been dismantled and rebuilt.

The original E.B. tower continues to function satisfactorily, the only breakdown being due to the partial collapse of a Nori-ware barrier in the saturex. This has been repaired as well as possible and the output is not yet seriously affected.

The pipe line carrying strong sulphuric acid from the

storage tanks to the mixed acid tanks is generally thin and as lengths are renewed, flanged joints are replacing sockets. It will thus be readily possible to remove worn out sections without damaging adjacent lengths of pipe.

Guncotton.

The cotton waste buildings, the pulping and moulding room, and all clean barrier boards have been limewashed or painted. On the wall behind the beaters a small amount of pulp had splashed and accumulated generally over the surface. Splashes from the potchers have been dealt with by a lead covering on the floor immediately surrounding them. Unprotected wooden platforms are not a desirable feature in this building; the water rots the wood and wherever it is necessary to repair boards, the joints are found to be packed with guncotton.

The principal work of the year has been the replacement of steel pipe by aluminium between the potchers and stuff chest and thence to the centrifugals. The stuff chest itself has been given a fall towards the outlet and fitted with an extended stirrer which reaches to the bottom; thus manual stirring is no longer necessary.

The quantity of guncotton left on the blankets has been materially reduced by placing the lead straps parallel to the flow of pulp. No increase has been recorded in the percentage of mineral water in the product and the amount of saveall guncotton per batch has been lowered from 60 lbs to 40 lbs.

The work in the drilling house mentioned in last year's report has been concluded by an extension to the 1-lb slab machine terminating in a filter box.

A wooden vat has been renewed.

When pressing 1-lb. slabs the columns of No 6 press were fractured. No ignition occurred and no other part was damaged.

Some difficulty was experienced in pulping guncotton made from cotton waste received from R.N.C.F. Pulping is a

process over which it is difficult to exercise any scientific control, and during the investigation the only guide, viz. the settling test, appeared to be of doubtful significance when applied to guncotton made from cotton wastes of different origin. An endeavour to regulate beating by means of power consumption did not succeed. The power taken by the roll rises gradually as the cotton is cut and reaches a maximum when pulping has proceeded to the extreme limit of subdivision. More power is therefore used to circulate the contents of the beater than to cut the fibre and no "end point" can be determined. As a result of this work the specification limit of fineness was modified to permit the use of apparently coarser material for service work.

Fuze Powder R.D. 202.

The plant has been used to recondition Admiralty stocks, partly by remilling and partly by reblending. The new runner suspension installed last year is satisfactory.

11. MANUFACTURE.

Nitric Acid.

The retort has been in use the whole year, the charges of Soda Nitrate being:-

33 @ 2 Tons.

38 @ $1\frac{1}{2}$ Tons.

14 @ 1 Ton.

Total nitrate of soda charged = 153.4 S/Tons crude.

= 152.32 " pure.

Equivalent HNO_3

= 112.60 " .

Nitric Acid produced

= 122.80 S/Tons @ 89.5%

= 109.95 S/Tons HNO_3 .

Loss

= 2.65 S/Tons.

Efficiency.

= 97.65%

Strong sulphuric acid used

= 152.4 S/Tons @ 95.2%

= 145.0 S/Tons H_2SO_4 .

Two stills have been used for the redistillation of weak

waste acid:-

No 8 - 36 Redistillations

No 5 - 53 "

The charge in each run was 16,500 lbs.

Acid charged = 734.25 S/Tons containing 444.81 S/Tons H_2SO_4
 130.90 " HNO_3
 158.54 " H_2O

Strong Nitric acid recovered = 143.40 S/Tons @ 88.7%
 = 127.14 S/Tons HNO_3 .

Loss = 3.76 S/Tons.

Efficiency = 97.15%

Weak sulphuric acid recovered = 562.73 S/Tons @ 77.1%
 = 434.04 " H_2SO_4 .

Loss 10.77 S/Tons.

Efficiency = 97.60%

Concentration of weak sulphuric acid.

Acid charged to concentrator = 554.18 S/Tons @ 77.0%
 = 426.77 S/Tons H_2SO_4 .

Strong sulphuric acid produced = 441.60 S/Tons @ 94.5%
 = 417.40 S/Tons H_2SO_4 .

Loss = 9.37 S/Tons.

Efficiency. = 97.80%

NITRATION.

No of sets of Guncotton = 1404

" " " Nitrocotton = 39

" " " Strip paper = 2

Mixed acid used = 2546.83 S/Tons.

Cotton waste used = 93.206 S/Tons.

= 83.272 S/Tons nett (See raw mtl's)

Guncotton produced = 139.98 S/Tons (including N/C& NSP)

Scaveall = 2.63 S/Tons.

Yield = 168.0% Available for Cordite 164.9%

Ratio Mixed Acid / Cotton Waste = 30.58/1
 Mixed Acid / Guncotton = 18.19/1

Service G/C. Particulars of Primers & Slabs.

8000 1 lb. G/C Slabs, wet. Service of C.O.O. Bramley.
 400 1 lb. G/C. Slabs, wet. Service of C.O.O. Bramley.
 2 lbs Special Pellets & Primers. Fuze Branch, R.F.F./Section E4A.
 600 1oz. Primers, dry. Service of C.O.O. Bramley.
 12000 1oz. Primers dry. Service of C.O.O. Bramley.
 1200 1lb. Slabs, wet. Service of C.O.O. Bramley.
 250 1lb. Slabs, wet. Service of C.O.O. Bramley.

Fuze Powder - R.D. 202.

Ammonium perchlorate Refined Crude 448 lbs.
 Pure 365 lbs.
 Admiralty stock repaired 580 lbs.

