

6-Inch SHELL CONTRACT

Oct. 24th 1917

MR. PRESIDENT : NEW YORK

Mr. Jas. K. Cullen,

Dear Sir:-

We have been called in consultation at Ottawa with regard to additional production of our 6" shell and the only point which seems to prevent us increasing to any great extent is the lack of room.

We had a consultation with Mr. Harris of Harris & Richards yesterday and it would seem that if the orders which are pending are given out that it might pay us to put up the additional lathe shop which was at first arranged to be omitted between the south machine shop at present in use and the new permanent storage house.

I am merely drawing attention to the matter as the subject may be taken up a little later on in a more definite form, but if we were to proceed with the additional number of 6" shell it would certainly pay us to put up this shop and charge the cost of same to the shell contract.

We have also been asked to look into the question of French 75 mm H.E. shell now being given out by the U.S. Government and the Imperial Munitions Board are asking if we could undertake the machining of a quantity of these shell, utilizing our old shrapnel equipment. With this end in view we are having Mr. Howard go to Washington along with a number of Canadian manufacturers

MR. PRESIDENT : NEW YORK

Oct. 24/17

for the purpose of getting data on the subject.

There is one thing which would govern on this subject and this would be if we would not do better to specialize on the 6-Inch rather than have two sorts of shell in the same shop together with the machine tool business.

But in any event we thought it well to make an examination of the matter at Washington, so that we would have something definite to go on, besides when in Washington Mr. Howard will collect data on the small tool situation with regard to this same shell, if it is given out in Canada.

Yours very truly,

Treasurer

HB/EMH

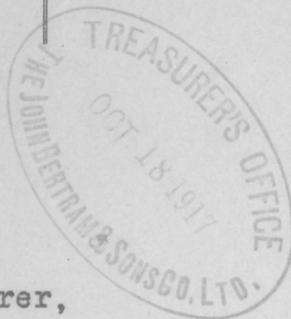
NILES-BEMENT-POND COMPANY

NEW YORK.

Subject.

PLEASE CONFINE YOUR LETTER TO ONE SUBJECT.

October 16-1917.



Mr. Henry Bertram, Treasurer,
DUNDAS WORKS.

Dear Sir:-

I enclose herewith letter received from Mr. Mills of our Cleveland Office concerning 6" shells, which I think will be of interest to you.

Yours very truly,

Jack Cullum

President.

JKC:MEW

Enc.

(C O P Y)

NILES-BEMENT-POND COMPANY

CHICAGO Ont. 11/17

Jas. K. Cullen, Esq.,

Dear James:-

Mr. Moberly of the Detroit Plant of the American Car & Foundry Co. was here yesterday. I was quite surprised to learn of the enormous amounts of money they pay to their axle lathe men working on shells. He tells me that many of the men, on piece work, make \$40. a day of 10 hours, turning 160 6" shells at 25¢ a piece. Our axle lathes have done the best work of any machine they have. He says that 10,000# of metal is removed by each machine in 10 hours. This all sounds like a fairy tale, but Moberly is in direct touch with the work and must know. No wonder there is discontent among the others receiving so much less, and no wonder it is difficult to secure men in regular occupations. The American Car & Foundry Co. made \$20,000,000 last year clear out of munitions contracts. They have just taken a contract for 1,200,000 shells 6" and under, and have a lot of 10" under way. They have also in other plants, contracts for thousands of portable steel kitchens, floating mines, portable gun carriages, etc. They need now a vast amount of machinery, so I wired Leeds one item of 75 axle lathes.

I trust you are all well. Kind regards

Sincerely

Geo. F. Mills

6" Shell

Oct. 19th 1917

MR. PRESIDENT : NEW YORK

Jas. K. Cullen, Esq.,

Dear Sir:-

I wish to acknowledge receipt of your favor of the 16th enclosing letter from Mr. Mills on the subject of manufacture of 6" shell.

I have been aware that the American Car & Foundry Company at Detroit have been manufacturing various sizes of shell for some time back and we have visited their works once or twice in order to pick up pointers, and on these occasions our men have been quite surprised and gratified to note the tremendous production obtained from Niles double axle lathes on shell work, and while we could not verify their production, yet we were somewhat surprised to note that a man could turn out as many as 160 6" shell in a day and he would receive as much as 25¢ each for the work. All this information is interesting because it goes to show this 6" shell is no harder to turn out than any other size we have already undertaken, and in a measure it somewhat confirms our belief that at the price we are getting there will be a fair amount of margin in it.

It may interest you to know that we are making good progress with the converting of our 8" shell department to 6", and although we are somewhat cramped for space, yet we feel confident we will be able to overtake the quantity aimed at in the shop space we have now available. We, of course, have had the advantage of our old pattern shop which adjoined our shell shop, which we are using as a tool room.

