

THE ELECTRIC STEEL AND METALS COMPANY, LIMITED

OFFICE OF THE PRESIDENT AND GENERAL MANAGER

CABLE ADDRESS
"ELECSTEEL" WELLAND
CABLE CODE USED
A.B.C. FIFTH EDITION
AND WESTERN UNION (UNIVERSAL EDITION)

WELLAND,
ONTARIO

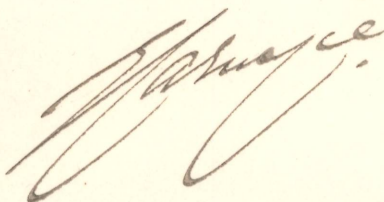
July 10th. 1916.

Henry Bertram, Esq.,
c/o John Bertram & Sons Company,
Dundas, Ontario.

Dear Mr. Bertram:-

With reference to our conversation of Thursday last relative to operations of 8" Shells. I find that I have not the operations for 8" Shells but I have for the 9.2" and in case they may be of interest to you I am enclosing a copy of these herewith.

Yours very truly,



EC:B
Encl.

July 11th 1916

E. Carnegie, Esq.,
The Electric Steel & Metals Company,
Welland Ont.

Dear Mr. Carnegie:-

I wish to acknowledge receipt
of your favor of the 10th enclosing
list of operations on 9.2" shells,
for which kindly accept my thanks.

Yours very truly,

HB/EMH

NILES -BEMENT -POND COMPANY

MACHINE TOOLS

CABLE ADDRESS
NILESCO NEWYORK

111 BROADWAY, NEWYORK

May 5, 1916.



Mr. Henry Bertram,
John Bertram & Sons Co.,
Dundas, Ont.

Dear Sir:-

At Mr. Cullen's request, I am enclosing herewith copy of a letter received from our Boston Office in regard to the time which the Lynn Works of the General Electric Co. are making on 9.2" shell, mark II, British (open base type).

Mr. Chase assures us that while Mr. Baker told him their total time was 7 hours for the machine work, including base plug and nose piece, from what he could learn they were doing it nearer to 4-1/2 hours. We originally estimated in offering them a certain amount of equipment that the time for doing their work would be about 9 hours.

Yours truly,

J. H. Kelly
New York Sales Manager.

JPI.KCH

Enc.

COPY

NILES BEMENT POND COMPANY
of Mass.

"GENERAL ELECTRIC COMPANY"

April 21st, 1916.

NEW YORK: Attention J. P. Ilsley, N.Y. Sales Mgr.

In reply to yours of the 20th, would say that the writer has gotten together some figures on General Electric Company's 9.2" British shell, and take it on the whole, our estimates were not very far off.

For instance, on the rough turning we estimated 30 minutes; and the best they have been able to do is 40 minutes. They think if they had the job to do over again, that they would put in 36" triple geared lathe for this rough turning.

On the boring operation, we estimated 45 minutes, and their average time is 60 minutes.

On the facing off the ends to bore, ream and tap, we were low on this. We estimated 25 minutes, and it takes them 40.

On finish turning, we estimated 40 minutes, and they are getting them out in 27.

On the grooving, we estimated 30. They are getting them out around 25.

On finishing the copper band, we estimated 20, and they are doing them in 12.

I have not been able to find out the total machine time, as they have changed round the various operations, and put them on different machines, but from what figures I have, I should say the total machine time was approximately 4-1/2 hours.

They told me once, confidentially, that the total time, including everything on the shell, was about 7 hours.

Trusting that this will give you the desired information we remain,

Yours truly,

NILES BEMENT POND CO. of MASS.,
Marcus Chase, Boston Sales Mgr

P.S. Don't say anything to Baker about this dope.

MEMORANDUM

April 25th/16.

9.2" SHELL MANUFACTURE - G. E. LYNN WORKS.

In connection with data recently received, note that the approximate time of seven (7) hours included machining of the base plug and nose bush. The source of our information is to be held strictly confidential.

Yours truly,

N.Y. Sales Manager.

JPI.KCH

May 10th 1916

NILES-BEMENT-POND CO : NEW YORK

J.P. Ilsley, Esq.,
Sales Mgr.

Dear Sir:-

I wish to acknowledge receipt
of your favor of the 5th together with
copy of correspondence regarding record
on 9.2" shell.

This information is of very
great assistance to us and thank you very
kindly for having sent copy to us.

Yours very truly,

Treasurer

HB/EMH

See later spec.

L
3471 A

This Specification, or any Patterns, Drawings, or other information issued in connection therewith, may only be used for a specific order, placed by an Officer of the War Department, and is not to be used for any other purpose whatsoever, without the express written sanction of the Army Council.

Shell, B.L. or Q.F., high explosive, forged steel
(fitted with adapter)

General Specification to govern manufacture and inspection.

57

24

1519

Approved 22nd June, 1915

NOTE.—The following specification contains conditions which apply to all shells, B.L. or Q.F., high explosive, forged steel, fitted with adapters. A separate specification has been prepared with regard to each calibre of shell in which are laid down the particulars of the sealed drawing, dimensions and proof.

The general specification is to be read with the particular specification for the calibre of shell ordered.

1. *Dimensions.*—The general dimensions of the shells are to be in conformity with the drawing. Should any discrepancy be found to exist between the drawing and this specification, reference is to be made to the Chief Inspector, Royal Arsenal, Woolwich.

2. *Quality of Material.*—The shell is to be of forged steel of the best quality, homogeneous throughout and free from seams, flaws and piping. It must be manufactured:—

- (a) In the case of shells for guns above 6 inches in calibre, by the “acid open-hearth,” “electric furnace” or “stock-converter” process.
- (b) In the case of shells for guns of 6 inches calibre and below, and for all howitzers, by the “acid or basic open-hearth,” “electric furnace,” or “stock-converter” process.

If made by the “stock-converter” process, non-phosphoric pig iron must be used.

The composition of the steel will be determined by analysis. Apart from the iron, the following chemical elements may occur in the percentages shown in the Table, viz.:—

	Min. per cent.	Max. per cent.
Carbon.....	—	0·55
Nickel.....	—	0·5
Silicon.....	—	0·3
Manganese.....	0·4	1·0
Sulphur.....	—	0·05
Phosphorus.....	—	0·05
Copper.....	—	0·1

The Contractor will take no steps to introduce into the composition of the steel any special ingredient (*e.g.*, chromium, aluminium) without information being given previously to the Inspecting Officer.

Should the Contractor, in making tests for his own information, find that any sample contains any constituents additional to those named in the Table, he is to call the attention of the Inspecting Officer thereto.

3. *Inspection of Ingots and Billets.*—The ingots for shells and adapters must be top-poured, and will be submitted to the Chief Inspector, Woolwich, or an Officer deputed by him, at the Contractor's works, who will make the necessary arrangements to have 20 per cent. cut off the top end of each ingot, and such further portion as may be necessary to ensure complete removal of the piping.

If it is desired to use bottom-poured ingots, the written permission of the Chief Inspector, Woolwich, must be obtained, and in this case the discard will be 25 per cent., a portion thereof being taken from the bottom of the ingot. The proportion taken from the bottom to be left to the discretion of the Inspector.

The portion to be cut off is to be removed by sawing and breaking after the ingot, or partially forged ingot, has cooled down, and such parting, in the case of a partial forging of an ingot, should be effected through a section of the ingot which has not been forged. Contractors who have not the necessary plant for cutting the discard from the ingot cold will be allowed to roll or forge the ingot to billet size before removal of the discard. The area of the fractured part will be 1/6th of the sectional area of the ingot if only one shell is to be made from it, and 1/12th if more than one shell is to be made from it.

If only one shell is to be made from an ingot, the latter, after removal of the discard, will be inspected and stamped in such manner as will ensure the base of the shell being towards the bottom of the ingot.

Such marking as may be necessary to identify the steel makers' cast and ingot numbers will be maintained by the Contractor upon every shell and adapter throughout manufacture. Where hollow-forged shell are submitted for test by day's work of drawing, the date of drawing must be similarly maintained.

The adapters are to be so forged that the longitudinal axis of the adapter is at right angles to the longitudinal axis of the original ingot, and they are to be stamped in such a way as to ensure this.

4. *Treatment.*—No hardening, toughening in oil, or process of a like nature is permitted.

5. *Tests.*—Mechanical tests will be taken as follows:—

(a) Longitudinal tensile and compression tests cut from the walls of at least 1 per cent. of the shells of every cast. Where hollow-forged, shell may be submitted in batches containing all the shell of any one day's work of drawing.

(b) The Contractor should so mark the adapters that the original direction of forging or rolling may be recognised, and the axes of the test pieces may, if the Contractor so desires, be placed parallel to it.

Tests will be taken from 1 per cent. of the adapters of every cast after final forging, tangential to the bottom of the cavity or cut from a disc at the outer end of the adapter at the option of the Contractor.

They must be capable of standing the following tests:—

TENSILE

	Tenacity, tons per square inch		Elongation in a 2-inch test piece, or such piece as can be cut from the shell or adapter provided that $\frac{\text{length}}{\sqrt{\text{area}}} = 4.$ (Minimum)
	Yield (Minimum)	Breaking	
Shells ..	19	35 to 49	17 per cent.
Adapters ..	19	35 to 49	17 "

COMPRESSION

A cylinder, of length equal to diameter, will be cold compressed to half its original length, and must stand this test without cracking.

If any one or more of the conditions in this clause be not complied with, the cast or batch of shells or adapters affected will be rejected and must not be re-submitted without permission.

L
3459A

See later spec.

This Specification, or any Patterns, Drawings, or other information issued in connection therewith, may only be used for a specific order, placed by an Officer of the War Department, and is not to be used for any other purpose whatsoever, without the express written sanction of the Army Council.

Shell, B.L., high explosive, 8-inch howitzer, Mark III. | L |;

forged steel, with fixing screw

Specification of Particulars as to sealed drawing, dimensions and proof.

57
24
360

Approved, 16th March, 1915.

NOTE.—This specification is to be read in conjunction with the general specification to govern the manufacture and inspection of Shell, B.L. or Q.F., high explosive, forged steel, with adapters.

1. The drawing mentioned in the general specification is R.L., No. 22,164 (1), full size.

2. *Proof* (vide general specification, clause 16).—The shell will be fired for recovery from an 8-inch B.L. Howitzer, with such a charge as will give a chamber pressure of not less than 13 tons per square inch.

H. GUTHRIE SMITH,

Director of Artillery.

WAR OFFICE.

This Specification is to be returned to the Chief Inspector, Woolwich, on completion of the ^{tender.} contract.

CLASS "C" METAL

The Contractor will supply free of charge, the necessary metal for testing, if requested by the Chief Inspector, Woolwich, to do so. The pieces should not be less than 7 inches in length, nor less than 1 inch in diameter.

Test pieces prepared from the above will be required to stand the following minimum tests.

TENSILE

Tenacity, tons per square inch		Elongation in a 2-inch test piece, or such a test piece as can be cut from the metal provided that $\frac{\text{length}}{\sqrt{\text{area}}} = 4$.
Yield	Breaking	
6	12	10 per cent.

This metal must not contain more than 0.1 per cent. of lead. Samples may be taken from the nose-bushes of the finished shell for testing and analysis, and must be replaced at the Contractor's expense.

In the case of shells under Clause 2 (b) the metal may contain up to 1 per cent. of lead, subject to the following conditions:—

- (1) The present mechanical tests of the Specification are to be adhered to.
- (2) The surface of the nose-bush where it is liable to come in contact with the explosive is to be well nickel-plated or tinned with pure tin.
- (3) The pure tin or nickel used for coating must not contain more than 0.1 per cent. of lead, and the coating is to be continuous and satisfactory as regards adhesion, in the opinion of the Inspector.

6. *Construction.*—The head of the shell is to be struck with the radius shown on the drawing, the point being truncated and screwed to receive the nose-bush or fuze. No sharp edge is to remain at the cavity end of the fuze hole threads, which should be chamfered if necessary.

The shells and adapters are to be turned and finished to the form and dimensions shown on the drawing.

The base of the shell will be screwed internally, as shown on the drawing. The adapter will be screwed externally, as shown on the drawing; the threads are to be a tight fit with those on the shell, and there must be no appreciable shake between the adapter and the shell when the former is screwed half-way home.

A groove for the driving band is to be turned near the base and undercut, with the number of waved ribs shown on the drawing projecting on the bottom to prevent the driving band from turning on the shell.

Three chisel cuts may be made across the waved ribs in the groove for the driving band at an angle to the longitudinal axis of the projectile, to allow the air in the channels between the ribs to escape when the band is being pressed on.

In the case of cup-shaped adapters the upper edge of the adapter must not project into the shell cavity at any point on its circumference.

7. *Nose-bush.*—If a nose-bush is shown on the drawing, it may be of mild steel or Class "C" metal; or it may be omitted and the fuze-hole formed in the head of the shell, if there is a note on the drawing to that effect.

The bushes, after having been machined to shape on the nose, and also internally, will be unscrewed about a quarter of an inch, so as to be readily removable for examination on delivery. Roughness and sharp edges should be removed from the cavity at the junction of the shell with nose-bush. A steel fixing screw will be fitted in the bush or head of the shell, as shown on the drawing.

8. The limits (high and low) allowed are shown on the drawing.

9. *Driving Band.*—The driving band is to be made from a ring of drawn or electro-deposited copper pressed into and in contact with the bottom and undercut of the groove in the shell all round and accurately turned to the form shown on the drawing.

10. *Screw Threads*.—All screw threads must, unless otherwise stated herein, or on the drawing, be of the British Standard fine screw thread, and conform to the standard gauges of the Chief Inspector, Woolwich. Contractors may send their screw gauges at any time to the Chief Inspector, Woolwich, to be checked and compared with the standard gauges.

11. *Preliminary Examination*.—The shells, after they have been prepared to receive the adapters, grooved, and finish machined internally and externally, but before varnishing or banding, will be submitted for preliminary examination.

The adapters must be submitted separately, finished except as to their outer face.

Any shell or adapter which is not finished to the satisfaction of the Inspecting Officer or which has any flaw or imperfection, or which fails to pass the Inspecting Officer's gauges, will be rejected.

12. *Varnishing*.—While the shells are clean and free from scale or rust they are to be thoroughly coated internally with copal varnish and stoved at 300 degrees F. for 8 hours.

The Contractor must supply for analysis a sample of the liquid varnish used. Further samples will be scraped out from the shells, which must be revarnished by the Contractor free of charge.

This varnish must be free from metallic impurity in any form, the following only being permitted:—

(a) A percentage of manganese not exceeding 0.5.

(b) A percentage of lead calculated as Pb taken from scrapings not exceeding 0.05.

(c) A percentage of copper not exceeding 0.1.

It must adhere firmly and present a perfectly smooth, clean, and dry surface, free from cracks, flaws, impurities, and other imperfections. Any shell supplied with the steel surface under the varnish not clean, free from rust, scale and foreign matter, or in which the varnish does not adhere firmly, will be rejected. After varnishing there must be no recess at the junction of the shell and adapter.

13. *Marking*.—The shell will be stamped on the base with the calibre, numeral, Contractor's initials, and date of completion of manufacture as shown on the drawing. Numbers to identify the cast and ingot of the shell are to be stamped on the head and numbers to identify the cast and ingot of the adapter on the base.

14. *Delivery*.—(a) The shells will be covered with a thin coating of vaseline or other similar anti-corrosive grease, which must be of such nature as not to interfere with gauging, and they will then be delivered, unpainted, at the Royal Arsenal, Woolwich, for inspection and proof.

(b) The shells will be delivered in lots for purposes of proof. A lot for this purpose will consist, as far as possible, of shells governed by the same mechanical tests under Clause 5 (a), and must not contain more than 121 shells. When the number so governed is less than 100, a number of casts or batches, up to a maximum of 7, may be grouped together for this purpose. In the event of further proof being required the shell will be taken from the lot supplied.

(c) The Contractor will supply, free of charge, such shells and adapters as may be required as described in Clauses 5 and 16 and such driving bands as in Clauses 15c and 16. The shells expended in proof, whether fired or otherwise tested, will be the property of the Government.

15. *Main examination after delivery*.—(a) Any shell of a lot which fails to pass the Inspecting Officer's gauges, or fails to satisfy the Chief Inspector, Woolwich, of its serviceability, will be rejected.

(b) If at any time during the examination it is found that defects of any nature other than errors of machining, which involve rejection of the defective shell amount to 5 per cent. of the number of the shells in the lot, the lot will be rejected.

(c) The driving band may, at the option of the Chief Inspector, Woolwich, be cut off one or more shells selected from the lot. Should the driving band appear not to have been thoroughly pressed home into the groove and undercut throughout, the lot will be rejected.