III. RA. MATERIALS.

	T.	C.	lbs.	
Oleum drawn from Store	143	19	64	= 161.25 S/Tons.
add difference in stocks				
Oleum consumed.				<u>39.00</u> <u>200.25</u>
				= 1.43 per lb G/C

	T.	C.	lbs.	
Nitrate of soda drawn from store	137	0	0	= 153.44 S/Tons.
minus diff. in stocks				
Nitrate of Soda Consumed				<u>2.50</u> <u>150.94</u>
				= 1.078 per lb. of G/C

	T.	C.	lbs.	
Cotton waste drawn from store	33	4	44	= 93.206 S/Tons.
Deduct oil and moisture	6.60			S/T
Pickings and Fly	3.31			S/T
	<u>9.91</u>			
Nett Cotton waste used for nitration				= 83.296 S/Tons.

Summary of Consumption and Losses. S/Tons.

	H ₂ SO ₄		HNO ₃	
	Actual.	Per Ton G/C.	Actual.	Per Ton G/C.
Manufacture of Nitric Acid.	145.04	1.016	2.65	.0189
Redistillation.	10.77	.0769	3.755	.0268
Concentration.	9.37	.0669	-	-
Nitration.	35.345	.2525	102.05	.7290
Washing out plant.	9.64	.0688	2.35	.0168
	210.165	1.5011	110.805	.7915

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Foreign matter removed in picking:- lbs.

Wood, string and metal 148 .0884

Grit. 112 .0672

FLY. 6484 3.890

Cotton used per lb. of Guncotton = 0.6662 Gross.

= 0.5948 Net.

NITROGLYCERINE SECTION.

In the early part of the year, the section lost Assistant Foreman Bird through retirement after 43 years continuous service in the Factory. His long experience, intimate knowledge of the plant and work, calm temperament and absolute trustworthiness made Mr Bird an ideal Assistant Foreman. He also filled very adequately the post of Nitroglycerine Foreman during the trying war period. He is succeeded by Assistant Foreman Beans, similarly a man of long service and experience. In the second half of the year, the manufacture of Nitroglycerine was carried on under difficulties, on account of the work going on in the vicinity, in connection with the reinforcement and modernising of the mounds of most of the Nitroglycerine Houses.

In the case of the Nitrating House all the service pipes had to be taken up and relaid. This gave an opportunity of renewing most of the pipes and reassembling them in more accessible positions. From the working point of view, the only disadvantages arising from these necessary improvements are that the emergency exit from the top platform of the Nitrating House has been made more difficult, and the transit from the Egg House to the Charge House more laborious. In the Acid Factory, manufacture has proceeded quite normally, with the exception that the accommodation for the storage of mixed acid has again been restricted through one of the tanks being under repair for seven months.

With the exception of a little purification, chiefly for the Air Force, no work has been carried on in the Tetryl Factory. There is now no earthenware or enamelled plant used in the purification. In the Picrite Factory manufacture has been proceeding slowly during most of the year. The work carried out in this plant has been the subject of a separate report. A record of the year's work in the various processes is appended.

A. Manufacture of Nitric Acid.

Retorts used were No 10, 29 runs (25 at 30 cwt, 4 at 25 cwt)

No 11, 17 " (23 " " " 4 " " " ↓

Average time of distillation was 11½ hrs. at 30 cwt charge

" " " " " 10½ " " 25 " "

Materials & results.

Nitrate of Soda used 91.84 Sh. tons at 98.63% NaNO_3

S.O.V. used 83.57 " " " 92.21% H_2SO_4

Oleum used 8.25 " " " 20% SO_3

Coke " 15.96 " "

Strong Nitric Acid made 64.39" " " 91.33% HNO_3

Weak " " " 8.72" " " 58.75% "

Nitre Cake produced 110 " " " 31.5% H_2SO_4

Efficiency strong acid 88.33%

Total & overall efficiency 96.01%

Plant.

No 9 retort was removed and replaced

Cooler " " " "

Egg for strong Acid was repaired.

B. Denitration of Waste Acid.

37 charges were denitrated in No I Tower, which was

run for 444 hours at an average temperature of 158°C

Output.

Waste acid denitrated 112.85 Sh. Tons.

Denitrated Sulphuric Acid made 115.90 Sh. tons at 70.47% H_2SO_4

Nitric Acid recovered 18.01 " " " 58.32% HNO_3

Efficiencies.

Sulphuric Acid, Process 100%, overall 97.86%

Nitric Acid, " 86.04% " 86.04%

Repairs.

All pipe runs were renewed.

C. Concentration of Weak Sulphuric Acid.

All the concentration was carried out in No 3 Concentrator (Evans-Bowden Tower) which was run for 1017 hours at an average dome temperature of 112°C.

Output.

Weak acid concentrated	203.85 Sh. tons @ 65.0% H_2SO_4
Strong acid made	123.89 " " " 92.60 "
Weak " "	33.88 " " " 43.84% "
Coke used	30.57 " "

Efficiency.

Strong Acid	86.08%
Total ; Process	97.01% ; Overall 95.30%

Plant.

No 2 Concentrator demolished in readiness for rebuilding.
Flue of No 3 Producer repaired.

D. Redistillation of Weak Nitric Acid.

13 Distillations were carried out in No 3 Still, average time of distillation being 16½ hours.

Output.

Weak nitric acid redistilled	29.32 Sh. tons at 57.61% HNO_3 .
Strong Sulphuric Acid used	45.0 Sh. tons @ 93.03% H_2SO_4 .
" Nitric Acid made	15.52 Sh. tons @ 89.54% HNO_3 .
Weak " " "	4.03 " " " 57.15% "
" Sulphuric Acid recovered	59.57 Sh. tons @ 69.93% H_2SO_4 .
Coke used	5.65 Sh. tons.

Efficiencies.

Nitric Acid strong.	82.3%
" " Total, Process & Overall	96.01%
Sulphuric Acid Process.	99.5%
Overall	98.72%

Repairs etc.

No 3 Still, lid & cover renewed.
Brickwork repaired
Strong Acid cooler repaired.

Main Flue & manholes overhauled & repaired.

E Acid Mixing.

No 1 Mixer was used for 237 hours, No 2 for 147 hours.

Output.

Nitric Acid, new, mixed	64.39 sh. tons @ 91.35% HNO_3 .
" " redistilled, mixed	14.52 " " 89.58% "
Oleum 20% mixed	33.75 " " 20% H_2SO_4 .
" 65% "	41.95 " " 65% "
Total	154.61 "

Repairs.

No 1 Store Tank repair finished

No 2 " " " in progress.

F. Manufacture of N/G.

37 charges of 1470 lbs of Glycerine each were nitrated, all in No 2 Nitrator, average time of Nitration was 67 minutes and of Separation 204 minutes, average temperature of Brine was -10°C . All charges were nitrated at 10°C and washed in No 1 Washing House.

Materials & Output.

Glycerine used	27.195 S/Tons.
Mixed Acid "	152.625 "
Waste " made	112.85 "
Soda Ash used	2.07 "
N/G made	63.440 "
Yield	233.28%

Summary of Tests.

	<u>Max^m</u>	<u>Min^m</u>	<u>Avge.</u>
Moisture	0.37%	0.17%	0.25%
Heat Test	12	10	11 minutes
Alkalinity	All under .0005%		

Nitroglycerine was used as follows:-

Fi	M.D.	57.96 S/Tons.
"	Lk.I	1.03 "

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For R.D.H.A.	4.58 S/Tons.
Dynamite	0.72 "
Various	0.30 "

BUILDINGS & PLANT

Apart from the small repairs resulting from the weekly and other periodical inspections, the only alterations inside the N/G Houses were the replacement of the old steam radiators in No 1 Washing House and the Wash Water Settling House by bigger and new pattern radiators.

The following are the chief items which were done in connection with the reinforcement of the Mounds of the Nitrating House & Nos 1 & 2 Washing Houses.

Brine Store Tank was moved from East side to the North side of Nitrating House, and all pipes to and from it were replaced conveniently. The galvanised iron vent pipe on the brine exits from the nitrators was replaced by an aluminium one.

All acid pipes to and from the Charge House, Nitrating House, and Egg House were taken up, renewed, & replaced in the most convenient positions.

All water, soda and glycerine pipes to and from the Charge House were renewed.

All steam and air pipes to the Nitrating, Charge, Egg, Nos 1 & 2 Washing Houses were renewed & replaced.

Fume Absorption Tower for the Nitrating House & all pipe runs in connection with it were renewed.

Summary of Consumption and Losses of Acids.

	H_2SO_4		HNO_3	
	Actual	S/Tons	Actual	Per Ton
				N/G
Manuf ^{re} of Nitric Acid	84.490	1.340		
Denitration	1,731	0.027	1.706	0.026
Redistillation	0.559	0.008	0.674	0.010
Concentration	6.404	0.101		
Acid Mixing	2,926	0.046	6.296	0.999
Nitration	1.622	0.025	54.663	0.862
Total.	98.182	1.547	63.349	0.997

Raw Materials used.

Nitrate of Soda.	1.433	per ton N/G
Oleum 20%	0.705	" " "
" 65%	0.705	" " "
Glycerine	0.4288	" " "
Soda Ash	0.0327	" " "

G. Drying and Weighing Guncotton & Nitrocotton

Stoves Nos 7,8,9,10, & 11 were used

49 Stovings of Guncotton and 2 stovings of Nitrocellulose were dried.

Average time of drying was 66 hours.

Moistures at the end of drying were Max^m .84% Min^m .24%
Average .45%

Total amount dried was:-

Guncotton 118.25 S/Tons

Nitrocotton 3.35 "

Guncotton was used for M. 0.121 250 S/Tons

Mk 1 0.646 "

Experimental 0.166 "
Total 122.062

Nitrocotton was used

For R.D.N.A.	3.612 S/Tons.
Experimental.	0.283
Issued.	<u>0.152</u>
Total	<u>4.067</u>

Repairs.

Nitrocotton racks were all repaired

Woodwork of No 8 stove was repaired.

Valve boxes of all stoves in use were repaired.

Additional Guards were placed in the Fan Houses.

M. Mixing Paste.

During the year No 5 Mixing House had to be put in order and taken into use in place of No 3 which was put out of commission by the work on the mounds. No 2 Mixing House mound was also reinforced, but was used all the year for pouring Nitroglycerine & mixing M.D. paste.

The wet mixing plant was used only for washing paste bags.

Paste Mixed.

M.D.	179.22 S/Tons.
Mk I	1.67 "
R.D.N./A.	20.05 "
Dynamite.	1.10 "
Experimental	1.66 "

Repairs

No 5 Mixing House - zinc lining repaired & cover of radiator renewed. Lead covering of floor in lorch and part of the house renewed. Two old type mixing tables were replaced by 2 of the new type. New steam supply erected from Wash Water Settling House. No 3 Mixing House - lead covering of pouring on pit M.D. & Mk I Burettes renewed.

I Tetryl.

During the year two lots of Gd IA, one corned for the Air Ministry, and one crystal were repurified into Grade I.

Output.

Gd IA dissolved	3403 lbs
Gd I made	3124 "
Primary acetone used	6720 "

Replacements.

In Purification House, earthenware filters by lead ones. Earthenware precipitation vessel by Aluminium one.

J Picrite Manufacture.

Apart from one short interval, manufacture has proceeded throughout the year, and the product has been giving complete satisfaction.

Developements have taken place, two of which are of major importance, viz (a) the introduction of the vortex spray crystalliser in place of the cumbersome revolving brass drum one, which was continually giving trouble, and (b) the replacement of the pressure vessel extractor by a non-pressure, non-jacketted, bottom emptying vessel. This also is working quite satisfactorily, and trials are still being carried ^{on} ~~out~~ to find the conditions for maximum yield.