(d) If at any time during the examination of a lot it is found that 5 per cent. of the shells in the lot will depart from the approved design, further examination of the lot will be suspended.

The whole of the lot must be re-examined by the firm, and those shells which are incorrect to design eliminated.

Those shells in which the departure can be rectified may be brought to the approved design by the firm. The lot may then be re-submitted for examination.

16. *Proof*.—A percentage of the shells, filled with sand or other suitable material, will be fired for recovery from a B.L. or Q.F. gun. Particulars of the gun pressure will be found in the separate specification for the particular calibre ordered. Should the shells so fired set up or break up in the gun, or should any portion of the driving band separate from the shell before first graze or impact, or should the adapter be distorted or fail to function correctly, the lot will be rejected, provided always that the pressure did not exceed the specification proof pressure by 0.5 ton. If the pressure did exceed this limit, a second proof is to be taken at Government expense before the lot is rejected. The pressure of the round, if not taken, will be assumed to be that of the last round fired with the same charge in which pressure was taken.

Further, should the shell be reported unsteady in flight and be found, on recovery, to be without its driving band, or with the driving band loose or slipped in its seating, then the driving band of a similar number of shells to that taken for firing proof may be cut out to ascertain whether they have been properly pressed down; if they have not been pressed down to the satisfaction of the Chief Inspector, Woolwich, the lot will be rejected. If found correct, such shells will be rebanded by the Contractor free of charge.

17. *Re-submission*.—(a) A lot rejected under either Clauses 15 or 16 must not be re-submitted unless the rejection is due to failure of the driving band, or for rectifiable gauging defects.

(b) Shells put out at any period of inspection for remediable defects may be re-submitted for further examination after the defects have been rectified. It is to be understood that the examination of such shells at that time will be incomplete, and that they are liable to rejection after rectification.

(c) If the Contractor wishes to re-invoice a lot rejected for failure of driving band under Clauses 15c or 16, he must remove the shells and reband them before they are again submitted.

(d) Rejected shells will, if considered necessary, be marked with a small rejection mark, so that they can be readily identified if re-delivered.

18. *Submission of Shell in Stock*.—If the Contractor wishes to supply shell already made, or partly manufactured, at the date of Contract, he should request permission of the Chief Inspector, Woolwich, to submit them, and give such particulars as will enable the Inspecting Officer to see that the Specification has been complied with.

19. *Plugs*.—Plugs for the protection of fuze holes in transit will be supplied free of charge, on demand, by the Ordnance Officer to whom delivery is to be made.

20. *Packing*.—All packages are to be so marked that the goods contained therein may be readily identified with the invoice. Unless it is specified in the contract that the packing cases or other packing material are to become the property of the Government they will remain the property of the Contractor, who is responsible for their removal. Should they not be removed within two months of the acceptance of the stores, they will be disposed of, and in such circumstances the Contractor will not be entitled to make any claim for compensation. The packing cases must be marked "Returnable" or "Non-returnable."

21. *Inspection*.—The shells may be inspected at any time during manufacture by, and will be subject to testing by, and to the final approval of, the Chief Inspector, Woolwich, or an Officer deputed by him.

H. GUTHRIE SMITH,

Director of Artillery.

WAR OFFICE.

This Specification is to be returned to the Chief Inspector, Royal Arsenal, Woolwich, on completion of the ^{tender.} contract

THE JOHN BERTRAM & SONS CO. LIMITED,

MACHINE TOOLS.

SUBJECT:

HEAD OFFICE:

DUNDAS, CANADA October 18, 1915

Mr. Henry Bertram-

Referring to letter just received from Mr. Young, about equipment required on machines we propose to use for 8" and 9.2" shells, I would suggest the following attachments for the machines which we are offering.

ROUGH TURNING OPERATION

Using 36" Triple Geared Lathes, having faceplate bolted to faceplate of lathe, and to this auxiliary faceplate screwing in hardened steel arbor, front end of which has three cams milled for a distance of 2". Over the cam arbor is a sleeve held in place by collar on the end of the shaft. Through the collars are mortised three holes, through which would operate three dogs with serrated faces. When the shell was centered, placed on the arbor, the forging would be forced up against a shoulder, the action of turning the shell would cause the jaws to expand, gripping the inside of the rough forging also centering same.

Rough Turning the Shell to shape

We would suggest that our present method, such as is used on the Finish Body Turning, be used with this difference, that whereas in the present method we depend on the heavy coil springs to draw the tool block to position, under these new conditions we would have the roller working between a form, and doing away with the springs altogether; that is in place of having, as at present, the one side of a cam, we would have the cam shaped on both sides of the roller. We would also have four tool turret toolpost mounted on lathe carriage, instead of ordinary tool-block. This four tool turret however would have to be operated by screw, similar to compound rest, so as to be independent of any movement of the cross-slide.

Rough and finish boring.

Using 36" x 14ft Projectile Boring Lathes, we would suggest the type of chuck for holding the shell to be a large cast iron split chuck bolted to the faceplate, bar bolted to the faceplate to be nearly the same diameter as the large faceplate supplied with the lathe, and same to be checked in to the faceplate.

The shell to be supported by extra heavy steady rest, the weight being taken on two hardened and ground steel rollers, about 4" diam, 3" face, and having at least 1-1/2" hole in them. This would eliminate a lot of friction in carrying that weight. For the cutter bars we would suggest, first, Heavy bar head carrying inserted tooth cutters, bar head to be attached to the square bar of the boring lathe. This would rough out the inside to about the distance of the straight cut. We would then follow this up with another bar of acorn shape, carrying inserted tooth cutters, staggered. In the front of this cutter to carry flat drill to go through the end of shell, size hole to be made by this about one eighth less than finished size. For the finishing cutter we would recommend another acorn shaped tool carrying 3 cutters, the exact shape of the finished inside nose of the shell, the body diameter of this cutter also taking a very light skim off the inside bore, making the cut smooth. For all of these cutters we would have to have an extra large flow of oil or cutting compound, so that the finishing surface would be almost glass smooth.

Finish body turning

Would suggest for this the same type of forming fixture as used on the roughing lathes, only same to be attached to the 30" x 13-1/2 ft Double Back Geared Lathes. This would also have four tool turret toolpost arranged as specified on rough turning operation. The type of chuck required for this would be of our compression chuck type, which would grip the large end or base of shell, and would finish turn from copper band groove to nose. The hole in the nose of shell running on ball bearing center in tailstock.

Facing to weight, counterboring and threading.

Would require chuck of similar type to that on the boring lathe, with steady rest of same type. Lathe to be equipped with four tool turret toolpost in place of the ordinary cross-slide.

Boring, threading and facing the nose of shell

For this cast iron split chuck could be used, and extra heavy steady rest, and four tool turret toolpost. For the threading we could use circular chaser with section cut out in suitable holder, or we could consider a milling attachment arranged on the lathe with the hob shaft, to be driven by an overhead drum. This would be applying our thread milling method to the lathe.

Pressing copper band

We would recommend for this, the steam hammer with suitable dies, depending on the size shell it was required to form.

Copper Band turning

Copper Band Turning

We would recommend for this operation, compression chuck, extra heavy steady rest and special tools.

Marking the base

For this would suggest a suitable hinged chuck, into which shell could be pressed nose down, and on the base place collar that would fit over the end of the shell, and through the collar at suitable intervals would be placed the independent figures and letters. Then in the spindle of a heavy radial drill, carrying head containing a number of rollers, which operating against the figures and letters in the collar, would force same into the shell base any depth desired. This collar mentioned would be secured to the shell base by three set screws.

Turning off socket

Using compression chuck of our regular type, extra heavy steady rest, and suitable steel block to carry the necessary tools.

Making the base plug

Using extra heavy three jaw scroll chuck and four tool turret toolpost.

October 28, 1915.

Machine Shop equipment required for doing the work on 9.2
H. E. Shells from the rough forging, at the rate of five
per hour.

OPER. 1 Cutting off open end of shell

2. Hall 12" Cutting Off Machines

Price each fob Brantford, - \$1525.00
Operation time 24 minutes.

\$3050.00

OPER. 1½ Centering

Using Radial or Vertical Drill, which customer may
have, and suitable fixture.
Operation time 5 minutes.

1000.00

OPER. 2 Rough turn

7 12- Pond 36 x 14' D.B.G. Motor Driven Lathes
without motor

Price duty paid Hamilton, Ohio each \$4387.50
Operation time 2½ hours 90 min

\$52650.00

OPER. 3 Boring

5 10- Pond 36" x 20' Projectile Lathe with motors
Price each fob Buffalo, duty paid - \$7924.50
Operation time 8 hours.

\$79240.50

317960

OPER. 4 Finish body turn

5- Pond 30 x 13½ Double Back Geared Belt Driven
Lathes

Price each fob Plainfield, duty paid - \$2781.00
Operation time 60 minutes.

\$13905.00

OPER. 5 Face to weight, counterbore and thread

7- Pond 30 x 13½ D.B.G. belt driven lathes

Price each fob Plainfield duty paid \$2781.00
Time for operation 1½ hours

\$19467.00

OPER. 6 Bore and face nose and thread

5- C.M.C. 26 x 12' D.B.G. Belt Driven Lathes

Price each fob Galt - \$1950.00
Operation time 60 minutes.

\$9750.00

OPER. 7 Wave and undercut

3- Bertram Axle Lathes with attachments

Price each fob Dundas - \$3000.00
Operation time 30 minutes.

\$9000.00

OPER. 8 Press on band

1- Bertram 2000# Steam Hammer
Price fob Dundas
Operation time 5 minutes

\$2200.00

Or Hydraulic Press can be used for this operation.

OPER. 9 Copper band turning

2- Bertram Special Lathes with attachments
Price fob Dundas - \$2500.00 each
Operation time 20 minutes.

\$5000.00

OPER. 10 Marking the base

1- Brown Boggs Special Marking Machine
Price fob Hamilton, Ont. -
Operation time 6 minutes.

\$1320.00

OPER. 11 Screw socket in place

Hand Operation

OPER. 12 Turn socket

1- C.M.C. 26 x 12' D.B.G. Lathe, belt driven
Price fob Galt, Ont. -
Operation time 12 minutes

\$1950.00

OPER. 13 Turn base plug

5- Pond 30 x 13½ D.B.G. Lathes, belt driven
Price fob Plainfield, duty paid - \$2781.00
Operation time 60 minutes.

\$13905.00

OPER. 14 Face Plug

1- C.M.C. 26 x 12' D.B.G. Lathe, belt driven
Price fob Galt, Ont.
Operation time 15 minutes.

\$1950.00

OPER. 15 Varnish and paint

As may be arranged

\$213,388.00

9.2 H.E. SHELLS

Oct. 23, 1915

Shell Committee,

Ottawa, Ont.

Gentlemen:-

In reply to your telegram asking for new bids on the above size shell, we wish to submit the following prices:-

(A) Shells furnished from forgings rough machined -

500 to 800 per week each \$33.00

(B) Shells furnished from forgings not rough machined -

500 to 800 per week each \$37.50

All material and component parts to be delivered to us, charges paid fob. our works.

Shell forgings (A) to be furnished rough machined and cut to length.

Shell forgings (B) to be furnished in the rough as produced by the forge.

All forgings shall be properly annealed before shipment by the Steel Company.

Providing there is no unusual delay in receiving our plant and extension to shops being completed, deliveries to commence July 1916, and reaching the above maximum about the end of August. It being understood that we are to be guaranteed a minimum order for delivery within one year from commencement of shipments of 35,000 shells on the basis of price made of five hundred per week. Contract is not to be subject to cancellation within one year from the date mentioned.

Shell Committee - Ottawa.
9.2 H.E. Shells.

Yours very truly,

The John Bertram & Sons Co. Limited

HB/EMH

Treasurer

Shell Committee - Ottawa.
9.2 H.E. Shells.

Yours very truly,

9.2 H.E. SHELLS

The John Bertram & Sons Co. Limited

Oct. 23, 1915

Shell Committee,

Ottawa, Ont.

Treasurer

HB/EMH
Gentlemen:-

In reply to your telegram asking for new bids on the above size shell, we wish to submit the following prices:-

(A) Shells furnished from forgings rough machined -

500 to 800 per week each \$33.00

(B) Shells furnished from forgings not rough machined -

500 to 800 per week each \$37.50

All material and component parts to be delivered to us, charges paid fob. our works.

Shell forgings (A) to be furnished rough machined and cut to length.

Shell forgings (B) to be furnished in the rough as produced by the forge.

All forgings shall be properly annealed before shipment by the Steel Company.

Providing there is no unusual delay in receiving our plant and extension to shops being completed, deliveries to commence July 1916, and reaching the above maximum about the end of August. It being understood that we are to be guaranteed a minimum order for delivery within one year from commencement of shipments of 35,000 shells on the basis of price made of five hundred per week. Contract is not to be subject to cancellation within one year from the date mentioned.

G. Walt

8" + 9"

9.2
17 hrs

1 year
\$32.00

24
\$29.00

Forge
35.00

8"

25.00

22.00

21.00

6"

Montreal

78
5

128

$\sqrt{2}$
800
41.600

$\sqrt{2}$
1000
26.000

29.00
2.90
31.90

1-Set 4.5 gauges

While - mostly of month office

Bertram Shell Plant, for machining 9.2 shells at the rate
of five per hour.

Time one shell 10 hrs. 19 min.

OPER. 1 Centering

1- Bert. Drill with fixture
Time per shell, 5 mins.

OPER. 2 Rough turn, trim to length, rough out wave groove
and round corner.

12- Bond 36 x 14 ft Triple Geared Motor Driven lathes
Oper. time per shell 2-1/2 hours.

If rough turning of shell is done at the forge plant, and
includes cutting off to shape, the time on the operation can
be reduced one hour, and the number of machines by five,
making seven in place of twelve.

OPER. 3 Boring

10- Pond 36 x 20 ft Projectile Boring lathes
Operation each shell 2 hours.

OPER. 4 Finish body turn

5- 30 x 14 ft Pond D.B.G. lathes
One shell one hour.

OPER. 5 Face to weight counterbore and thread

7- 26 x 12' CMC lathes
Time per shell 1-1/2 hours

OPER. 6 Bore, thread and face use

5- CMC 26x 12' lathes.
Time per operation each shell 1 hour

OPER. 7 Wave and undercut

3- Bert. #6 Axle Lathes
Time operation one shell 30 mins.

OPER. 8 Pressing copper band

1- Bert. 2000# Steam Hammer, single frame.
Time one shell 5 mins.

Oper. 9 Copper bandturning

1- Bert. #6 Axle lathe, with special equipment
Time per operation 10 to 15 mins.

OPER. 10 Marking base

1- Special Marking Machine
Time per operation 12 mins.

OPER. 11 Screwing socket in place

Hand operation. 5 mins. per shell

OPER. 12 Trim off socket

1- CMC 26 x 12' lathe
Time per operation 12 mins.

OPER. 13 Making base plug

5- 26" CMC lathes
Time per operation one hour

OPER. 14 Face off base plug to position.

1- 26 x 12' CMC Engine Lathe
Time per operation 15 mins.

Add 40 mins. for varnishing and painting.

Machines on order with Niles-Bement-Pond Co. will give
four equipments of larger machines, for this size work.

BERTRAM PLANT for 9.2" Shells -- 5 per hour

OPER. #1 -- Centering

5m 1- Bertram 45" Drill with fixture (say) - - - \$1000.00

OPER. #2 -- Rough turn, trim to length, rough out wave groove and round corner

2½ hr ✓ 12- Pond 36" x 14' Triple Geared Motor Driven Lathes @ \$3250.00 each
Duty paid - \$52,650.00
or 7- Pond 30 x 13½" ^{motor} still 6 motor driven ^{same duty} 2560- 7,776.00

OPER. #3 -- Boring

2 hr ✓ 10- Pond 306" x 20' Projectile Boring Lathes at \$5730.00 each. Duty paid - 77,355.00
8 for gang 2 for fly - 6,480.00

OPER. #4 -- Finish Turn Body

1 hr ✓ 5- 30" x 14' Pond D.B.G Lathes at \$2060.00 ea. Duty paid - 13,905.00
5- 30 x 13½" all for motor. 2270 8 for gang

OPER. #5 -- Face to weight, counterbore and thread

1½ hr ✓ 7- 26" x 12' C.M.C. Lathes at \$1787.00 ea. ~~2560~~ 12,509.00
7- 30 x 13½" motor 2 @ 2560
3 - 2270
Belt 2 - 2060 all for gang

OPER. #6 -- Bore, thread and face nose

1 hr ✓ 5- C.M.C. 26" x 12' Lathes at \$1787.00 ea. ~~2560~~ 8,935.00
Duty paid - 8,935.00

OPER. #7 -- Waving and undercutting

30 min ✓ 3- Bertram No.6 Axle Lathes at \$3000 ea. - - 9,000.00
3 - 30" x 13½" Pond Belt Dr Gang 2060 attachment to take place of second carriage

OPER. #8 -- Pressing copper band

5M ✓ Bertram 2000# Steam Hammer-- Single Frame - - 2,200.00
Belt

OPER. #9 -- Copper band turning Belt

15 min ✓ 1-1/4 Bertram #6 Axle Lathes at \$3000.00 - - - 4,000.00
no saddle

OPER. #10 -- Mark Base

1/2 min 1- Special Machine (say) 1,000.00

BERTRAM PLANT for 9.2" Shells (Continued)

OPER. #11 -- Screw socket in place

5 min Hand operation

OPER. #12 -- Turn off socket

15 min 1- C.M.C. 26" x 12' Engine Lathe \$ 1787.00

OPER. #13 -- Make base plug

1 hr 5- Pond 36" x 14' Triple Geared Lathes
at \$2850.00 each fob Chicago--duty paid 19,238.00
5- 30 x 13 1/2 Pond lathe for gang duty - 2060
duty -

OPER. #14 -- Face off base plug in position

15 min 1- 26" x 12' CMC Engine Lathe 1,787.00

Total hrs 9 h 45 m.

40 min - Painting + varnishing

11 h 17 min total

28000
20000
48000

45
42
90
1890.00

PLANT EQUIPMENT for 5 per hr. 9.2" H.E. SHELLS
Forgings Rough Machined.

OPERATION NUMBER	Name of Machine	No. Wanted	DELIVERY		PRICE duty paid	Time
			No.	Month		
1 Centering	Radial Drill of Vertical Drill Press with fixture	1	Stock		\$1000.	5 Min.
2 Rough Turn	Pond 30"x13½' Tr.Gd. Motor driv- en Lathe 15 HP 400-1500 motor \$470 ea.	7		Febry	27062	90 Min.
3 Boring	Pond 36"x20' Tr.Gd. Projectile Boring Lathes-motor driven 20 HP 325-1500 motors \$630 ea.	10	8 2	Jany. Febry	77400 6300	120 Min
4 Fin.Body Tg	Pond 30"x14' DBG Lathes all motor dr.	5	5	Jany	17375	60 Min
5 Face to Weight	Pond 30"x13½' DBG Lathes 3 motor 2-Steel Gr. & " 2-Belt	7		Dec.	11425 7732 5562	90 Min
6 Bore & face nose	CMC 26"x12' DBG Lathes -Belt Dr.	5		Jany.	8940	60 Min
7 ave & Under.	Bert. No.6 Sgle Axle Lathes to have modified construction & our special attacht. 10'bed	3			9000	30 Min
8 Press on band	Goldie & McC. Hyd. Press incldg pump & accumulator (estimate)	1			3000	5 Min
9 Copper Band Turning	Bert. No.6 Sgle Axle Lathe with bandg. attacht belt drive--no saddle--10' bed	1		Febry	2000	15 Min
10 Markg.Base	Brown Boggs type Markg Machine	1		March	1200	12 Min
11 Screw Sock.	Hand operation					15
12 Turn Socket	CMC 26" x 12' Eng.Lathe-belt Dr.	1		Jany.	1800	12 Min
13 Turn Brass Plug	Pond 30"x13½' Tr.Gd.Engine Lathe Belt drive	5	4 1	Jany Febry	13905	60 Min
14 Face Plug	CMC 26"x12' DBG Lathes Belt drive	1		Jany	1800	15 Min
15 Varnishg & Painting	Brantford oven and varnishing arrangements				1500	40 Min.

LATHES ORDERED

50- Pond 36" x 20' Triple Geared Projectile Boring Lathes
20 HP Variable Speed Motor.

PRICE arranged for 20 HP 375-1500 rpm 220 volt motor D.C.
with reversing controller and resistance drum, but
without electrical equipment, fob Buffalo- \$5730.00

DUTY PAID
\$7735.50

SHIPMENT- 8 January
16 February
16 March
10 April

For Motor equipment Westinghouse quote net to us \$630.00
Shipment 6 to 14 weeks.

50- Pond 36 x 14' Triple Geared Quick Change Gear Engine
Lathes, arranged for variable speed 15 HP 220 volt motor,
400-1500 rpm.

Price without motor fob cars Hamilton, O. \$3250.00 ea. \$4387.50

S SHIPMENT- 25 February
25 March

For Motor equipment Westinghouse quote net to us \$470.00
Shipment 6 to 14 weeks.

51 Pond 36" x 14' Triple Geared Quick Change Gear Belt Driven
Lathes, Price fob cars Chicago, Ill. \$2850.00

\$3847.50

Shipment - 3- January
16- February
16- March
16- April

24 Pond 36" x 14' Double Back Geared Quick Change Gear
Belt Driven Lathes.

Price fob cars Plainfield, N. J. - \$2220.00 \$2997.00

SHIPMENT - 8- February
8- March
8- April

Barrett 25" x 15' Heavy Duty Projectile Boring Lathes
arranged for 15 HP motor 4 to 1

Price - fob \$3100.00 \$4185.00

48- Pond 30" x 13½ Double Back Geared Quick Change Gear
Lathes belt driven. Price fob Plainfield \$2060.00

\$2841.00

X Shipment - 12- January, February, March and April.

9- arranged for motor with steel gears, fob Plainf. \$2560.00

\$3456.00

9- " " " without do " 2270.00

\$3064.50

Shipment- January.

50 (Norwood Eng. Co. 22" x 7' Belt driven lathes
Price fob cars -

1280.00

\$1728.00

Davis Rochester 22" x 8' or 10' Lathes belt driven

Price fob Rochester, N.Y. - *Budget Lathes 25 per - in Feb*

Shipment- 25 per month

FORGING EQUIPMENT FOR MACHINING 6, 8, and 9.2 shells

6" H. E. Shells) 8 plants required capacity 25 per hour
22,000 per week wanted) would take each
or 3666 per day)
or say 183 per hour) 3- 7" Cutting Off Machines for
20 hour day) open end
19- Heavy Duty Lathes

Operation time rough turn shell $3\frac{3}{4}$ hour.

8" H. E. Shells) 6 plants required capacity 25 per hour
16000 per week wanted) would take each
or 2666 per day)
or 133 per hour) (6- Cut Off Machines
20 hour day) 31- Heavy Duty Lathes 16

Operation rough turn shell $1\frac{1}{4}$ hrs.

9.2" H. E. Shells) 5 plants required capacity 5 per hour
3000 per week wanted) would take each
or 500 per day)
or 25 per hour) 2- Cut Off Machines
20 hour day) 6- Heavy duty lathes

Operation time rough turn shell $1\frac{1}{2}$ hrs.

For forge plants would require - 24- Cut Off Machines)
152- Heavy Duty Lathes) for 6" shell
36- Cut Off Machines)
186- Heavy Duty Lathes) for 8" shell
10- Cut Off Machines)
30- Heavy duty lathes) for 9.2" shell

438

HEAVY DUTY LATHES- 368 -
CUT OFF MACHINES - 70

438

8 19
6 31
5- 6
19 56

9.2 Shell - no Estimate #2

$10\frac{1}{2}$ hrs + 10% = 11.55 hrs Say $11\frac{3}{4}$ hrs B. Rough turned
 $13\frac{1}{4}$ " Blank rough for frog

		Machines for R Turned Blank		Machines from Rough Blank	
500 per	WK 26000	1 year	33.00	-	37.50
800 "	" 42000		32.50	-	37.00
500 per	WK 26000	2 yr	30.00		32.50
800 "	" 42000	"	29.50		32.00

8" Shell

1 year	1000 per	WK 50000	26.50	28.00
2 yr	1000 "	" 100000	23.00	24.50

9.2 -	500	WK	1 year	33.00	37.50
	800	"	2 yr		
8"	1000	"		26.50	28.00

9.2 - Turning supplied Turned (500 week)

11 3/4	@ 45	5.29
	@ 60	7.05
		<hr/>
		12.34

Plant \$225,000
for 25,000 shells

	9.00
<hr/>	
	21.34

Profit 1.00 per hr.

	11.75
<hr/>	
	33.09

2 years 5000 shells
depreciate

	4.50
<hr/>	
	28.59

(1st) 33.00

(2nd) 29.00

9.2 Turning supplied not rough-turned

13 1/4 hrs @ 45	5.96
@ 60	7.95
<hr/>	
	13.91

Plant
\$257,000 for
25,000 shells

	10.28
<hr/>	
	24.19

Profit \$1.50 per hr.

	13.25
<hr/>	
	37.44

2 years 5000 shells
depreciate

	5.14
<hr/>	
	32.30

(1st) 37.50

(2nd) 32.50

8" Shell - Forging - Rough turned 1000 per wk

8.5 hrs
15%
85
9.35 hrs

$$@ 45 = 4.21$$

$$@ 60 = 5.61$$

10.82

Plant. 263000⁰⁰
for 50000 shells.

5.26

16.08

Profit 1.00 per sh.

9.35

26.43

(1st)

for 2 years deduct

2.63

23.80

(2nd)

8" Shell

Forging net Rough turned 1000 per wk

9.75 hrs

15%

975

10.725 hrs

@

45⁰⁰

@

65⁰⁰

4.82

6.44

11.26

Plant. 287200⁰⁰
for 50000 shells.

5.75

17.01

Profit 1⁰⁰ per sh.

10.73

27.74

(1st)

for 2 years deduct

2.88

24.86

(2nd)

TELEGRAM.

The John Bertram & Sons Co., Limited

C. P. R.

DUNDAS, ONTARIO

Send the following message, without repeating, subject to the terms and conditions printed on the back of regular message blank, which are hereby agreed to.

OTTAWA Oct. 20th 1915

J.B. & S. Co.

Dundas

To expedite allocation of orders for large shells we have decided to invite revised tenders from all firms to which our previous enquiries were addressed. For guidance of manufacturers we estimate fair trade price for machining and assembling of the following shells complete delivered fob works, Shell Committee to supply all component parts free of charge, nine point two inch twenty nine dollars, eight inch twenty one dollars, six inch seven dollars. You are invited to state at what reduction or advance on these prices you are prepared to accept orders for twelve months deliveries from date of commencement on basis of following - per week - nine point two inch 500 per week, eight inch 1000 per week, six inch 1000 per week or such other quantities as you prefer to undertake. State date when deliveries will begin and by what date full output may be expected. Preference in allotting will be given to firms naming lowest prices but we do not undertake to accept the lowest or any tender. Revised tenders should reach us by noon Monday October twenty fifth. No further information can be given until all tenders have been received & considered.

Shell Committee

9.2 - shells - 500 per wk

12	15 1/2	@ 35	La	5.43	4.20
12	15 1/2	@ 50	Ex	7.75	6.00

77.50 hrs wk
 Grant \$160000⁰⁰ - 25000 shells
 200 000 8.00

Profit 115 per hr.
 17.83 22.00

Blog.

8/

\$ 12

37.41
 2.00
 39.41
 40.20

500 per week 52 weeks =

42.
 25.
 210
 84
 1050000

9" H E Shell M II L Solid or Forged Blank Horn - Min -

Operation

for 5 per hr
Equipment

No 1 -	Centering		05	1 -		350.00
2 -	R. turning	2	30	12 Machs		24000.00
3 -	Boring	3	00	15 "		30000.00
4 -	Fin Turn Body	1	00	5 "		10000.00
5 -	Facing to weight	1	30	8 " 32" lathe		16000.00
6 -	Threading nose	1	00	5 "		10000.00
7 -	Waring, & inducutty		30	3 "		6000.00
8 -	Pressing Copper band		05	1 " 1500Ham		2000.00
9 -	Copper Band turning		15	2 "		4000.00
10 -	Marking Base		10	1 " 0.10		800.00
11 -	Screwing Socket in place		5	2 equip		100.00
12 -	Turning Socket		15	2 Machs		3000.00
13 -	Making base plug	2	15	17 "		22000.00
14 -	Facing "		15	2 "		4000.00
16 -	Varnishing work		30			1000.00
17 -	Painting		30			200.00
		13	55	87 machs		133550.00
10% for deflection work		1	23	Motors		20000.00
		15	18			153550
Drilling		1		Equipment		160000.00
		16	18			

New Estimate

Blank cost

Blank net
royalty Fund

$$10\frac{1}{2} \text{ hr} + 10\% = 11.55 \text{ hrs Pro L}$$

$$\begin{array}{r} 11.55 \text{ hrs } 13.2 @ 40 \text{ } 45 = 4.62 \\ 11.57 \text{ hrs } 13.2 @ 50 \text{ } 60 = 6.35 \end{array} \quad \begin{array}{r} 5.28 \\ 7.26 \end{array}$$

Plant 225,000 on 25000
Shells ~~257,000~~ 257,000

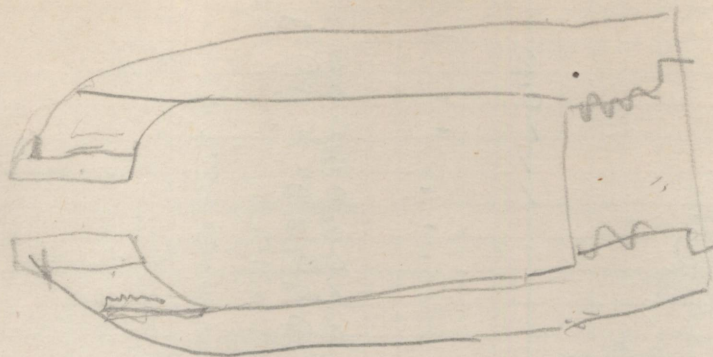
Profit 100 pth

$$\begin{array}{r} = 9.00 \\ = 11.55 \\ \hline 31.52 \end{array} \quad \begin{array}{r} 10.28 \\ 13.20 \\ \hline 36.02 \end{array}$$

For 2 year Contract -
deduct

$$\begin{array}{r} 4.50 \\ \hline 27.02 \end{array} \quad \begin{array}{r} 5.14 \\ \hline 30.88 \end{array}$$

14 6000
70000
32
140
350



9.2" Shells require for 5 per hour

10-- 36" x 14' Projectile Lathes
24-- 30" x 13 $\frac{1}{2}$ ' Pond D.B.G. Lathes
7-- 26" x 12' C.M.C. Lathes
4-- Bertram Axle Lathes
1-- Marking Machine
1-- Hydraulic Press
1-- Drill for Centering

48- Machines

Sheet 1 *Equipment for 8 per hr 9.2 H.E. Steel & Forging*
rough machine *2nd machine* *by page*

Operat Number	Name of machine 1 Forging + Finishing	No Wanted	Delivery		Price duty Paid	Time
			numb	month		
1	Cutting off open End	2			3050	
Centering 1 1/2	Centering - Radial or other drill	1			1000	5 min
2	Pond 36x20' 1/2 Triph Gears motor drive lathe	12		Feb	46170 5690	90 min
3	Pond 36x20' 1/2 Triph Gears motor drive lathe	10	8	Jan	79245	120 min
4	Pond 30x13 DB & Lathe all Belt drive	5	5	Jan	13915	60 min
5	Pond 30x13 1/2 DB & Lathe 3 motor 2 Belt	7		Dec	19467	90 min
6	CMC - 26x12 DB & Lathe Belt drive	5		Jan	19750	60 min
7	Bertram No 6 Single axle lathe to have modified construction and on special attachment. 10' Bed	3			9000	30 min
8	Goldie + Mc Hydraulic Press including Pump + accumulator (Ent)	1		Mar	3000 2200	5 min
9	Bertram No 6 Single axle lathe with band attach Belt dr no Saddle - 10' Bed	2		Feb	5000	15 min
10	Brown Bore type marking machine	1		March	1100	12 min
11	Hand operation					
12	CMC - 26x12 Engine Lathe Belt dr	1		Jan	1950	12 min
13	Pond 30x13 1/2 DB & Engine Lathe Belt dr	5	4	Jan	13905	60 min
14	CMC - 26x12 DB & Lathe Belt dr	1		Jan	1950	15 min
15	Varmishing inside and outside				214232	40 min

Sheet
2

Int. Equipment for 8 per the 9.2 HE Shells
forging to be made for machines

Operation no	Name of machine	No. Units	Delivery	Price per unit	Time
1 Centurion					
2 Rough Turn					
3 Boring					
4 Fin Body Turn					
5 Face to lat					
6 Bore of face not					
7 Name & material					
8 Press on Box					
9 Opposition turn					
10 Marking Base					
11 Scr Socket					
12 Turn Socket					
13 Turn Base Plug					
14 Face Plug					
15 Turning & Borelines					

40
✓ 0
36
11
10
16
10
6
199

Shell Committee

Ottawa, Ont.