Following is a brief summary of the work.

Extractions (all water)	357
Autoclave runs	133
Nitrations	75
Purifications	823

Raw Materials used

Calcium Cyanamide	39,633 S/Tons.
Ammonium Nitrate	12.060 "
Sulphuric Acid 98%	28.125 "
Nitric Acid 100%	.468 "

Product completed 13.025 S/Tons

Recovered Sulphuric Acid issued 10.08 S/Tons

Raw Materials per ton Picrite.

Calcium Cyanamide	3.50 S/Tons.
Ammonium Nitrate	1.09 "
Sulphuric Acid	2.54 "
Nitric Acid	0.03 "

Picrite was used as follows:-

For R.D.M./A.	11.853 S/Tons.
" R.D.M. (new)	0.228 "
" HP	0.487 "
Issued to C.S.R.D.	0.455 "
Samples to R.D.Chemist.	0.016 "

CORDITE SECTION.

The output of cordite from the presses ~~is~~ during the year has been approximately 203 tons.

As 80% of this has been on the Small Screw Presses there has been a slight increase in the number of men required. The number has varied between 53 & 57, and has averaged about 56 men.

Except during the Influenza epidemic which was particularly severe ^{this year} on this section, sickness has been very low and has been less than 2%.

The following remarks in connection with the plant and buildings may be of interest.

Paste Stores.

Nos 3, 4, & 5 Paste Stores have been regularly in use the first for R.D.M./A. and the others for M.D. & Mk I.

There is nothing outstanding to report in connection with these stores.

Incorporating House.

No accident either during the incorporation or in connection with the plant has occurred during the year.

In order to comply with the request by R.D, for increased speed of incorporation for R.D.N./A., one of the large machines has been speeded up by 50%.

Press Houses.

No accident to any of the presses, either screw or hydraulic, and no ignition during pressing has occurred.

Considerable repairs have been necessary to the Screw presses. As was reported last year, all the Thrust Bushes showed signs of considerable wear, and it was anticipated that replacement of these would be necessary. In all 5 thrust bushes have been renewed. Apart from the above the condition on No 10 Press House is very good. Four bays are in good order and the other bay would not require very much repair work in order to put it in a similar condition.

Stoves.

Only 1/3rd of No 1 Reel Stove has been regularly in use for Rifle cordite, and 1/3rd (the tray portion) has been used intermittently for drying small sizes of cut material.

Four tray stoves (Nos 9 - 12) have been used during part of the year for drying cannon cordite, and these are in good order.

Blending Houses and Reeling House.

2 Blending Houses (Nos 2 & 7) have been in use at the Lower Works and the Reeling House at the Upper Works and all three buildings are in good condition.

Boats.

No 13 Boat has been condemned and will be broken up.

Manufacture.

The difficulty mentioned in the last two reports of

reducing the V/M of M.D.T. 5-2 has been overcome. All M.D. cordite that has to be drummed is now dried in two stages one before reeling and one after. The advantage of this is that the density of loading of a stove after reeling is about $7\frac{1}{2}$ times the density before reeling, and therefore there is no difficulty in continuing the time of stoving now if necessary.

Owing to the irregular expansion of the cords during pressing it was found necessary to drum some of the lots of M.D.T.5-2 with 43 strands, instead of 44 in order that the bundle of cords might pass through a .33 gauge. All these lots have passed proof.

The amount of dry waste from M.D.T.5-2 has again been very low amounting to only .65% on the cordite reeled.

R.D.N./A.

The manufacture of R.D.N./A. so far as production is concerned continues to be quite satisfactory. Occasionally difficulty is experienced due to high pressure required for extrusion resulting from the strainer becoming choked with aggregates of picrite crystals.

The appearance of the cord however is not satisfactory. The cord has usually a rough surface probably due to an irregular flow in the die which may be the result of variation in the solvent content of the dough.

This difficulty is in course of investigation in conjunction with C.S.R.D.

There has been no difficulty due to sticking of the cords together on drying. This is no doubt due to the fact that the γ N₂ in the N/C of all batches used this year has been 12.3 or over.

A machine has been installed for sieving the carbanite. It was found that the sieving of large quantities of carbanite by hand through an open sieve was objectionable both on account of the irritation caused by carbanite dust to the

nose and throat and also to the excessive labour required. A further advantage resulting is, that a 60 mesh sieve is now used whereas only a 20 mesh sieve could be used when sieving by hand.

Experiments.

14 Experimental batches have been made this year . A complete investigation into the possibility of substituting carbamite for mineral jelly in M.D. cordite was carried out with entirely satisfactory results. This has been the subject of a separate report.

Ballistics.

One lot of M.D.4, made in the previous year was rejected for high ballistics. This lot was made from guncotton nitrated from 50/50 cotton waste - linters. The cordite was reworked and has since been accepted.

Difficulty has been experienced with cannon cordite during the latter part of the year due to high velocities and pressures and in one case also to high M.D. It is difficult to find a reason for this trouble as the weight per 100" of these lots with high ballistics was identical with previous lots giving satisfactory proof results.

No lot made during the present year has been rejected.

The following tables give a summary of the various raw materials used and the different quantities of sizes manufactured and issued.

I Raw Materials & Paste.

	M.B.	MkI.	RDN.	Expt ¹	Total
Acetone (Cons 2416-2420)	134352	750	7840	213	143155
Mineral Jelly (Cons 185-187)	18230	177			18407
Carbamite (Cons 4-5)			3348	65	3413
Paste:- N/G Ch No 593-629 G/C Batches 1200-1301 N/C Batches 21-24.	344337	3348 $\frac{1}{2}$	40653 $\frac{1}{2}$	1210	389549 $\frac{1}{2}$
	496919	4275 $\frac{1}{2}$	51841 $\frac{1}{2}$	1488	554524 $\frac{1}{2}$

II Material Incorporated.

M.D. Dough.	362460	
" Rework.	<u>870</u>	363330
Mk I Dough.	3525	3695
" Rework.	<u>170</u>	
R.D.N./A.	43950	43950
PS25/2 Expt ²	1140	1140
Various "	163	<u>163</u>
		<u>412278</u>

Cordite Pressed.

III. Small Screw Presses.

M.D.T.5-2.	253460	
M.D.24	21620	
4, out	2860	
4, reeled	6182	
Experiments	<u>32</u>	284154
MkI 1/.05	2723	
3	224	
20S/C	427	
Experiments	<u>2</u>	3376
M.D.N./A..042	43370	
F 535/2	1025	
Various expmt ^s	<u>123</u>	44518

Hydraulic Press.

M.D.8	42255	
M.D.11	31410	
M.D.T. 18-10	<u>40</u>	<u>73605</u>
		<u>405653</u>

Chs.

IV. Cordite Issued.

M.D.T.5-2.	248060	
M.D.24	21620	
4, cut	2860	
4, reeled	6182	
8	76980	
11	31410	
M.D.T. 18-10	40	
Experiments	32	
M.D.	<u> </u>	387184
MkI 1/.05	2930	
3	224	
20S/C	427	
Experiments	<u>2</u>	3583
M.D.N./A.042	51990	51990
F 535/2	1025	1025
Various expmt ^s	123	<u>123</u>
		443905

The following table show loss of cordite due to burnings etc and also the percentage of acetone and mineral jelly used.

	M.D.		Mk.I.	
Paste used	344337		33484	
M/J used	18230		177	
Stock of rework 31.3.32	1875	364442	13	35384
Cordite produced	357759		<u>3376</u>	
Stock of w ork 31.3.33	<u>3310</u>	<u>361069</u>	<u>42</u>	3418
Loss		3373		1204
Loss		.91		3.6
Acetone used.		37.5		
M/J used.		5.09		

MAIN LABORATORY.

Inspection of raw materials, intermediate & finished products etc

The following raw materials supplied by outside contractors have been inspected:-

Cotton Waste	82 Tons
Glycerine	45 "
Acetone	103 "
Mineral Jelly	10 "
Nitrate of Soda	250 "
Soda Ash	8 "
Chemical Lead	13 "
Calcium Cyanamide	45 "
Ammonium Nitrate	21 "
Diethyldiphenylurea	1 "
C.O.V.	70 "
N.O.V.	233 "
Nitric Acid	10 "
M.N.T.	7 "
Coke	166 "
Petrol	180 Galls.

Intermediate products inspected included:-

N/G 37 nitrations = 111 washings = 63 Tons.

G/C 103 Batches

51 Stovings)	=	140 "
15 Service Batches			
3 N/C Batches)	=	3½ "
Product "C" 103 Batches)	=	11½ "

Finished products inspected included:-

400 samples) Cordite M.D. 123 Lots)
representing) " " 3 Batches) 195 Tons.
" " Mk I 23 Lots

27 samples) A.S.N./A. 6 Lots)
representing) 6 Batches) 26 Tons
Lbs

46 samples representing Puze powder (For Research Dept.) 1600
(" Filling Factory) 3000

520 Cordite batch samples.

70 Blend & stove "

150 R.D.N./A. "

Routine inspections for the purpose of process control included the following:-

U.C.V. from N/G manufacture 46 samples.

" " G/C "	96	"
Denitrated Acid for N/G "	120	"
" " " G/C "	90	"
Nitric Acid for N/G "	120	"
" " " G/C "	250	"
Mixed acid for N/G "	16	"
" " " G/C "	23	"
Waste Acid from N/G "	38	"
" " " G/C "	52	"
Condensate Acid G/C "	106	"
Nitre Cake from N/G "	12	"
" " " G/C "	24	"
Soda Nitrate for N/G "	12	"
" " " G/C "	24	"
Cotton waste	255	"
Acetone	150	"
Mineral Jelly	51	"
Glycerine	36	"
Filter-bed water	240	"
Vat-boiling water	740	"
G/C from Stores & Weighing House	100	"
Product "A"	130	"
" "B"	150	"
" "C"	106	"
" "D"	50	"
Ammonium Nitrate Liquor	134	"
Sludge	94	"
Spray Crystalliser	80	"
Milled Picrite	112	"
R.D.N./A.	400	"

Fuze Powder and Charcoal.

3000lbs of fuze powder mill cake and the necessary charcoal have been prepared for Supt. R.F.F. and 1600 lbs for C.S.R.D.

MACHINERY SECTION.

Organisation.

There have been no changes in the staff attached to the section, but Mr G.C.Allfrey was appointed Technical Assistant to the Services Section on 23/1/33 and will divide his time between the R.G.F. and R.S.A.F. He comes to the Factory with particular knowledge of both steam and electrical plant and will take charge of the Machinery section in the absence of the Shop Manager, Mr Griffiths.

Services.

The whole of the plant for the manufacture of T.N.T. has been erected and set to work during the year. Several contracts were made with specialist firms for the supply of the different classes of plant required, and on the whole the supply has been satisfactory and within the estimated cost. Steam, Air and Electricity are all required for the process and transmission lines have been erected by the section. An overhead runway for the conveyance of acid drums has been added to the original equipment and has proved of considerable value.

Alterations in plant and method have improved efficiency of working at the Picrite Factory and have, to a large extent, removed the anxiety which it was reported last year this plant was giving us, and the improvements should considerably reduce the cost of maintenance. Two of the steam engines, which hitherto have driven the plant at this factory, have been superseded by electric motors, while a third is now contemplated, and further economy both in maintenance and running costs should result.