Oct. 5th 1915

Gentlemen:-

We wish to acknowledge receipt of your inquiry of the 28th regarding shells set forth in your drawing C-147 and the specification covering same for 8" Howitzer Mark III shells.

We have carefully gone over the cost in connection with the manufacture of this shell and make you the following offer:- For a minimum order of 70,000 shells, to be delivered at the rate of 1000 to 1400 per week, the price will be thirty dollars per each shell, finished to your specification, fob. cars our works Dundas. This estimate covers machining from the hollow forged blank, which must be furnished by the forge rough machined and cut to length.

If you are interested in a price for the same shell machined from the solid, our figure would be thirty two dollars.

We shall be glad to undertake the manufacture of this or the 9.2 shell in quantities as per the above number or greater, as we would increase our plant to suit the conditions.

Yours very truly,

Treasurer

HB/EMH

LATHES ORDERED

- 40- Pond 36" x 20' Triple Geared Projectile Boring Lathes, 20 HP
4-1 Variable Speed Motor.
Price arranged for 20 HP 375-1500 rpm 220 volt motor D.C. with
reversing controller and resistance drum, but without
electrical equipment, fob Buffalo, each - - - - - \$5730.00 ea

SHIPMENT, - 8 - January
16 - February
16 - March
10 more April and May

- 50- Pond 36" x 14' Triple Geared Quick Change Gear Engine Lathes,
arranged for variable speed 15 HP 220 volt motor, 400-1500 rpm.
Price without motor, fob cars Hamilton - - - - - \$3250.00 ea.

SHIPMENT, - 25 - February
25 - March

- 36- Pond 36" x 14' Triple Geared Quick Change Belt Driven Lathes
Price fob cars Chicago, Ill. - - - - - \$2850.00 each

SHIPMENT: 4 - January
16- February
16- March

- 11- Pond 36" x 14 ft Double Back Geared quick Change Gear Belt driven
Lathes
Price fob cars Plainfield N J - - - - - \$2220.00 each

SHIPMENT: March

- 10- Pond 30" x 14' Double Back Geared Quick Change Belt driven Lathes
Price fob cars Plainfield N.J. - - - - - \$2060.00 each

SHIPMENT: March

Barret 25" x 15' Heavy Duty Projectile Boring Lathes, arranged
for 15 HP motor 4 to 1.
Price fob - - - - - \$3100.00 each

Norwood Eng. Co. 22" x 7' Belt Driven Lathes
Price fob cars - - - - - \$1280.00 each

Davis Rochester 22" x 8' or 10' Lathes belt driven
Price fob Rochester NY - - - - - \$

SHIPMENT: 25 per month beginning December

- 16 - 36" x 14' Belt driven Triple Geared Lathes)
10- 36" Boring Lathes) Shipment April and May
6- 36" x 16' Triple Geared motor driven Lathes)

Equipment required for machining 8" H.E. Shells 5 per hour
 Total cost

Opers		mach	no-mach	Cost per mach
1	Centering	5	1	
2	Rough turn	1 45	8	
3	Bore	2	10	
4	Finish body turn	1	5	
5	Face to weight core thread	1	5	
6	Thread nose of shell face	1	5	
7	Wave & undercut	20	3	
8	Turn copper band	5	1	
9	Copper band turn	15	1	
10	mark base	10	1	
11	Set up socket to place	5	1	
12	Turn socket	15	1	
13	make firm plug	1 45	8	
14	Face base plug in place	15	1	
15	Vanish over	15	5	1
16	Hand paint	15		
		10 30		

2mm

$$57 - @ 285 = 142500.00$$

$$63 - 3250 = 204750.00$$

$$6 - 3364 = 20184.00$$

$$10 - 5870 = 293500.00$$

$$12 - 2060 = 24720.00$$

$$9 - 2370 = 21330.00$$

$$9 - 2690 = 24210.00$$

$$36 = 2060 = 74160.20$$

$$24 = 2220 = 53280.00$$

$$40 - 3070 = 122800.00$$

$$\underline{981434}$$

$$245858$$

$$\underline{98143}$$

$$1,324,936$$

80

$$981434$$

due

$$981.434$$

$$39630$$

$$\underline{1021064}$$

$$24.3$$

$$\underline{80.2}$$

$$19.20$$

63 motors for 36 x 14'

6

18 " " 30 x 13 1/2

87 "

$$15 HP @ 470 = 32430$$

$$10 HP @ 400 = 7200$$

$$\underline{39630}$$

32

$$2910$$

$$\underline{210}$$

$$3710$$

$$\underline{3710}$$

$$\frac{18400}{7200}$$

$$240$$

$$301$$

$$300$$

$$\frac{241}{59}$$

October 12th 1915.

POND PROJECTILE LATHES

Code Word
UGAMA

20" x 9'3" POND HEAVY DUTY LATHE, 3' between centers;
quick change gear for feed and screw cutting;
center rest; steel gears; 18" 4-jaw ind. steel chuck;
15 HP 2/1 D.C. motor. (Photo. 50361)

NET WEIGHT including motor - 10700#
" " without " - 9500#

NET PRICE fob our works, including motor \$3,520
" " " " " without motor 3,185.

DEDUCT for Center Rest, if not wanted, 200# 45.

Code Word
UGAND

24" x 9'3" POND HEAVY DUTY LATHE, 3' between centers;
21" 4-jaw ind. steel chuck. (Other specific-
ations same as 20" lathe above). (Photo 50365).

NET WEIGHT, including motor - 11200#
" " without " - 10000#

NET PRICE, fob our works, including motor 3,570.
" " " " " without motor 3,235.

DEDUCT for Center Rest, if not wanted, 250# 50.

DEDUCT if screw cutting is not wanted (on either 20"
or 24" lathe) NET 150.

PER FOOT EXTRA for either 20" or 24" Lathe.

Net Weight - 300#

Net Price, fob our works 40.

UGOL

TAPER ATTACHMENT for either 20" or 24" lathe - EXTRA

Net Weight - 350# (Photo. 50366)

Net Price, fob our works 200.

Code Word
UGAOL

30" x 14' POND HEAVY PROJECTILE TURNING LATHE, 4'6"
between centers; steel gears; center rest;
forced lubrication; 35 HP 3/1 D.C. motor. (Photo 50345)

NET WEIGHT including motor - 26500#
" " without " - 22900#

NET PRICE, fob our works, including motor 6,100.
" " " " " without motor 5,295.

DEDUCT for Center Rest, if not wanted, 625# 105

PER FOOT EXTRA:

Net Weight - 450#

Net Price, fob our works

UFKAL

RADIUS LINK POINT FORMING ATTACHMENT - EXTRA (Photo 50379)⁵²

Net Weight - 1700#

Net Price, fob our works 400.

Code Word 30" x 18' POND HEAVY PROJECTILE BORING LATHE; 7 ft.
UGAPA between face plate and end of boring bar;
center rest; steel gears; forced lubrication; 35 HP
3/1 D.C. motor. (Photos 50376-7)

NET WEIGHT, including motor - 28800#
" " without motor - 25200#

NET PRICE, fob our works, including motor \$6,400.
" " " " " without " 5,595

DEDUCT for Center Rest if not wanted, 625# 105

PER FOOT EXTRA : (Two extra feet of bed required to
bore 1 extra foot of length)

Net Weight - 450#

Net Price fob our works 52

Code Word 36" x 20' POND HEAVY PROJECTILE BORING LATHE: 8 ft
UGARU between face plate and end of boring bar;
center rest; steel gears; forced lubrication; 35 HP
3/1 D.C. motor. (Photos 50357-8)

NET WEIGHT including motor - 35400#
" " without " - 31800#

NET PRICE fob our works, including motor 8,100.
" " " " " without " 7,295.

DEDUCT for Center Rest if not wanted, 625# 105

PER FOOT EXTRA: (Two extra feet of bed required to
bore 1 extra foot of length)

Net weight - 500#

Net Price fob our works 60

DELIVERY: Apply for delivery on any of the above lathes

October 12th 1915

SHELL ATTACHMENTS FOR POND LATHESPRICES and WEIGHTS are NET

CODE	ATTACHMENTS	24" HD	26" DBG	30" DBG	36" DBG	36" TG.
UFJEL	Boring Attachment and Bar, per photo #50368	2300# \$715	2200# \$700	2700# \$730	3200# \$780	3200# \$780
UFJIM	Boring Attachment with Swiveling Bar, including steel former on rear of carriage. (Per Fig.2).....	\$715 2300#	\$700 2200#	\$730 2700#	\$780 3200#	\$780 3200#
UFZEE	Boring Tailstock, Support and Feed Gears (Photos 50371-2 & 50256-50257 With boring tailstock the maximum dist- ance between faceplate and end of boring bar (with standard length of bed) is	\$920 2600# 1'10"	\$920 2600# 2'10"	\$1225 3700# 1'3"	\$1560 5700# 3'0"	\$1920 8100# 2'10"
NOTE: For each additional foot to bore add two feet of bed, as per Price List.						
UFJON	Deduct for regular tailstock if not wanted	\$125 740#	\$80 430#	\$130 760#	\$150 1000#	\$165 1200#
UFJUR	Deduct for regular carriage, leadscrew and feed gears, if not wanted ..	\$480 1400#	\$265 1100#	\$340 1500#	\$370 1700#	\$440 2100#
UFKAL	Point Forming Attachment, Radius Link Type, without link or former (Photos 50255, 50385-6)	\$310 1100#	\$270 400#	\$340 1500#	\$370 1600#	\$400 1700#
UFKAD	Extra for Link	\$11 20#	\$11 20#	\$11 20#	\$11 20#	\$11 20#
UFKAF	Extra for former for one size projec- tile	\$75	\$75	\$75	\$75	\$75
UFKAN	Waving Attachment with 4 sided turret tool post(similar to Fay & Scott style G)on rear of carriage (Photo 50373-4)	\$660 1000# 9" tur- ret	\$750 1200# 9" tur- ret	\$785 1400# 9" tur- ret	\$865 2850# 10½" tur- ret	\$890 2900# 10½" tur- ret
UFKAR	Deduct for Turret Tool Post if furn- ished by customer	\$120 175#	\$120 175#	\$120 175#	\$140 250#	\$140 250#

CODE	ATTACHMENTS	24" HD	26" DBG.	30" DBG.	36" DBG	36" TG
UFKEM	Band Forming Attachment with 1 steel former, including 4 sided turret. tool post (similar to Fay & Scott style G) on rear of carriage..... (Photos 15605 & 50384).....	\$460 575#	\$450 525#	\$480 1050#	\$530 1150#	\$540 1200#
UFKIN	Deduct for Turret Tool Post, if not wanted, or if furnished by customer	9" tur- ret \$120 175#	9" tur- ret \$120 175#	9" tur- ret \$120 175#	10½" tur- ret \$140 250#	10½" tur- ret \$140 250#
UFKOK	*Hexagonal Turret on Carriage, similar to Fay & Scott style O (Photos 15592 & 50382	17½" \$225 1000#	15½" \$200 900#	15½" \$200 900#	17½" \$300 1200#	22" \$300 1200#
UFKUP	*Four Sided Turret Tool Post (Similar to Fay & Scott style G) interchangeable with compound rest... (Photo #15402)	9" \$160 175#	9" \$160 175#	9" \$160 175#	10½" \$190 250#	10½" \$190 250#
UFKVO	*Deduct for Compound Rest if not wanted	\$75 3 00#	\$70 230#	\$75 300#	\$85 350#	\$100 400#
UFLAC	Four Jaw Independent Steel Chuck fitted to faceplate (Similar to Horton Model #60)	20" \$100	22" \$110	26" \$160	30" \$235	30" \$235
UFLAF	Three Jaw Univ. Steel Chuck fitted to faceplate (sim.to Union model#123)	18" \$135	21" \$195			
UFERL	Hollow spindle	\$40	\$35	\$40	\$45	\$60
UFLAM	Deduct for Center Rest, if not wanted	\$50 250#	\$45 160#	\$50 220#	\$55 300#	\$65 375#

*When carriage is equipped with Turret Tool Post in place of regular compound rest, allow for compound rest, if not wanted, as per price given.

The Standard Ideal Company Limited



PORT HOPE, ONTARIO
CANADA

THE LARGEST EXCLUSIVE CAST IRON ENAMELING
SANITARY WORKS UNDER THE BRITISH FLAG



#1 -	3050.00
1 1/2 -	1000.00
2 - 36 x 14 - DBG	21000.00
3 - 5 - Boring Laths	40000.00
4 - 5 - Pine Laths	13900.00
5 - 5 - Pine Laths	19467.00
6 - 3 Cmc	6000.00
7 - 2 Ash Laths	6000.00
8 - 2000# Hammer	2300.00
9 - 1 - Laths	2500.00
10 - Hand	
11 - "	
12 - 1 - Cmc	1950.00
13 - 5 - 30' Pine	13900.00
14 - Cmc	1950.00

133027
4
532.

CONFIRMATION

sent 3.28
TELEGRAM.

The John Bertram & Sons Co., Limited

C.P.R. - PAID

DUNDAS, ONTARIO

Send the following message, without repeating, subject to the terms and conditions printed on the back of regular message blank, which are hereby agreed to.

Nov. 11th 1915

J.J. Carrick,
Hotel Blackstone,
Chicago, Ill.

Our experts have returned after visiting works making nine point two shells and report great reduction in output from one machine. We now estimate a machine plant capable production two thousand per week will cost in round figures five hundred thousand. Our option expires Friday night. If interested wire me Chateau Laurier Ottawa.

H. Bertram

Canadian Pacific Railway Company's Telegraph



IN CONNECTION WITH THE

COMMERCIAL CABLE CO. COMMERCIAL PACIFIC CABLE CO.
BRITISH PACIFIC CABLE BOARD
HALIFAX-BERMUDAS AND WEST INDIES CABLES

REACHES ALL PARTS OF THE WORLD

READ THE NOTICE AND AGREEMENT ON THE BACK

J. McMILLAN,
Manager Telegraphs, Montreal.

SENT NO.	SENT BY	REC'D BY	TIME SENT	TIME FILED	CHECK
6	R. H. Mc	My	1:30		27

Send the following Message, subject to the terms printed on the back hereof, which are hereby agreed to:

To ^S Montreal Que 11 _____ Nov 11 _____ 1915

To J. B. & Co.

Dundas

Carrick and Associates left for Chicago
last night will stop at Blackstone
I shall advise you wire there that
our machinery offer is only open until
Friday night.

John Bertram Horsfield

W. J. CAMP, Assistant Manager, Montreal, Que.	W. MARSHALL, Assistant Manager, Winnipeg, Man.
D. H. BOWEN, Supt., Sudbury, Ont.	R. N. YOUNG, Supt., Vancouver, B. C.
H. J. LILLIE, Supt., Toronto, Ont.	D. L. HOWARD, Supt., Calgary, Alta.
A. C. FRASER, Supt., Montreal, Que.	D. COONS, Supt., Moose Jaw, Sask.
W. M. GODSOE, Supt., St. John, N. B.	E. M. PAYNE, Supt., Winnipeg, Man.

It is agreed between the sender of the message on the face of this form and this Company, that said Company shall not be liable for damages arising from failure to transmit or deliver, or for any error in the transmission or delivery of any unrepeatd telegram, whether happening from negligence of its servants or otherwise, or for delays from interruptions in the working of its lines, for errors in cypher or obscure messages, or for errors from illegible writing, beyond the amount received for sending the same.

To guard against errors, the Company will repeat back any telegram for an extra payment of one-half the regular rate, and in that case it shall not be liable for damages beyond fifty times the amount received for sending and repeating.

Correctness in the transmission of messages can be insured by contract in writing, stating agreed amount of risk, and payment of premium thereon at the following rates, in addition to the usual charge for repeated messages, viz.: one per cent. for any distance not exceeding 1,000 miles, and two per cent. for any greater distance.

This Company shall not be liable for the act or omission of any other Company, but will endeavor to forward the telegram by any other Telegraph Company necessary to reaching its destination, but only as the agent of the sender and without liability therefor. The Company shall not be responsible for messages until the same are presented and accepted at one of its transmitting offices; if a message is sent to such office by one of the Company's messengers, he acts for that purpose as the sender's agent; if by telephone, the person receiving the message acts therein as agent of the sender, being authorized to assent to these conditions for the sender. This Company shall not be liable in any case for damages, unless the same be claimed, in writing, within sixty days after receipt of the telegram for transmission.

No employee of the Company shall vary the foregoing.