The erection of higher mounds around the N/G buildings necessitated alterations to existing steam, air, brine and electricity services, and the opportunity has been taken to straighten out some of the lines to reduce transmission losses.

Other services carried out during the year include the installation of mechanical stirring in another of the mixed acid tanks at the G.C. Factory and renewal, to a large extent, of the acid pipe line from these tanks.

The exhaust fans for the Nitrating House at the G./C. Factory have in the past been costly to maintain. A trial has been made of a rubber covered impeller and also one of the original type of earthenware impellers, but neither proved successful, and a new fan, constructed entirely of Staybrite steel, is now contemplated.

A boat has been fitted up with tank and pump for conveying waste acid to a convenient point for pumping into a contractor's tanker.

Steam-raising Plant & Steam Mains.

Two Boiler Houses only have been in commission during the year for 12½ Periods out of the 13, steam being supplied to the whole of the Upper Works from No 5 Boiler House since April 16th. 1932.

The cost of steam for the year as compared with the two previous years is as follows:-

1930/1	74.45	million pounds	3	46.21	pence per 1000 lbs				
1931/2	83.728	"	"	39.5	"	"	"	"	"
1932/3	96.156	"	"	28.19	"	"	"	"	"

The reduction in cost follows the closing of No 3. Boiler House in the middle of Period I. and demonstrates the feasibility of the economical transmission of steam over considerable distances from a central boiler house where mechanical stokers are installed and a cheaper fuel is burned.

The reduction in total cost as compared with the previous year is chiefly in Stokers wages (£200) Fuel (£800) Maintenance of Plant & Bldgs. (£800), notwithstanding an

increase in the amount of steam supplied of 14%.

A further reduction of some £600 is brought about by an alteration in the apportionment of certain general charges vide office section report.

The efficiency of the Boilers under present conditions of working is, however, not as high as might be expected, and I propose to carry out a thorough investigation into the reason.

The policy of substituting electric motors for steam engines at the North end of the Factory will reduce the demand for steam, especially at buildings situated at considerable distances from the Boiler House, and this will have the effect of reducing the number of outlying Boiler Houses required in an emergency.

Electricity supply.

The cost of electricity per unit for the two power houses combined compared with the two previous years is as follows:-

1930/1	317,807 units @ 4.027d per unit
1931/2	317,532 " " 3.596d " "
1932/3	345,502 " " 2.88d " "

The decrease in cost follows the decrease in the cost of steam brought about by the concentration of steam production, most of the other items of expense remaining at about the same figure as for the previous year. One of the smaller generator sets has been overhauled during the year and the two sets at the Lower Works Power House are now due for overhaul.

There has been no breakdown in the supply during the year, but a cable at the G/C. Factory developed a short circuit to earth and has been cut out but not repaired in view of certain contemplated alterations to the mains at this part of the factory. The remainder of the cables show very fair insulation tests.

Some of the lighting installations, particularly in buildings where acid processes take place, show serious signs

of deterioration and a trial is being made of aluminium fittings and conduit.

Emergency requirements and spare plant.

The investigation which was made in the previous year regarding the possibility of taking current from the North Metropolitan Electric Power Supply Co. at the G/C Factory was pursued and a report has been submitted which, if adopted, will give us considerable relief in the amount of plant to be maintained in preparedness for an emergency.

BUILDING WORKS DEPARTMENT.

Property.

The gross returns from property attached to this Factory for the last five years are as follows:-

1928/9	1929/30	1930/1	1931/2	1932/3
£994	£996	£1529	£1537	£1524

The loss on total possible rental from Cottages amounted to less than £4. Detailed figures for domestic buildings for the year are as follows:-

	Assessed Value by C. of L.	Receipts.	Maintenance 1932-33.
Ordinary Rentals	£475	519	£240
1/7 Basic "	£411	292	£252
Free quarters.	£195	-	£198

This last figure includes tenancy expense which is always associated with a change of occupancy, at the same time we took the opportunity of improving the internal drainage system by the elimination of an objectionable cesspool system.

The Lee Catchment Board requested us to undertake further work to the main rivers in this Factory on repayment by them to the value of approximately £100 and themselves undertook - after discussion with the Controller of Lands - to put the small River Lea into such a state of clearance as would be acceptable to the Board for

commutation purposes. The service was carried out on repayment by us to a maximum of £250. Further discussions between the Clerk to the Board & Controller of Lands have resulted in a tentative agreement for the Factory to receive from them 50% of the cost of Water Regulation in each year together with various additional small reliefs in the matter of telephonic communication with the neighbouring weirs etc etc - and we anticipate a reduction of overhead expense of over £200 p.a. in this direction alone as from April 1st 1933.

We have again escaped any flooding but the condition of the main rivers is causing considerable anxiety to the Catchment Board who are being very severely limited to expenditure on a farthing rate by the Ministry of Agriculture. Various schemes have been put forward by the Board to improve matters adjacent to this Factory and with the additional object of employing local labour but these have met with no encouragement either as rate paid schemes or on any basis of loans for capital services.

The flow of water in the valley has fluctuated from a maximum of 16557 cubic feet per min. in May to a minimum of 3939 cubic feet per min., in August throughout the year and the daily averages for the last 5 years at Fieldes Weir Gauge have been:-

1928/9	1929/30	1930/31	1931/32	1932/33
8.293	9.974	9.987	9.973	8.675

Departmental Work.

The following capital work has been carried out:-

The third section of the 4" Ring Fire Main in C.I. piping.

Further foundation work for Motors and Plant in the T,N,T, buildings, also provision of platforms and lean-to accommodation and a runway over the Mill Head stream for cables,

water main and acid runs were provided. A ferry boat is also installed in connection with the Runway.

The whole of the N/G Mounds scheme has been carried out between July and the end of the financial year entailing the transport of nearly 5000 tons of soil from the Navigation at Cheshunt and depositing over 5 hills internally. Not the least satisfactory part of the scheme was the fact that we were able to employ 10 additional men from the neighbourhood throughout the winter months.

As regards maintenance work there is not a great deal to report in view of the above services but we carried out a considerable area of dredging from the Black Ditch to the out loading south to provide access to Stoves, two Reel Stoves were re-roofed with asbestos slates, further sections of the Guncotton Acid Platforms were renewed and a retort in the N/G Factory was taken down and rebuilt.

Two temporary crosses were erected N & S of the Factory to dimensions supplied for inspection from above by the Royal Air Force. These were subsequently removed and final instructions for permanent structures were received at the end of the year.

Officials from Princes Risborough (Forest Products Research Laboratory) have visited us throughout the year and 6 selected bat willow trees were felled and clefted for the purpose of a special investigation into the conditions governing the planting and care of willows specially selected for the manufacture of cricket bats.

We have taken toppings from the trees and planted them out, knowing that if satisfactory results are obtained from these 6 trees we shall have valuable setts for planting out in future years.

The gas supply to the Factory is now arranged under a new agreement with the Local Supply Co whereby owing to the cessation of manufacture in the Gas Factory at the Royal S.A. Factory the consumption of the two Factories is

taken for payment purposes with the result that the discount allowable on Waltham's consumption has been increased from 15% to 25% representing a saving of some £250 per annum on a normal consumption.

Fire Brigade.

An inspection was made by the London County Council Fire Brigade Officers in July.

In addition to the Ring Main already referred to appliances have been increased this year by another small portable Pumping Engine which has enabled us to instal one more on a fire Float in the Lower Works and 5 single hydrants & 22 lengths of 50'0" hose together with necessary fittings.

A small manual fire pump has been disposed of. All the appliances have been periodically tested, cleaned, etc, fire squads have carried out monthly drills satisfactorily and no fires have occurred.

OFFICE & STORES.

A renumbering of the Factory has been carried out with a resultant improvement of the conditions at the pay tables.

Due mainly to the withdrawal of certain sickness privileges of members of the staff, the agreement with the N.C., was cancelled and a new one signed jointly with the R.S.F. came into effect on 1/1/33. A reduction of some 3/- per employee in the cost of medical services has thereby accrued.

The build up of F.E. rates of the Service sections has been specially considered. It was decided that overhead expenses which were peculiar to R.G.F.F. on account of the fact that it was an Explosive Factory should not be spread over the service sections. The result aimed at was to arrive at F.E. rates comparable with those of similar sections in other Ordnance Factories.

In addition a further dissection on similar

lines took place with the E.S.D. F.R. rate which enabled a rate to be charged against maintenance work done outside the Factory which was a little lower than that charged to inside work.

Good progress has been made in the clearance of surplus & obsolete stores which has enabled us to use our available storage accommodation to better advantage.

Schedules as follows are attached:-

- (1) Annual Turnover and production statistics.
- (2) F.R. comparison.
- (3) Some comparative Material statistics.

1932 - 33.

Annual Turnover.

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Royal Gunpowder Factory, Waltham Abbey.

	<u>Parliamentary</u> <u>Estimate.</u>	<u>Latest</u> <u>Forecast.</u>
	£.	£.
A. Establishments.	4,393	4,114
B. Wages.	45,763	45,848
C. Materials.	40,973	30,043
D. Machinery, Contract.	3,700	2,052
E. Works, Contract.	1,428	467
F. Miscellaneous.	6,100	5,850
G. Non-effective.	7,970	7,100
	<u>110,327</u>	<u>95,474</u>
Add - Net effect of Materials on I.D.Ds.	4,350	902
	<u>114,707</u>	<u>96,376</u>
H. Productions for Army, Navy, etc.	112,577	98,110
Misc. Receipts.	1,950	2,400
Sale of Scrap, old stores and stores issued on repayment.	930	2,786
	<u>115,457</u>	<u>103,296</u>
Deduct - Net effect of I.D.Services.	4,950	5,190
	<u>110,507</u>	<u>98,106</u>
Balance as shown below.	4,200	1,730

<u>Incomings.</u>			<u>Outgoings.</u>		
	<u>Parl'y.</u> <u>Estimate</u>	<u>Latest</u> <u>Forecast.</u>		<u>Parl'y.</u> <u>Estimate</u>	<u>Latest</u> <u>Forecast.</u>
	£	£		£	£
Estimated amounts recover- able in respect of:-			Estimated expenditure on New Capital:-		
Depreciation of Buildings and Mains.	2,565	2,566	land.	-	-
preciation of Machinery	1,456	1,530	Buildings & Mains -		
Buildings, Machinery and Mains written off.	29	1,221	(a) Contract.	1,000	417
First Equipment of shops written off :-			(b) Departmental.	6,350	6,298
Petrolite Plant.	3,000	1,237	Machinery -		
T.N.T. Pilot Plant.	3,000	2,724	(a) Contract.	550	405
			(b) Departmental	350	214
			First Equipment:-		
			Petrolite Plant.	3,000	1,237
			T.N.T. Pilot Plant.	3,000	2,724
Decrease of Stores in Stock.	-	3,747	To be transferred to Supplies Suspense A/c.	-	1,730
To be transferred from Supplies Suspense A/c.	<u>4,200</u>	<u>13,025</u>		<u>14,250</u>	<u>13,025</u>
	<u>14,250</u>	<u>13,025</u>			
Approximate Net Value of all Productions			<u>This year.</u>	<u>Last year.</u>	
			£78,000	£80,000	
M.D. Cordite Produced.	Rifle		252,000 lbs.	193,000 lbs.	
	Gun		139,000 lbs.	172,000 lbs.	
Cost per lb.	Rifle		3/3	3/5	
	Gun		2/11	3/1	

R.G.P.F. WALTHAM ABBEY.FACTORY EXPENSE.