No 6 Aule Lather for 9.2 Shell

Operation 7- Wave + undercut 3 machines 10'

9- Copper Band turn 1 " 10' Bed

There would be short beds and belt driven
with less gear power than for Rough turning

Roughing Lather 10'

Boring " 12'

Nov. 11, 1915.

Equipment proposed for machining operations-High Explosive
9.2 Howitzer shells, Mark 2, from the rough forgings, at the
rate of 20 per hour.

OPER. 1 Drilling center hole and facing nose of shell

6- Radial Drills, 5 ft Plain with speed box drive.
Price each \$1670.00 \$10020.00
Operation time 20 minutes

OPER. 2 Cut off open end

6- Hall & Sons Cutting Off Machines
Price each fob Brantford, Ont. - - \$1677.00 10062.00
Operation time 20 minutes.

OPER. 3 Rough turn

36" x 14' T.G. lathes \$4387 14
30- 36" x 14' Pond Double Back Geared belt driven
engine lathes,
Price each duty paid Plainfield - \$3000.00 90000.00
Operation time 90 minutes.

OPER. 4 Bore *Rough & Finish Bore*

20- 36" x 20' Pond Projectile Boring Lathes
with motors
Price each duty paid U.S. point - \$7925.00 158500.00
Operation time 60 minutes.

20
20
90
60
45
40
15
40
3
12
12
60

39 620-0

✓ OPER. 5 Finish body turn

15- Pond 30 x 13½ ft Double Back Geared belt
driven lathes.
Price each duty paid Plainfield, \$2781.00 41715.00
Operation time 45 minutes

✓ OPER. 6 Bore and thread nose

13- C.M.C. 26 x 12' D.B.G. belt driven lathes
Price each fob Galt, Ont. \$1950.00 - 25350.00
Operation time 40 minutes

60 / 417

✓ OPER. 7 Wave and undercut

5- Bertram Axle Lathes with attachments
Price each fob Dundas - \$3000.00 15000.00
Operation time 15 minutes.

✓ OPER. 8 Counterbore and thread base

13- Pond 30" x 13½ ft D.B.G. belt driven lathes
Price each duty paid Plainfield - \$2781.00 36153.00
Operation time 40 minutes.

OPER. 9 Press band

1- 2000# Bertram Steam Hammer
Price fob Dundas-
Operation time 3 minutes.

\$2200.00

OPER. 10 Turn copper band

4- Bertram Special Axle Lathes with attachts.
Price each fob Dundas - \$2500.00
Operation time 12 minutes

10000.00

✓ OPER. 11 Facing base plug in position

4- C.M.C. 26 x 12' D.B.G. belt driven lathes
Price each fob Galt, Ont. - \$1950.00
Operation time 12 minutes.

7800.00

✓ OPER. 12 Turning base plug

20- Pond 30 x 13½ ft D.B.G. belt driven lathes
Price each duty paid Plainfield, \$2781.00
Operation time 60 minutes.

55620.00

\$462420.00

To the above prices it will be necessary to add price
of turrets, special forming attachments, special chucks,
and high speed tools.

3600

15800

9' 2" shell H - M - machine

500 per week

No. 1 -	Centering		.05	1
2 -	R. turning	2 -	30	12
3 -	Boring	3 -	00	15
4 -	Fin Turning Rod	1 -	00	5
5 -	Facing to 1st	1 -	30	8
6 -	Threading nose	1 -	00	5
7 -	Waring: rudiment		30	3
8 -	Pressing Cup per hour		05	1
9 -	Turning band		15	2
10 -	Marking base		10	1
11 -	Screws, sockets, & fls		5	2 gup
12 -	Turning sockets		15	2
13 -	Marking base fls	2 -	15	11
14 -	Facing " "		15	2
15 -	Grinding		30	
17 -	Painting		30	

100% for bad work

13 -	15
1 -	23
<hr/>	
14 -	78
<hr/>	
15 -	18
1 -	00
<hr/>	
16 -	18

Drills

Reckon time gfs. open end part of But. Square
Centered and whole outside rough machined to 16th 1/2
add for abm work

4 -
Hrs. 20. 4 1/2

16 -	18
15	
80	
16	13 - 30
<hr/>	
240	
18	
<hr/>	
258	

9.2 " Equipment for Bertram 197.001⁰⁰
5 per hour
225,000

~~\$222~~
25.00-00
420
197421-⁰⁰

8 " Equipment for Bertram 237,711⁵⁰
10 per hour
272,000

~~\$~~
35.
272-⁰⁰

The Standard Ideal Company Limited



PORT HOPE, ONTARIO
CANADA

THE LARGEST EXCLUSIVE CAST IRON ENAMELING
SANITARY WORKS UNDER THE BRITISH FLAG



F290 Standard
Steel
Sink

Montreal. Young

Price. Estimate on time. Duggan

27⁰⁰

*30% less 2000
fringe - 2000*

*27.00
24000
5400.000*

20-

6.000

*8. / 4000 / 500
40 166*

200

*4000
8*

2 1/2

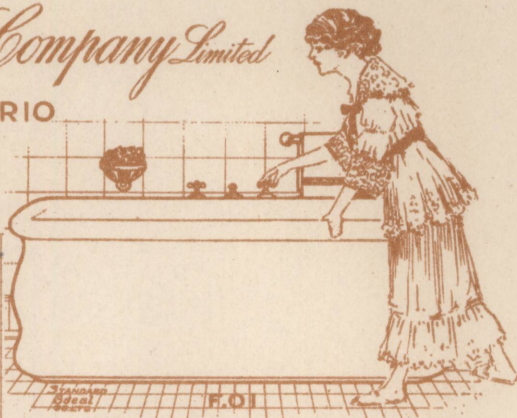
2.5 / 500.0 / 2



The Standard Ideal Company Limited

PORT HOPE, ONTARIO
CANADA

THE LARGEST EXCLUSIVE CAST IRON
ENAMELING SANITARY WORKS UNDER THE BRITISH FLAG

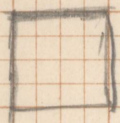


3 days. 170 stat
for 4.5

55.00 Jan. 27.01

100.00 9.2 frogs
200.00 " machine

(4)



8"
9.2
6"
60%

50% brass
\$ 7.75 for 6" shell
3.50 - 4.50

Hardware 37.50. for 8" 3000 pint

19.50

18.00 for frogs

The Standard Ideal Company Limited



PORT HOPE, ONTARIO
CANADA

THE LARGEST EXCLUSIVE CAST IRON ENAMELING
SANITARY WORKS UNDER THE BRITISH FLAG



Canada Cement -
100,000 - 9.2 freight
200,000 " " + machining
price \$5500

MONTREAL
42 BEAVER HALL HILL

TORONTO
119 KING ST. EAST

WINNIPEG
76-82 LOMBARD ST.

VANCOUVER
410 CARTER COTTON BLDG.

8" and 9.2" BERTRAM SHELL EQUIPMENT

8" Shells require for 10 per hour

14--- 36" x 14' Projectile Lathes
17-- 30" x 13 $\frac{1}{2}$ " D.B.G. Lathes
29-- 26" x 12' C.M.C. Lathes
7-- Bertram Axle Lathes
1-- Marking Machine
1-- Hydraulic Press
1-- Drill for Centering

70-- Machines

PLANT EQUIPMENT for 10 per hr. 8" HIGH EXPLOSIVE SHELLS-MarkIII
Shells rough machined by Forge

OPERATION NUMBER	Name of Machine	No. Wanted	DELIVERY		PRICE		Time Limit
			No.	Month	Duty	Paid	
1 Centering	Radial or Vertical Drill with fixture	1				1,000.00	5 Min.
2 Rough turn	Pond 30" x 13 $\frac{1}{2}$ " DBG Lathes belt drive	9				25,569.00	90 Min.
3 Boring	Pond 36"x 20' Projectile Boring Lathes Motors	14 14				108,297.00 8,820.00	90 Min.
4 Finish turn body	C.M.C. 26" x 12' DBG Lathes	8				14,300.00	45 Min.
5 Face to weight Cbore & thread	C.M.C. 26"x12' DBG Lathes	10				17,875.00	60 Min.
6 Ream, face thd. nose	C.M.C. 26" x 12' DBG Lathes	5				8,937.50	30 Min.
7 Wave & Und.	Bert. Spec. Axle Lathe	4				8,000.00	20 Min.
8 Press Band	Goldie & McC.Hyd. Press & Pump or 2000# Steam Hammer	1				3,000.00	5 Min.
9 Turn Band	Bert. Special Axle Lathe	3				6,000.00	18 Min.
10 Mark Name	Special Stamping Press	1				1,200.00	6 Min.
11 Screw soc- ket in place	Hand operation						15 min
12 Turn Sock.	C.M.C. 26" x 12' DBG Lathes	3				5,362.50	15 Min.
13 Turn base plug	Pond 30" x 13 $\frac{1}{2}$ " DBG Lathes	8				22,728.00	45 Min.
14 Face plug	C M.C. 26"x12' DBG Lathes	3				5,362.50	15 Min.
15 Paint & Varnish	Brantford Special oven						40 Min.

236451.50
1305
237651.50
Shes.
4 minutes

Plant equipment for 10 pr. hour 8" H. S. #1 shells
shells rough machined by forge

Oper -number	Name of machine	no. wanted	Delivery		Price duty pd	Time limit
			no	months		
Centering	Radial or vertical drill with fixture	1	11 add 25	25	1000 00	5 min
2 Rough turn	Pond 30 x 13 1/2 DB4 lathe drive	9	3-		25569 00 8 523	90 min
3 Boring	Pond 36 x 20 Projectile turning lathe, motors	14 14	4-		10829 00 8820 00	90 min
4 Final turn body	C.M.C. 26 x 12 DB4 lathe	8	2		14300 00 3575	45 min
5- Face & weight Chamfer	C.M.C. 26 x 12 DB4 lathe	10	2		17875 00 3575	60 min
6 Ream, face & thread nose	C.M.C. 26 x 12 DB4 lathe	5	2		8937 50 1788	30 min
7 Wash & inducement	Bertram special axle lathe	4	1		8000 00 2000	20 min
8 Press band	Soldie & McCallock Hydraulic pump & pump or 2000 lb steam hammer	1			3000 00	5 min
9 Band turn	Bertram special axle lathe	3	1		6000 00 2000	18 min
10 mark name	Special stamping press	1			1200 00	6 min
11 Screw socket in place	Hand operation					
12 turn socket	C.M.C. 26 x 12 DB4 lathe	3	1		5362 50 1788	15 min
13 turn base plug	Pond 30 x 13 1/2 DB4 lathe	8	2		22728 00 5682	45 min
14 face plug	C.M.C. 26 x 12 DB4 lathe	3	1		5362 50 1787	15 min
15 Paint ramish	Brantford special oven				223540 277158	40 min

FORGING EQUIPMENT FOR MACHINING 6, 8, and 9.2 shells

6" H. E. Shells) 8 plants required capacity 25 per hour
22,000 per week wanted) would take each
or 3666 per day)
or say 183 per hour) 3- 7" Cutting Off Machines for
20 hour day) open end
19- Heavy Duty Lathes
Operation time rough turn shell 3/4 hour.

8" H. E. Shells) 6 plants required capacity 25 per hour
16000 per week wanted) would take each
or 2666 per day)
or 133 per hour) 6- Cut Off Machines
20 hour day) 31- Heavy Duty Lathes
Operation rough turn shell 1-1/4 hrs.

9.2" H. E. Shells) 5 plants required capacity 5 per hour
3000 per week wanted) would take each
or 500 per day)
or 25 per hour) 2- Cut Off Machines
20 hour day) 6- Heavy duty lathes
Operation time rough turn shell 1-1/2 hrs.

For forge plants would require - 24- Cut Off Machines)
152- Heavy Duty Lathes) for 6" shell
36- Cut Off Machines)
186- Heavy Duty Lathes) for 8" shell
10- Cut Off Machines)
30- Heavy duty lathes) for 9.2" shell

HEAVY DUTY LATHES- 366
CUT OFF MACHINES - 70

Bertram plant required for 8" High Explosive Shells machine work to be done at the rate of 10 per hour.

OPER. 1 Centering

Time one shell 7 hrs. 34 mins.

1- Bertram Drill Press with fixture
Time one shell five minutes

OPER. 2 Rough turn to length, rough out wave groove and round corner.

14- Pond 36 x 14 ft Triple Geared Motor Driven lathes
Time operation on one shell 1-1/2 hours.

note

If the forgings are rough turned by the Forge plant, reduce the time on this operation to one hour, and cut off five machines which would make nine instead of fourteen.

OPER. 3 Boring.

14- Pond 36 x 20 ft Projectile Boring machines
Operation on each shell 1-1/2 hours

OPER. 4 Finish turn body

8- CMC 26 x 12' Double Back Geared lathes.
Time per operation each shell 45 mins.

OPER. 5 Face to weight, counterbore and thread.

10 CMC 26 x 12' lathes.
Output per shell one hour.

OPER. 6 Ream, face and thread nose

5- 26 x 12' CMC lathes.
Time per shell, 1/2 hour

OPER. 7 Waving and undercutting

4- Bertram #6 Axle Lathes.
Per shell 20 mins.

OPER. 8 Press copper band

1- Bertram 2000# Steam Hammer
Per shell 5 mins.

OPER. 9 Copper band turning

3- Bert. Axle Lathes, with equipment.
Time 18 mins. per shell

OPER. 10 Marking base of shell

Special machine.
Time 6 mins. one shell

OPER. 11 Screw socket in place

Hand operation. or can be combined with

OPER. 12 Screwing in and turning off socket in place

3- CMC 26 x 12' lathes.
Time one shell 15 mins.

OPER. 13 Making base plug.

8- Pond 36 x 14' Triple Geared lathes
Time each shell 45 mins.

OPER. 14 Face off base plugs in position

3- CMC 26 x 12' lathes
Time 15 mins. one shell

allowance 40 min for varnish & paint

Machines on order with Niles-Bement-Pond Co., will give four equipments of larger machines, for this size work.

500
200

BERTRAM PLANT for 8" Shells -- 10 per hour

8 hr 4 m

OPER. #1 -- Centering

5 min 1- Bertram 45" Drill Press with fixture (say) 1,000.00

OPER. #2 -- Rough turn, trim to length, rough out wave groove and round corner

1 1/2 hr 14- Pond 36" x 14' Triple Geared Motor driven Lathes at \$3250.00 ea. Duty paid -- 64,425.00

OPER. #3 -- Boring

1 1/2 hrs 14- Pond 36" x 20' Projectile Boring Machines at \$5730.00 each Duty paid -- 108,297.00

OPER. #4 -- Finish turn body

45 min 8- Pond 30" x 14' D.B.G. Lathes belt drive at \$2060.00 each Duty paid --
or
8- CMC 26" x 12' D.B.G. Lathes at \$1787.00 ea. 14,296.00

OPER. #5 -- Face to weight, counterbore and thread

1 hr 10- Pond 36" x 14' D.B.G. Lathes belt drive at \$2220.00 each Duty paid --
or
10- C.M.C. 26" x 12' D.B.G. Lathes at \$1787.00 ea. 17,870.00

OPER. #6 -- Ream. face and thread nose

1/2 hr 10- CMC 26" x 12' Lathes at \$1787.00 each 17,870.00
5- 8,935.00

OPER. #7 -- Waving & Undercutting

20 min 4- Bertram No.6 Axle Lathes at \$3000.00 ea. 12,000.00

OPER. #8 -- Press copper band

5 min 1- Bertram 2000# S.F. Steam Hammer 2,200.00

BERTRAM PLANT for 8" Shells (Continued)

OPER. #9 -- Copper band turning

18 min 3- Bertram #6 Axle Lathes at \$3000.00 ea 9,000.00

OPER. #10 -- Mark Base

6 min 1- Special Machine (say) 1,000.00

OPER. #11 -- Screw socket in place

Hand operation

OPER. #12 -- Turn off socket

15 min 3- C.M.C. 26" x 12' Lathes at \$1787.00 ea. 5,361.00

OPER. #13 -- Make base plug

45 min 15- Pond 36" x 14' Triple Geared Lathes
at \$2850.00 fob Clicago Duty paid 42,750.00
7 1/2 21,375.00

OPER. #14 -- Face off base plugs in position

15 min 3- CMC 26" x 12' Lathes at \$1787.00 ea. 5,361.00

SUMMARY:

Operation #1	-	1,000.00
" #2	-	64,425.00 duty paid
" #3	-	108,297.00 " "
" #4	-	14,296.00 C.M.C.
" #5	-	17,870.00 C.M.C.
" #6	-	17,870.00 C.M.C.
" #7	-	12,000.00 Bertram
" #8	-	2,200.00 "
" #9	-	9,000.00 "
" #10	-	1,000.00 Marking
" #12	-	5,361.00 C.M.C.
#13	-	42,750.00 Duty paid
" #14	-	<u>5,361.00 C.M.C.</u>

\$301,430.00

301310.00

271,120.00

Thomson

Mr Bertram
according to our schedules machining time
on High Explosive shells is as follows.

60 pr. High Explosive	2 hours 37 min.
6" — —	4 — 49 —
8" — —	7 — 34 —
9.2" — —	10 — 19 —

G. N. Howard.

Re ~~Unleash~~ High Speed Steel
for manufacture of tool for war

9.2 I'll that Miss Hardy
said you wanted.

Think they might be rough loved in
 $1\frac{1}{2}$ hours each + handling time

C.J.D.

SHELL H.E.9.2" HOWITZER MARK II-L

Sept. 22nd 1915

Shell Committee,

Ottawa, Ont.

Gentlemen:-

Answering your inquiry of Sept. 8th, we have carefully gone over the various operations for machining the above shell, including the base plug and copper band, the socket machining only is included so far as finishing it to shape after being screwed in place, all component parts being furnished to us FOB. our works, properly tested to the requirements of your specifications.

For a minimum order of 25,000 shells to be delivered at the rate of 500 per week, the price would be \$42.00 per shell, FOB. cars our work, Dundas.

This estimate covers machining from the hollow blank, which must be furnished by the forge rough machined and cut to rough length.

If solid forgings are supplied the price may vary \$3.00 per shell higher,- it being understood that the party forging shall deliver same rough machined on the outside and cut to rough length.

We are of the opinion that for the first six months, shell can be delivered at the above rate but after six months, arrangements can be easily made to double the capacity, we to be guaranteed sufficient order for at least twelve to eighteen months work.

In the equipment for the work we figure to use such standard machines in our plant that are suitable, but for the capacity offered and to facilitate handling the shell at these figures, the manufacturer ought to be warranted at least twelve months orders.

Shell Committee - Ottawa

Sept.22/15

We would be pleased to discuss further with you this
offer.

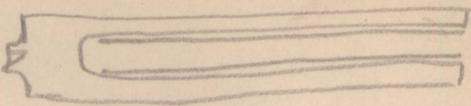
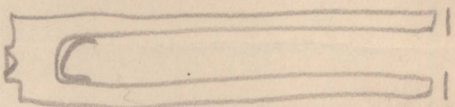
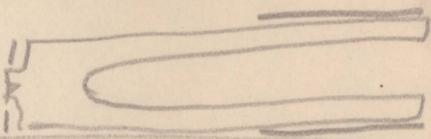
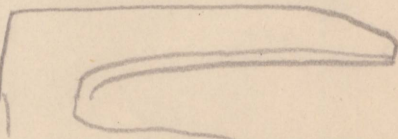
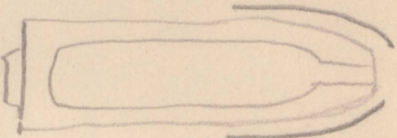
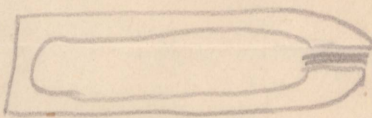
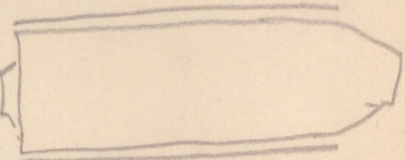
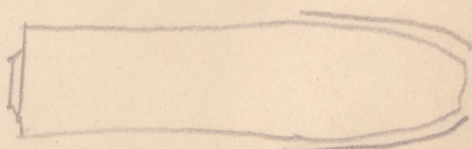
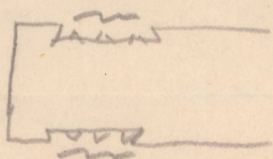
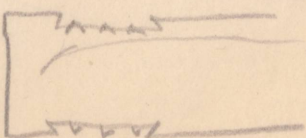
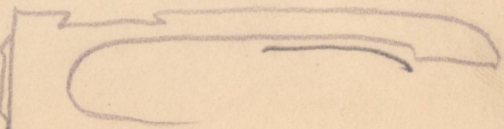
Yours very truly,

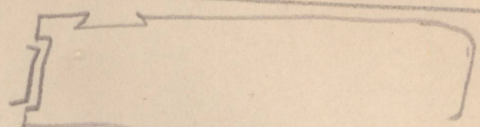
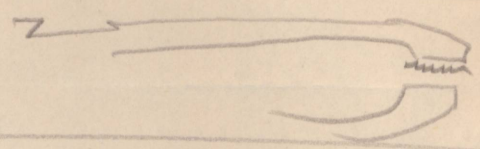
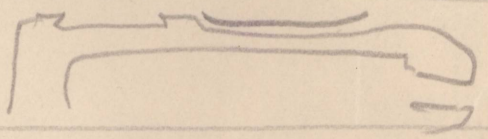
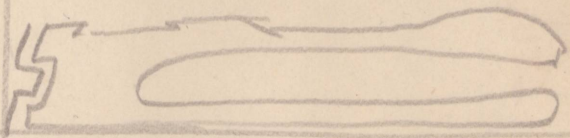
Treasurer

HB/EMH

9.2 Shell H E Operation

Part 1 List of operations with open end parted and Butt parted and centered and whole outside surface rough turned

1	Rough + finish Bore	2 hrs 15 mins	
2	Rough + finish Profile + face to length inspection of Bore by overseer	2 Hrs	
3	Cone for Heading + Face Base	35 mins	
4	Grinding Inside	25 mins	
5	Heading (Press House)	30 mins 2 men	
6	Bore + Face over	20 mins	
7	Finish Turn	45 mins	
8	Finish Turn Radius	1 hour 33 mins.	
9	Groove and undercut	25 mins	
10	Wane Groove	18 mins	
11	Draw Back neck to weight	1 Hour 15 mins	

12	Face off center face + Rad base bore + screw for die	1 Hr 30 min	
13	Screw nose for Bush	22 1/2 min	
14	Relieve Body To weight	40 min	
15	Fit in and Face Disc	1 Hr 15 min	
16	Chip File + Cross cut Wave groove	8 min	
17	Annual + Band Cope	10 min	
18	Turn Drilling Band	40 T	
19	Turn shims	30 min	
20	Final Gage weight and Stamp	20 min	
22	Grease Grind + Pack	8 min	

Total time equal for our man
16 hr 4 1/2 min

For rough turning turning band rough turned
add 4

Aug 1915

High Explosive 9.2 Howitzer
Mark II-L Shell

October 8th 1915

Shell Committee

Ottawa, Ont.

Gentlemen:--

Referring to our letter of the 22nd Sept. we find that an equipment now available for prompt delivery for this work will cost us considerably more than we estimated in our tender, which estimate for plant was based on prices for ordinary deliveries. Our over-head for plant investment will be considerably higher than estimated in our tender for shells and unless we were assured of larger orders, it would be necessary to ask leave to amend our price. We therefore request you to change our tender to read for 50,000 shells instead of 25,000 as shown.

We shall be glad to discuss the situation regarding machine tool conditons at any time you may desire.

Yours very truly,

Treasurer

HB/EMH

SHELL COMMITTEE

Brig.-Gen. A. Bertram
Chairman.

HON.-COL. D. CARNEGIE, M-INST. C.E. *Brig.-Gen. J. Benson*
ORDNANCE ADVISOR

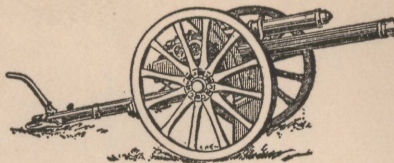
Master General of Ordnance

Hon. Col. T. Cantley

Hon. Lt.-Col. G. W. Watts

Mr. E. Carnegie

Mr. J. W. Borden



STEPHEN BUILDING
PHONE QUEEN 3034-5-6

Lt.-Col. C. Greville Harston

C. I. of Arms and Ammunition

Lt.-Col. F. D. Lafferty, R.C.A.

Supt. Dominion Arsenal

OTTAWA, ONT. September 8th, 1915

Messrs. John Bertram & Sons Co. Ltd.,

Dundas, Ont.

Gentlemen:-

We enclose herewith Drawings No. R.L. 22283 (1),
dated 29/3/15, and Specifications Nos. $\frac{L}{3352B}$ and $\frac{L}{3472A}$
covering 9.2" Shells; and also 6" Shell Drawing R.L. 22334A (1),
dated 11/5/15, together with Specifications $\frac{L}{3509}$ and $\frac{L}{3472B}$.

We shall be glad if you will state whether you
are prepared to undertake the machining of these shells if
the component parts are supplied to you, and at what price
and rate of delivery. Also at what price and rate per week
if a contract were placed with you for six months.

Yours very truly,

SHELL COMMITTEE

DC/CKW

A. Bertram

CHAIRMAN

ckw.

PROPOSED METHOD

for producing 9.2 High Explosive Shells from the solid

Steel billet would be cast about 12" in diameter and worked down under heavy hammer to 9-3/4" or 10". This would work up stock and give it the necessary toughness which would be equal to the same steel if forged to shape in an hydraulic press.

Bottom of shell would then be squared and shell cut off to desired overall length.

MACHINING OPERATIONS, as follows,--

OPER. #1-- Centering

In our own plant we would use one of our Horizontal Boring machines, and set the blank in "V" blocks, bringing same to central position, and having centre reamer in the spindle of machine.

TIME: 5 minutes each shell

OPER. #2 -- Rough Turning

Would recommend for this operation plain Axle Lathe, No.3 size, as being the best producer. Work however can be done on 32" to 36" Engine Lathes

TIME: 2½ hours each shell

OPER. #3 -- BORING

*Posd Estimate 1 hr
boring from facing
using special boring
lathe*

This shell can be rough drilled, rough and finished bored on Axle Lathe with suitable chuck to hold the end, and steady rest to support the body of shell. Axle lathe would be equipped with square bar for holding tools, this bar having rack cut in bottom side and being moved forward by pinion feed. Bar to be held in what ordinarily is a tailstock. Tools are rough forged tools, and for the roughing and finishing tool is made of acorn shape, carrying inserted H.S. Steel staggered cutters, for the finishing operation a tool of the same shape is provided with flat cutters running the whole length of the acorn.

TIME: 3 hours

OPER. #4 -- Finish Turn Body

Use Bertram No.3 Axle Lathe arranged with special forming Attachment holding the base of shell in compression chuck and nose of shell fitted in ball bearing centre fitted to the reamed hole.

TIME: One hour

L
3352B

(*Supersedes* $\frac{L}{2562}$)

This Specification, or any Patterns, Drawings, or other information issued in connection therewith, may only be used for a specific order, placed by an Officer of the War Department, and is not to be used for any other purpose whatsoever, without the express written sanction of the Army Council.

**Shell, B.L., high explosive, 9·2-inch Howitzer,
Mark II. | L |;**

forged steel, with fixing screw

Specification of Particulars as to sealed drawing, dimensions
and proof.

57
24
9935

Approved, 4th October, 1914.

NOTE.—This Specification is to be read in conjunction with the general specification to govern the manufacture and inspection of Shell, B.L. or Q.F., high explosive, forged steel, with adapters.

(1) The drawing mentioned in the general specification is R.L., No. 22,283, full size.

(2) *Proof* (*vide* general specification, clause 16).—The shell will be fired for recovery from a 9·2-inch B.L. Howitzer with such a charge as will give a chamber pressure not less than 13 tons per square inch.

H. GUTHRIE SMITH,

Director of Artillery.

WAR OFFICE.

*This Specification is to be returned to the Chief Inspector, Woolwich, on completion of the {tender.
contract.*

This Specification, or any Patterns, Drawings, or other information issued in connection therewith, may only be used for a specific order, placed by an Officer of the War Department, and is not to be used for any other purpose whatsoever, without the express written sanction of the Army Council.

Shell, B.L. or Q.F., high explosive, forged steel (fitted with adapter)

General Specification to govern manufacture and inspection.

57
24
1519

Approved 22nd June, 1915

NOTE.—The following specification contains conditions which apply to all shells, B.L. or Q.F., high explosive, forged steel, fitted with adapters. A separate specification has been prepared with regard to each calibre of shell in which are laid down the particulars of the sealed drawing, dimensions and proof.

The general specification is to be read with the particular specification for the calibre of shell ordered.

1. *Dimensions.*—The general dimensions of the shells are to be in conformity with the drawing. Should any discrepancy be found to exist between the drawing and this specification, reference is to be made to the Chief Inspector, Royal Arsenal, Woolwich.

2. *Quality of Material.*—The shell is to be of forged steel of the best quality, homogeneous throughout and free from seams, flaws and piping. It must be manufactured:—

- (a) In the case of shells for guns above 6 inches in calibre, by the “acid open-hearth,” “electric furnace” or “stock-converter” process.
- (b) In the case of shells for guns of 6 inches calibre and below, and for all howitzers, by the “acid or basic open-hearth,” “electric furnace,” or “stock-converter” process.

If made by the “stock-converter” process, non-phosphoric pig iron must be used.

The composition of the steel will be determined by analysis. Apart from the iron, the following chemical elements may occur in the percentages shown in the Table, viz.:—

	Min. per cent.	Max. per cent.
Carbon.....	—	0·55
Nickel.....	—	0·5
Silicon.....	—	0·3
Manganese.....	0·4	1·0
Sulphur.....	—	0·05
Phosphorus.....	—	0·05
Copper.....	—	0·1

The Contractor will take no steps to introduce into the composition of the steel any special ingredient (*e.g.*, chromium, aluminium) without information being given previously to the Inspecting Officer.

Should the Contractor, in making tests for his own information, find that any sample contains any constituents additional to those named in the Table, he is to call the attention of the Inspecting Officer thereto.

3. *Inspection of Ingots and Billets.*—The ingots for shells and adapters must be top-poured, and will be submitted to the Chief Inspector, Woolwich, or an Officer deputed by him, at the Contractor's works, who will make the necessary arrangements to have 20 per cent. cut off the top end of each ingot, and such further portion as may be necessary to ensure complete removal of the piping.

If it is desired to use bottom-poured ingots, the written permission of the Chief Inspector, Woolwich, must be obtained, and in this case the discard will be 25 per cent., a portion thereof being taken from the bottom of the ingot. The proportion taken from the bottom to be left to the discretion of the Inspector.

The portion to be cut off is to be removed by sawing and breaking after the ingot, or partially forged ingot, has cooled down, and such parting, in the case of a partial forging of an ingot, should be effected through a section of the ingot which has not been forged. Contractors who have not the necessary plant for cutting the discard from the ingot cold will be allowed to roll or forge the ingot to billet size before removal of the discard. The area of the fractured part will be 1/6th of the sectional area of the ingot if only one shell is to be made from it, and 1/12th if more than one shell is to be made from it.

If only one shell is to be made from an ingot, the latter, after removal of the discard, will be inspected and stamped in such manner as will ensure the base of the shell being towards the bottom of the ingot.

Such marking as may be necessary to identify the steel makers' cast and ingot numbers will be maintained by the Contractor upon every shell and adapter throughout manufacture. Where hollow-forged shell are submitted for test by day's work of drawing, the date of drawing must be similarly maintained.

The adapters are to be so forged that the longitudinal axis of the adapter is at right angles to the longitudinal axis of the original ingot, and they are to be stamped in such a way as to ensure this.

4. *Treatment.*—No hardening, toughening in oil, or process of a like nature is permitted.

5. *Tests.*—Mechanical tests will be taken as follows:—

(a) Longitudinal tensile and compression tests cut from the walls of at least 1 per cent. of the shells of every cast. Where hollow-forged, shell may be submitted in batches containing all the shell of any one day's work of drawing.

(b) The Contractor should so mark the adapters that the original direction of forging or rolling may be recognised, and the axes of the test pieces may, if the Contractor so desires, be placed parallel to it.

Tests will be taken from 1 per cent. of the adapters of every cast after final forging, tangential to the bottom of the cavity or cut from a disc at the outer end of the adapter at the option of the Contractor.

They must be capable of standing the following tests:—

TENSILE

	Tenacity, tons per square inch		Elongation in a 2-inch test piece, or such piece as can be cut from the shell or adapter provided that $\frac{\text{length}}{\sqrt{\text{area}}} = 4$. (Minimum)
	Yield (Minimum)	Breaking	
Shells ..	19	35 to 49	17 per cent.
Adapters ..	19	35 to 49	17 "

COMPRESSION

A cylinder, of length equal to diameter, will be cold compressed to half its original length, and must stand this test without cracking.

If any one or more of the conditions in this clause be not complied with, the cast or batch of shells or adapters affected will be rejected and must not be re-submitted without permission.