Description.	1932/3 Amount.	1931/2 Amount.
<u>Process Expenses.</u>	£	£
Foremen, Asst. Foremen etc.	1978	1920
Miscellaneous Labour.	703	732
Consumable Stores.	340	426
Gas.	35	48
Water.	20	21
Steam (Process).	3250	4554
Power.	2635	3172
Refrigeration.	2361	3388
Compressed Air.	1963	2134
Maintenance of Plant.	8064 (1)	11323
Maintenance of Buildings.	1454	1550
Depreciation.	826	816
Rates.	154	200
Internal Transport.	779	809
Balance of Process Expenses.	2738 (2)	4273
<u>Sectional Expenses.</u>		
Management.	2361	2283
Electric Light.	249	252
Gas.	77	89
Steam for heating.	1817	1539
Maintenance Services.	1168	1394
Miscellaneous Labour.	325	263
Laboratory Testing.	3092	3078
Care & Custody of Departmental Stores.	190	184
Allowances.	1367	1359
O.T. & N.S. Bonus.	87	137
Balance of Sectional Expenses.	866	772
Credit for Materials returned to Store.	323	424
<u>General Expenses.</u>		
Superintendence.	584	586
Registry, Pay & Order Branches.	263	252
Worktakers, Wages & Accounts.	698	763
Central Stores.	4658 (3)	1956
Police, Fire Brigade & Warders.	4487	3055
Maintenance of Grounds, Mains Canal, Permanent Way etc.	2432	3823
Non-effective Charges.	4877	3437
Balance of General Expenses.	7575	7502
Total.	64150	67866
Less Subsidy.	14151	13555
Total Factory Expense.	49999	54111
Percentage to Direct Labour.	563.43	606.35
Direct Labour.	8874	8924

- (1) Erection of T.N.T. Plant, employed Maintenance Staff but arrears will be made up during 1933-4.
 (2) Less Expenditure on R.D.N. first equipment.
 (3) Loss on disposal of gunpowder ingredients.

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MATERIALS.

Price per ton of main items (average prices given if
more than one contract.)

Material.	1931/32.	1932/33.
	£. s. d.	£. s. d.
Acetone.	57. 5. 0	61. 6. 8.
Cotton Waste.	53. 15. 0	53. 5. 0
Glycerine.	42. 0. 0.	45. 0. 0.
Sodium Nitrate.	7. 10. 9.	8. 10. 0.
Calcium Cyanamide.	11. 1. 6.	9. 0. 0.
Acid Sulphuric (20% Oleum)	5. 17. 6.	6. 1. 0.
Lead, Chemical, Sheet.	20. 8. 4.	17. 16. 8.
Coal, Mechanical Stoker.	1. 0. 1½	17. 10½

Royal Gunpowder Factory Waltham Abbey. 1932/33.

Glycerine.

Other Explosive
Materials.

General Stores.

Value of Stock.		Value of Stock checked by Stock-takers.		Discrepancies.		Surplus Stock Sold.			
						Book Value.		Net Loss.	
This Year	Last Year	This Year	Last Year	This Year	Last Year	This Year	Last Year	This Year	Last Year
£	£	£	£	£	£	£	£	£	£
41207	42048	41207	42048	-	-	-	-	-	-
14592	15210	13979	2365	151	-	3596 *	12	2241	7
13132	15104	9281	7577	13	-	144	298	82	194
68931	72362	64467	51990	164	-	3740	310	2323	201

* Disposal of Gunpowder Materials specially approved on W.O. paper 12/1249 (F.5)

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R.G.P.F.

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A1.

Personnel.

31.3.33.

	Total this year.	Total last year.
Supervisory &c.	41	38
Skilled.	43	41
Semi Skilled.	81	83
Unskilled.	117	108
Women & Girls.	-	-
Boys.	6	4
	288	274
Highest.	290	277
Lowest.	274	272
Average.	282	274
Entries during the year.	20	4
Discharges " " "	21	8
Transfers " " "	29	20
	(Transfers "In"=15 "Out"=14)	

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A9

Nos. and Average of R.G.P.F.Employees on 1.4.32. and 31.3.33.

<u>Age</u>	<u>Nos. on 1.4.32.</u>	<u>Nos. on 31.3.33.</u>
65	-	-
64	12	3
63	2	12
62	12	10
61	10	8
60	8	13
59	12	15
58	14	14
57	13	13
56	13	13
55	12	21
54	21	15
53	15	9
52	9	15
51	14	11
50	9	11
49	10	5
48	5	7
47	7	4
46	4	3
45	3	3
44	3	7
43	6	5
42	5	4
41	3	2
40	2	1
39	1	1
38	1	5
37	4	6

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A2
Cmb

<u>Age.</u>	<u>Nos. on 1.4.32.</u>	<u>Nos. on 31.3.33.</u>
36	4	4
35	5	4
34	4	1
33	1	1
32	1	1
31	1	6
30	3	7
29	7	4
28	3	2
27	1	1
26	1	5
25	2	3
24	1	2
23	1	2
22	2	1
21	1	1
20	1	1
19	1	1
18	-	2
17	2	1
16	1	1
15	-	1
14	1	-
	<hr/>	<hr/>
	274	288
	<hr/>	<hr/>

Average age = 49.49

Average age = 48.9

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A3

R.G.P.F.

Total strength on 31/3/33.

	Nos.	%
60 and over.	46	15.97
Over 50 and under 60.	137	47.57
" 40 " " 50.	41	14.24
" 30 " " 40.	36	12.5
" 21 " " 30.	21	7.29
Under 21.	7	2.43
	<hr/>	<hr/>
	288	100.
	<hr/>	<hr/>