CLASS "C" METAL

The Contractor will supply free of charge, the necessary metal for testing, if requested by the Chief Inspector, Woolwich, to do so. The pieces should not be less than 7 inches in length, nor less than 1 inch in diameter.

Test pieces prepared from the above will be required to stand the following minimum tests.

TENSILE

Tenacity, tons per square inch		Elongation in a 2-inch test piece, or such a test piece as can be cut from the metal provided that $\frac{\text{length}}{\sqrt{\text{area}}} = 4$.
Yield	Breaking	
6	12	10 per cent.

This metal must not contain more than 0.1 per cent. of lead. Samples may be taken from the nose-bushes of the finished shell for testing and analysis, and must be replaced at the Contractor's expense.

In the case of shells under Clause 2 (b) the metal may contain up to 1 per cent. of lead, subject to the following conditions:—

- (1) The present mechanical tests of the Specification are to be adhered to.
- (2) The surface of the nose-bush where it is liable to come in contact with the explosive is to be well nickel-plated or tinned with pure tin.
- (3) The pure tin or nickel used for coating must not contain more than 0.1 per cent. of lead, and the coating is to be continuous and satisfactory as regards adhesion, in the opinion of the Inspector.

6. *Construction.*—The head of the shell is to be struck with the radius shown on the drawing, the point being truncated and screwed to receive the nose-bush or fuze. No sharp edge is to remain at the cavity end of the fuze hole threads, which should be chamfered if necessary.

The shells and adapters are to be turned and finished to the form and dimensions shown on the drawing.

The base of the shell will be screwed internally, as shown on the drawing. The adapter will be screwed externally, as shown on the drawing; the threads are to be a tight fit with those on the shell, and there must be no appreciable shake between the adapter and the shell when the former is screwed half-way home.

A groove for the driving band is to be turned near the base and undercut, with the number of waved ribs shown on the drawing projecting on the bottom to prevent the driving band from turning on the shell.

Three chisel cuts may be made across the waved ribs in the groove for the driving band at an angle to the longitudinal axis of the projectile, to allow the air in the channels between the ribs to escape when the band is being pressed on.

In the case of cup-shaped adapters the upper edge of the adapter must not project into the shell cavity at any point on its circumference.

7. *Nose-bush.*—If a nose-bush is shown on the drawing, it may be of mild steel or Class "C" metal; or it may be omitted and the fuze-hole formed in the head of the shell, if there is a note on the drawing to that effect.

The bushes, after having been machined to shape on the nose, and also internally, will be unscrewed about a quarter of an inch, so as to be readily removable for examination on delivery. Roughness and sharp edges should be removed from the cavity at the junction of the shell with nose-bush. A steel fixing screw will be fitted in the bush or head of the shell, as shown on the drawing.

8. The limits (high and low) allowed are shown on the drawing.

9. *Driving Band.*—The driving band is to be made from a ring of drawn or electro-deposited copper pressed into and in contact with the bottom and undercut of the groove in the shell all round and accurately turned to the form shown on the drawing.

10. *Screw Threads*.—All screw threads must, unless otherwise stated herein, or on the drawing, be of the British Standard fine screw thread, and conform to the standard gauges of the Chief Inspector, Woolwich. Contractors may send their screw gauges at any time to the Chief Inspector, Woolwich, to be checked and compared with the standard gauges.

11. *Preliminary Examination*.—The shells, after they have been prepared to receive the adapters, grooved, and finish machined internally and externally, but before varnishing or banding, will be submitted for preliminary examination.

The adapters must be submitted separately, finished except as to their outer face.

Any shell or adapter which is not finished to the satisfaction of the Inspecting Officer or which has any flaw or imperfection, or which fails to pass the Inspecting Officer's gauges, will be rejected.

12. *Varnishing*.—While the shells are clean and free from scale or rust they are to be thoroughly coated internally with copal varnish and stoved at 300 degrees F. for 8 hours.

The Contractor must supply for analysis a sample of the liquid varnish used. Further samples will be scraped out from the shells, which must be revarnished by the Contractor free of charge.

This varnish must be free from metallic impurity in any form, the following only being permitted:—

(a) A percentage of manganese not exceeding 0.5.

(b) A percentage of lead calculated as Pb taken from scrapings not exceeding 0.05.

(c) A percentage of copper not exceeding 0.1.

It must adhere firmly and present a perfectly smooth, clean, and dry surface, free from cracks, flaws, impurities, and other imperfections. Any shell supplied with the steel surface under the varnish not clean, free from rust, scale and foreign matter, or in which the varnish does not adhere firmly, will be rejected. After varnishing there must be no recess at the junction of the shell and adapter.

13. *Marking*.—The shell will be stamped on the base with the calibre, numeral, Contractor's initials, and date of completion of manufacture as shown on the drawing. Numbers to identify the cast and ingot of the shell are to be stamped on the head and numbers to identify the cast and ingot of the adapter on the base.

14. *Delivery*.—(a) The shells will be covered with a thin coating of vaseline or other similar anit-corrosive grease, which must be of such nature as not to interfere with gauging, and they will then be delivered, unpainted, at the Royal Arsenal, Woolwich, for inspection and proof.

(b) The shells will be delivered in lots for purposes of proof. A lot for this purpose will consist, as far as possible, of shells governed by the same mechanical tests under Clause 5 (a), and must not contain more than 121 shells. When the number so governed is less than 100, a number of casts or batches, up to a maximum of 7, may be grouped together for this purpose. In the event of further proof being required the shell will be taken from the lot supplied.

(c) The Contractor will supply, free of charge, such shells and adapters as may be required as described in Clauses 5 and 16 and such driving bands as in Clauses 15c and 16. The shells expended in proof, whether fired or otherwise tested, will be the property of the Government.

15. *Main examination after delivery*.—(a) Any shell of a lot which fails to pass the Inspecting Officer's gauges, or fails to satisfy the Chief Inspector, Woolwich, of its serviceability, will be rejected.

(b) If at any time during the examination it is found that defects of any nature other than errors of machining, which involve rejection of the defective shell amount to 5 per cent. of the number of the shells in the lot, the lot will be rejected.

(c) The driving band may, at the option of the Chief Inspector, Woolwich, be cut off one or more shells selected from the lot. Should the driving band appear not to have been thoroughly pressed home into the groove and undercut throughout, the lot will be rejected.

(d) If at any time during the examination of a lot it is found that 5 per cent. of the shells in the lot will depart from the approved design, further examination of the lot will be suspended.

8" H.B. SHELL

Oct. 23rd. 1915

Shell Committee

Ottawa, Ont.

Gentlemen:-

In reply to your telegram asking for new bids on the above size shell, we wish to submit the following prices:-

(A) Shells furnished from forgings ^{rough} already machined -

1000 per week each \$26.50

(B) Shells furnished from forgings not rough machined -

1000 per week each \$28.50

All material and component parts to be delivered to us, charges paid fob. our works.

Shell forgings (A) to be furnished rough machined and cut to length.

Shell forgings (B) to be furnished in the rough as produced by the forge.

All forgings shall be properly annealed before shipment by the Steel Company.

Providing there is no unusual delay in receiving our plant and extension to shops being completed, deliveries to commence July 1916, and reaching the above maximum about the end of August. It being understood that we are to be guaranteed a minimum order for delivery within one year from commencement of shipments of 50,000 shells, and contract is not to be subject to cancellation within one

Shell Committee - Ottawa
8" H.E. Shells

year from the date mentioned.

Yours very truly,

The John Bertram & Sons Co. Limited,

Treasurer

HB/EMH

Shell Committee - Ottawa

8" H.E. SHELLS

year from the date mentioned.

Oct. 23rd. 1915

Shell Committee

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Shell Committee - Ottawa
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The John Bertram & Sons Co. Limited,

John Bertram
Treasurer

HB/EMH

SHELL COMMITTEE

Brig.-Gen. A. Bertram
Chairman.

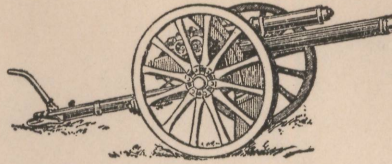
HON.-COL. D. CARNEGIE, M-INST. C.E. *Brig.-Gen. T. Benson*
ORDNANCE ADVISOR *Master General of Ordnance*

Hon. Col. T. Cantley

Hon. Lt.-Col. G. W. Watts

Mr. E. Carnegie

Mr. J. W. Borden



STEPHEN BUILDING
PHONE QUEEN 3034-5-6

Lt.-Col. C. Greville Harston

C. I. of Arms and Ammunition

Lt.-Col. F. D. Lafferty, R.C.A.

Supt. Dominion Arsenal

OTTAWA, ONT. Sept. 28, 1915

John Bertram & Sons Co.,

Dundas, Ont.

Gentlemen,-

We enclose herewith Drawing # C-147 and Specification
L & L for the 8-inch Howitzer Mark III Shell.
3459A 3471A

We would like you to quote on machining and assembling the shell in question to the dimensions and particulars given on the drawings and specifications. You may base your price on any quantity up to 1,000 per week for a twelve months' contract. The Shell Committee will supply the following component parts,- forging of shell body, forging of base plug, socket, machined ready to screw into the nose of the shell, the plug machined ready to screw into the socket, copper band, paint and varnish.

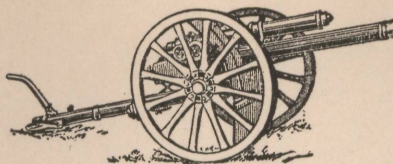
Please state how long after receipt of master gauges you would be able to start deliveries in the event of an order being placed with you.

All orders placed for the machining and assembling of shells will be subject to the rules and conditions on the accompanying form.

SHELL COMMITTEE

Brig.-Gen. A. Bertram
Chairman.

HON.-COL. D. CARNEGIE, M-INST. C.E. *Brig.-Gen. J. Benson*
ORDNANCE ADVISOR *Master General of Ordnance*



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Mr. E. Carnegie

Mr. J. W. Borden

OTTAWA. ONT.....191.....

Replys must be received within ten days of date of
this letter in order to be considered by the Committee.

Kindly mark your reply to the attention of Mr. Taylor.

Yours very truly,

SHELL COMMITTEE

PER...*R. Y. Taylor*.....

RFT:MLP

All orders for Machining & Assembling Shells
Will Be Subject To The Following Rules and Conditions.

1. All component parts and other material entering into the manufacture of the shells will be purchased by the Shell Committee and the quantity of such parts and material required to complete the number of shells allotted will be supplied free of charge. All additional parts required to replace shells submitted for test purposes, or those which may be rejected by authorized Government Inspectors, will be supplied at cost on receipt of order from the manufacturer for these extra parts.

2. All Steel Forgings and other component parts are inspected and passed by authorized Inspectors before being shipped to the manufacturers, but if any defective parts are discovered when machining and assembling shells, the manufacturer must immediately communicate with the Shell Committee and if it is found that the defects are due to poor material or workmanship on the part of the component part manufacturer, such parts will be replaced free of charge, but no allowance will be made for any work done on such parts by the machining and assembling manufacturer.

3. Manufacturers who are also manufacturing component parts, which they use in the machining and assembling of their shells, are subject to the same conditions as in all other component part manufacturers as regards inspection, etc. and must advise the Shell Committee regularly of parts they use.

4. All component part manufacturers are supplied with shipping slips, a copy of which is sent with each shipment of parts. These slips must be signed and returned to the Shell Committee promptly with notation of any shortage, by the assembling manufacturer. In all cases where these slips are not returned to the Shell Committee or in the absence of a shipping slip, an acknowledgement of the shipment is not sent, the Shell Committee will be compelled to take the component part manufacturers' figures, and the assembling manufacturer will be responsible for any shortage which may be discovered later.

5. One complete set of master gauges will be supplied to each machining and assembling manufacturer by the Shell Committee, free of charge. These master gauges are to be used for reference only, and must be returned to the Shell Committee in good order immediately after orders are completed.

6. It is desirable that machining and assembling manufacturers should submit to Chief Inspector of Arms Ammunition for inspection, say three of the first shells completed by them, so as to ensure certainty that all is right before proceeding with the assembling of large quantities. Test shells, not exceeding three, so supplied, will be paid for by the Shell Committee.

7. Boxes for shipping completed shells will also be supplied by the Shell Committee free of charge, and shipments must be made as instructed by the Shell Committee. Such shipments to be certified to by our authorized inspectors.

8. All invoices covering completed shells must be accompanied by authorized inspectors' report showing that the shells have passed the necessary tests. All invoices will be paid the 15th of the month following receipt of invoices. Shells which the manufacturers are required to submit for firing proof or other test purposes, as called for in War Office specification, must not be invoiced to the Shell Committee, it being understood that the manufacturers are responsible for the expense of all such tests.

9. Provided the Shell Committee supply the required component parts one month in advance of the time called for deliveries of the finished shells, the Committee reserves the right to cancel any portion of the order not delivered on dates stipulated by the order.

Oct. 4, 1915.

Proposed method of doing the machine work on 60 pr. High Explosive Shells, at the rate of 15 pr hour.

OPER 1 Cut off open end

2- Hall & Sons 6" Cutting Off Machine
Output per hour each machine 7-1/2

OPER. 2 Face end

2- Hall & Sons 6" Cutting Off Machine
Output per hour each machine 7-1/2

OPER. 3 Centering on suitable drill press

Using fixture to hold the shell
Output per hour 20

OPER. 4 Rough turn body

4- 32" x 14' Heavy Duty Lathes, to be equipped with four turret toolpost, and special driving arbors.
Output per hour each machine 4.

OPER. 5 Boring shell

5- 32" Heavy Duty Lathes with heavy turret on carriage, necessary chuck and boring bars.
Output per hour each machine 3.

OPER. 6 Form nost to shape.

1- 200 ton Hydraulic Press with accumulator and pump,
or 1- 1500# Steam Hammer
Output per hour each machine 20

OPER. 7 Bore and ream nose and face

3- 24" Turret Lathes, or
24" Engine Lathes with turret on cross-slide
Output per hour each machine 5

OPER. 8 Finish turn body

4- 22-24" Engine Lathes
Output per hour each machine 4

OPER. 9 Wave and undercut

2- 26" Engine Lathes with waving and undercutting attacht.
chuck and cams
Output per hour each machine 9

OPER. 10 Bore out base of shell

3- 24" Turret Lathes or 3- 24" Engine Lathes with turret
on cross-slide, necessary chuck and bars.
Output per hour each machine 6

OPER. 11 Threading nose of shell

1- Bert. 2 Spindle Thread Milling Machine.
Output per hour 20

OPER. 12 Press copper band to place

1- Hydraulic Press
Output per hour 20

OPER. 13 Turn copper band

1- 26" lathe with suitable equipment
Output per hour each machine 15

OPER. 14 Turn socket in place

1- 20" lathe with equipment
Output per hour 15

OPER. 15 Turn base plate

2- 20" lathes with equipment or
24" Turret Lathes
Output per hour each machine 8

OPER. 16 Pean and face base plate

3- 20" lathes with equipment or
3- 24" Turret Lathes
Output per hour each machine 5

Ovens for varnishing and provision for painting have to be
considered, also.

9.2" BRITISH HIGH EXPLOSIVE SHELL

Nosed-in Type

British piece work prices as per schedule
per shell total amount paid \$4.33½

Number of hours work on each shell based
on 1/ per hour wages - - - - - 18 hrs 3 min.

Number of hours work on each shell based
on 9 pence or 18¢ per hour - - - - - 24 hrs. 3 min.

Number of hours work on each shell based
on 8 pence or 16¢ per hour - - - - - 27 hrs. 3 min.

(NOTE-- No allowance shown for baseplate or marking)

Operations -- 21

Machines used -- 23

BERTRAM method of machining without allowance for
baseplug, marking or nosing calls for

12 machines
12 operations

Time allowance per shell 4 hrs. 32 min.

9.2" BRITISH HIGH EXPLOSIVE SHELL

Nosed-in Type

British piece work prices as per schedule
per shell total amount paid \$4.33½

Number of hours work on each shell based
on 1/ per hour wages - - - - - 18 hrs 3 min.

Number of hours work on each shell based
on 9 pence or 18¢ per hour - - - - - 24 hrs. 3 min.

Number of hours work on each shell based
on 8 pence or 16¢ per hour - - - - - 27 hrs. 3 min.

(NOTE-- No allowance shown for baseplate or marking)

Operations -- 21

Machines used -- 23

BERTRAM method of machining without allowance for
baseplug, marking or nosing calls for

12 machines
12 operations

Time allowance per shell 4 hrs. 32 min.

$$\begin{array}{r} 4 = 240 \\ 32 \\ \hline 272 \text{ min} \end{array}$$

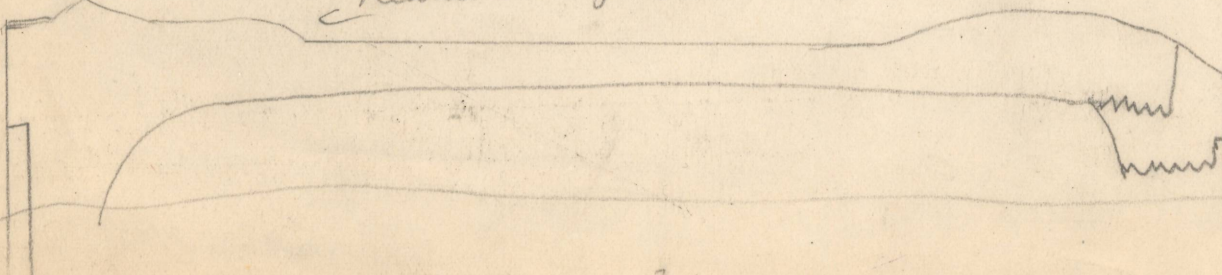
PRICES PAID BY ~~CAMPBELL LAIRD & CO.~~
FOR FINISHING 9.2" SHELLS.

December 18/15.

R. L. prices. P. Work.	Price each shell	
Parting ends.	5 1/2 or	.11 1/4
Centring and turning bodies 2 m/cs.	1.6	.36
Boring and cutting to length.	3.3.	.78
Facing base.	8.	.16
Turning taper for heading.	5 1/2	.11
Heading (two heats for heading) 300/400 tons pressure.	3.0	.72
Centring.	1.	.02
Rectifying body after heading.	4.	.08
Rough boring fuze hole.	4.	.08
Radius 2/mcs.	1 1/2	.03
Boring Neck.	1.9.	.42
Boring and screwing for socket.	3 1/2	.07
Inserting and finishing socket.	5 1/4	.10 1/2
Grooving.	1.2 1/4	.28 1/2
Bandong.	2 1/4	.04 1/2
Turning Band.	10 1/4	.20 1/2
Turning between bands.	5	.10
Boring and screwing for Base Plate.	1.4.	.32
Inserting and finishing Base Plate.	9.	.18
Lifting hole.	2 3/4	.05 1/2
Adjusting to weight.	5.	.10

Based on Operator earning 8 to 9 pence
per hour but they earn actually 1/-.

Reduce to weight here



C O P Y

October 4th 1916

P.G. Adjustment Department

TO MACHINERS AND ASSEMBLERS OF 8" HIGH EXPLOSIVE SHELLS:

Dear Sirs:

We beg to submit the following revised
list of prices for 8" High Explosive shell component
parts which will now obtain on replacement orders:

Forgings, including steel, 1.1.....	\$19.50 each
Plugs.....	.07 "
Wooden plugs.....	.02 "
Copper Bands.....	.55 per lb
Adapter forgings.....	2.05 each
Grub Screws.....	6.50 per 1000
Boxes.....	1.60 each

The above will also supersede all former
prices furnished by our Insurance Department, and
must be used in valuing our components for insurance
purposes.

These prices are exclusive of carrying
charges.

Yours truly,

ADJUSTMENT DEPARTMENT

PG:GS

Per P. Graham

MEMORANDUM

No. 75, 37655, 50M

Verbal Orders Don't Go

The John Bertram & Sons Co., Limited

Write Ordinary Communications on this Form

Use book if Carbon copy is desired

DUNDAS.....Feb 17/17.....191

To.....

No..... Sec.....

Hours on 8" Shell to Feb 13/17

13th

190455 1/4

about 1450 per day now

4 2 3

7000

Signed

197455 @ 444 = 86880.20

Reply

Supplied at Hardgate

100k

383062

38000

421.062

Signed

8 inch H. E. Shell Mark V.

DAILY OUTPUT REPORT

WEEK ENDING..

[illegible]

BERTRAM EQUIPMENT

for

8-Inch H.Explosive Shells

Shop
Number

OPERATION and EQUIPMENT

OPER. #1 -- Drilling & Facing Nose of Shell

- | | | |
|-----|----|--|
| 501 | 1- | Bertram 36" Sliding Head Drill Press with special centering fixture and jig attachment bolted to frame of drill |
| 502 | 1- | Bertram 36" Sliding Head Drill Press with special centering fixture and jig attachment bolted to frame of drill |
| 503 | 1- | Bertram 36" Sliding Head Drill Press with special centering fixture and jig attachment bolted to frame of drill |
| 504 | 1- | Bertram 36" Sliding Head Drill Press with special centering fixture and jig attachment bolted to frame of drill |
| 505 | 1- | Bertram 36" Sliding head Drill Press with special centering fixture and jig attachment bolted to frame of drill. |
| 562 | 1- | Bertram 45" Sliding Head Drill Press with special centering fixture and jig attachment bolted to frame of drill. |

OPER. #2 -- Cutting Off open end of shell

- | | | |
|-----|----|--|
| 545 | 1- | Root & Vandervoort Special Cutting Off Machine with right angle drive |
| 548 | 1- | Root & Vandervoort Special Cutting Off Machine with right angle drive |
| | 1- | Root & Vandervoort Special Cutting Off Machine with right angle drive. |

OPER. #3 -- Rough Turning

- | | | |
|-----|----|--|
| 535 | 1- | 27" x 12' Bridgford Plain Turning Lathe with two carriages, link forming attachment and expanding driver. |
| 536 | 1- | 27" x 12' Bridgeford Plain Turning Lathe with two carriages, link forming attachment and expanding driver. |

BERTRAM EQUIPMENT
for
8-Inch H.E. Shells (Continued)

Shop Number	OPERATION and EQUIPMENT		
537	1- 27" x 12' Bridgeford Plain Turning Lathe with two carriages, link forming attachment and expanding driver.		
538	1- 27" x 12' Bridgeford Plain Turning Lathe with two carriages, link forming attachment and expanding driver.		
553	1- 27" x 12' Bridgeford Plain Turning Lathe with two carriages, link forming attachment and expanding driver.		
554	1- 27" x 12' Bridgeford Plain Turning Lathe with two carriages, link forming attachment and expanding driver.		
	1- 27" x 12' Bridgeford Plain Turning Lathe with two carriages, link forming attachment and expanding driver.		
	1- 27" x 12' Bridgeford Plain Turning Lathe with two carriages, link forming attachment and expanding driver.		
542	1- 36" x 16' Pond Triple Geared Lathes with special forming attachment and expansion driving arbor.		
543	1- 36" x 16' Pond Triple Geared Lathe with special forming attachment and expansion driving arbor.		
<u>OPER. #4 -- Boring</u>			
511	1- 36" x 20' Pond Projectile Boring Machine, with special shell chuck, special boring bars and extension socket		
512	1- 36" x 20' Pond Projectile Boring Machine, with special shell chuck, special boring bars and extension socket		
513	1- 36" x 20" Pond Projectile Boring Machine, with special shell chuck, special boring bars and extension socket		
514	1- 36" x 20' Pond Projectile Boring Machine with special shell chuck, special boring bars and extension socket.		

BERTRAM EQUIPMENT
for
8-Inch H.E. Shells (Continued)

Shop Number	OPERATION and EQUIPMENT		
515	1- 36" x 20' Pond Projectile Boring Machine with special shell chuck, special boring bars and extension socket		
516	1- 36" x 20' Pond Projectile Boring Machine with special shell chuck, special boring bars and extension socket		
517	1- 36" x 20' Pond Projectile Boring Machine with special shell chuck, special boring bars and extension socket		
518	1- 36" x 20' Pond Projectile Boring Machine with special shell chuck, special boring bars and extension socket		
519	1- 36" x 20' Pond Projectile Boring Machine with special shell chuck, special boring bars and extension socket.		
<u>OPER. #5 -- Finish Body Turning</u>			
522	1- 32" x 14' C.M.C. DBG QCG Engine Lathe equipped with special expansion driving arbor, and special forming attachment having circular tool and tool holder.		
525	1- 32" x 14' C.M.C. DBG QCG Engine Lathe equipped with special expansion driving arbor, and special forming attachment having circular tool and tool holder.		
530	1- 32" x 14' C.M.C. DBG QCG Engine Lathe equipped with special expansion driving arbor, and special forming attachment having circular tool and tool holder.		
531	1- 32" x 14' C.M.C. DBG QCG Engine Lathe equipped with special expansion driving arbor, and special forming attachment having circular tool and tool holder.		
532	1- 32" x 14' C.M.C. DBG QCG Engine Lathe equipped with special expansion driving arbor, and special forming attachment having circular tool and tool holder.		

BERTRAM EQUIPMENT
for
6-Inch H.E. Shells (Continued)

Shop
Number

OPERATION and EQUIPMENT

533 1- 32" x 14' C.M.C. DBG QCG Engine Lathe equipped with special expansion driving arbor, and special forming attachment having circular tool and tool holder.

534 1- 32" x 14' C.M.C. DBG QCG Engine Lathe equipped with special expansion driving arbor, and special forming attachment having circular tool and tool holder.

OPER. #6 -- Boring out Nose for Fuse Seat

555 1- Davis 24" Turret Lathe, fitted with expansion chuck and tools

556 1- Davis 24" Turret Lathe, fitted with expansion chuck and tools

557 1- Davis 24" Turret Lathe fitted with expansion chuck and tools.

558 1- Davis 24" Turret Lathe fitted with expansion chuck and tools.

(Old Shop Numbers 283-298-300-301)

OPER. #7 -- Counterboring base of shell
and Facing

508 1- 26" x 12' Bridgeford D.B.G Engine Lathe, with special chuck, tool holders and tools

509 1- 26" x 12' Bridgeford D.B.G. Engine Lathe with special chuck, tool holders and tools.

510 1- 26" x 12' Bridgeford D.B.G. Engine Lathe with special chuck, tool holders and tools.

539 1- 26" x 12' Bridgeford D.B.G. Engine Lathe with special chuck, tool holders and tools.

540 1- 26" x 12' Bridgeford D.B.G. Engine Lathe with special chuck, tool holders and tools.

541 1- 26" x 12' Bridgeford D.B.G. Engine Lathe with special chuck, tool holders and tools.

BERTRAM EQUIPMENT
for
8-Inch H.E. Shells

Shop
Number

OPERATION and EQUIPMENT

OPER. #8 -- Grooving & Undercutting

- 563 1- Bertram Special Grooving & Undercutting Machine with expansion chuck, four tool turret toolpost with necessary tools and special centre
- 564 1- Bertram Special Grooving & Undercutting Machine with expansion chuck, four tool turret toolpost with necessary tools and special centre
- 565 1- Bertram Special Grooving & Undercutting Machine with expansion chuck, four tool turret toolpost with necessary tools and special centre

OPER. #9 -- Threading Base of shell

- 566 1- Bertram Special No.3 Two-Spindle Thread Milling Machine with suitable chucks and steady rest, also hobs

567 OPER. #10 -- Threading nose of shell

- 1- Bertram Special No.3 Two-Spindle Thread Milling Machine with suitable chucks and steady rest, also hobs
- 1- Bertram Special Single Spindle Thread Milling Machine for nose

OPER. #11 -- Pressing copper band to place

- 526 1- West Tire Setter No.3 Banding Press with pump

With this equipment is

- 1- Ireland Gas Furnace

OPER. #12 -- Rivetting baseplug and finish
Turning end of shell

- 559 1- Bertram 20" x 8' Engine Lathe with special chuck, special tool holder and riveting attachment
- 560 1- Bertram 20" x 8' Engine Lathe with special chuck, special tool holder and riveting attachment.
- 561 1- Bertram 20" x 8' Engine Lathe with special chuck special tool holder & riveting attachmt

BERTRAM EQUIPMENT
for
8-Inch H.E. Shells (Continued)

Shop
Number

OPERATION and EQUIPMENT

OPER. #13 -- Varnishing

- 1- Special Shell Rotating Machine with motor
- 1- Spraying Outfit

OPER. #14 -- Baking

- 1- Electric Baking Oven with unit of 9
- 1- Electric Baking Oven with unit of 9
- 1- Electric Baking Oven with unit of 9
- 1- Electric Baking Oven with unit of 9
- 1- Electric Baking Oven with unit of 9

OPER. #15 -- Copper Band Turning

- 547 1- Root & Vandervoort Copper Band Turning Lathe
 - 549 1- Root & Vandervoort Copper Band Turning Lathe
 - 1- Root & Vandervoort Copper Band Turning Lathe
- (Third machine not here yet but ordered and on way)

OPER. #16 -- Weighing

- 1- Toledo Special Shell Scale
- 1- Toledo Special Shell Scale

OPER. #17 -- Marking

- 545 1- Brown Boggs Marking Machine

on

Eight Inch High Explosive
Shell Adapters

on

Eight Inch High Explosive Shell Adapters

[illegible]

MACHINES EMPLOYED

on
Eight Inch High Explosive
 Shell Adapters

Shop
Number

OPERATION and EQUIPMENT

OPER. -- Finish drilling of holes in adapters

1- 28" Hamilton Drill Press

OPER.-- Facing surplus stock off adapters

141 1- 20" x 10' Bertram Engine Lathe

156 1- 20" x 8' Bertram Engine Lathe

OPER. #1 -- Drill and Face Hole

6- Bertram Drill Presses
Average 6 per hour or 360 in 10 hours

Equipment ample for per day 500

OPER. #2 -- Rough Turn

7- Bridgeford Lathes
2- Pond Lathes

Note:

Present

lathes should Average 24 each machine or 216

turn out 3 Present equipment 22 hours 453

per hour each

or 540.

On present output two more machines needed
to turn out

500

OPER. #3 -- Bore

Note: Pre- 9- Pond Boring Lathes
sent lathes

should turn Average 24 each machine or 216

out 3 per hour present equipment 22 hours 453

each or 540.

On present output 2 more machines
needed to turn out

500

OPER. #4 -- Finish Turn

7- C.M.C. 32" x 14' Lathes

Average 33 each machine in 10 hours

Present equipment 22 hours 726

Present equipment ample for per day 500

OPER. #5 -- Bore and counterbore nose

3- Davis Turret Lathes

Average 80 each machine in 10 hours

Present equipment 22 hours 536

Present equipment ample for per day 500

OPER. #6 -- Counterbore base

6- Bridgeford 26" x 12' Lathes

Average 40 each machine 10 hours

present equipment 22 hours 528

Present equipment ample for per day 500

8-Inch SHELL EQUIPMENT (Continued)

OPER. #7 -- Wave and Undercut

Note: Present lathes should run 7 to 8 per hour.

3- Bertram Special Lathes

Average 60 each machine in 10 hours
present equipment 22 hours 396

On present output one extra machine needed for 500

OPER. #8 -- Thread Base

2- Bertram Thread Millers

Average each machine 90 per 10 hours

Changes now being made to increase this output
Change should take care of

500

OPER. #9 -- Thread Nose

1- Bertram Special Thread Miller

Average should be 20 per hour

1 extra machine may be needed for

500

OPER. #10 -- Copper Band Press

Ample capacity for

extra press

500

OPER. #11 -- Pean base and face to length

3- Special lathes

New man now doing 6er per hour
Average should be 75 per 10 hours

Present outfit should take care of

500

OPER. #12 -- Varnish

One man will varnish 18 to 20 shells per hour

Are providing now for second man's outfit

OPER. #13 -- Baking

5 Units of 9 shell capacity each

Present equipment ample for

500

8-Inch SHELL EQUIPMENT (Continued)

OPER. #14 -- Copper Band Turn

2- Root & Vandervoort Machines

Based on 12 per hour

Present capacity ample for 500

Root & Vandervoort are getting 18 per hour

OPER. #15 -- Marking Base

1- Brown Boggs Marking Machine

Present capacity ample for 500

extra 1

8-Inch SHELL ADAPTER

OPER. #1 -- ROUGH Turn Base

2- Side Head Mills
@ 10 per hour x 12 hr 2 week 440
+ 1- 26" lathe ————— for — 500

OPER. #2 -- Rough Turn Body

1- ^{5-1"} Side Head Mill
3- 20" engine lathe } 6 per hr } 528
each mach } ample for — 500

OPER. #3 -- Drill and tap

1- 26" Drill)
1- 20" Drill) Should be ample for — 500

OPER. #4 -- Finish turn and mill thread

6- C.M.C. 26" x 12' Lathes

Output should be 4 per hr. each machine

average at present 2 per hr.

On basis of 3 per hr. would need 2 more machines for 500

OPER. #5 -- Drill Holes to finish size

1- 28" Hamilton Drill
ample capacity ————— 500

OPER. #6 -- Face off back of adapter

2- 20" Lathes } ample capacity ————— 500
1- 18" — }