Mr. Jas. K. Cullen - New York

Oct. 19/17

and that will save us a very considerable amount of delay heretofore experienced in carrying tools back and forth to the regular toolroom. The old pattern storage building we will utilize for the storage of boxes and bulky supplies for the present order. We are now breaking up all the old patterns which are obsolete, and are burning them in the furnace for the purpose of heating the plant at this time, so that we will clear out the old pattern shop in the next two or three weeks, giving us that available space we require for storage.

Comparing the price paid by the American Car & Foundry Co. we find on some records which have been sent us by the Imperial Munitions Board that the average piece work price for rough turning of 6" shell runs from 14 to 15¢ each in Canada, and you will readily understand that if the American Car & Foundry Co. paid 25¢ that they were being stung for about one half of what they should have paid for the work. We are planning to do this work on our Bridgeford double carriage lathe, and by their use we think we should produce a very large quantity per day and we think that our piece work price would be reduced to about 10¢ each.

Mr. Mills' letter is quite interesting in all details, and I have taken the liberty of keeping a copy, and return herewith the original.

Thanking you very much for the data given in this letter,

Yours very truly,

HB/EMH

Treasurer

6" SHELL

Oct. 19 1917

Imperial Munitions Board
District Office
Royal Bank Building,
Toronto Ont.

A.E. Till, Esq.,
Production Dept.

Dear Sir:-

Please accept our thanks for your favor of the 15th in which you enclose outline templet as well as list of prices paid by other concerns. This will be a guide in making up our piece work prices.

Could you send us the piece work data covering 4.5" shell. We are very much interested in this size and would like to have these details if you have them to give out. Please let us have them by return mail if possible.

Yours very truly,

Treasurer

HB/EMH

MUNITIONS & METAL PRODUCTS - PETERBORO.

Roughing Only.....	31 - 40 Per Day -	.14¢
Re-Roughing & Facing.....		.07 ¹ / ₂ ¢
Facing Base.....		.02 ³ / ₄ ¢
Re-Roughing Only.....	71 - 80 Per Day -	.06¢
Nose Boring Rough.....		.02¢
Nosing Boring Finish.....	41 - 50 Per Day -	.11¢
Boring.....		.18¢
(Over 120 in week 2¢ per shell extra)		
Body Finish.....		.10
(Over 40 in day 2¢ extra for bal. over)		
Facing Base.....		.04
Rivetting.....		.02
Re-centering01 ¹ / ₂
Waving05
Base Recess12
Rectification.....		.06
Marking.....		.01
Single Pointing.....		.02 ¹ / ₄
Press Copper Band.....		.01
Copper Band.....		.02
Nose Bush.....		.05
Thread Miller.....		.02
Base Plates05 -	.06
	(thd.)	
Sewing Plugs.....		.01
Varnish.....		1.50 per 100
Cut Off - Night -04
Cut Off - Day -03 ¹ / ₂
Centering.....		.01 ¹ / ₂

HAYES WHEEL COMPANY - CHATHAM

Centre and Inspect for eccentricity & base thickness.....		.02
Cut Off Open End.....		.06
Rough Turn.....		.15
Bore, Face & Chamfer.....		.20
Face Off Base.....		.04
Re-Centre.....		.01 ¹ / ₂
Forge In Nose of Shell.....		.04 ¹ / ₂
Bore Nose and recess thread diameter.....		.06
Finish Turn & Profile.....		.11
Recess Base & Cut to weight.....		.08
Turn Wave Grooves.....		.04
Sand Blast.....		.02
Mill & Nose Threads.....		.04
Press On Copper Bands.....		.01 ¹ / ₂
Rivet Base Plates.....		.02
Face Off Base Plates.....		.04
Wash Inside of Shell.....		.01 ¹ / ₂
Dry Shell & Varnish.....		.01 ¹ / ₂
Turn Copper Bands.....		.02

MCKINNON DASH COMPANY - ST. CATHARINES

Piece Work Prices on 6" Mark 111 H.E. SHELL

Centering -----	.03
Cut Off Open End.....	.05
Rough Turn.....	.15 on one lathe
	.10 on two lathes
Finish Bore.....	.20 complete
	.17 on bore
	.03 on chamfer
Re-Center.....	.01 $\frac{1}{2}$
Intermediate Turn.....	.07
Cut Off Back End.....	.06
Nosing in on press.....	.05 divided 2 men
	.07 on hammer 3 m3n
Drilling & Reaming Nose.....	.06 (.02 drill- .04 ream)
Finish Turn.....	.10
Inside Radius.....	.04
Cut to weight.....	.04
Wave & Groove.....	.05
Thread / Nose.....	.02 $\frac{1}{2}$
Rough Base Recess.....	.04
Finish Base Recess.....	.04
Fit in Base Plates.	
Rough Off Base Plate.....	.02 $\frac{1}{2}$
Rivet Base Plate.....	.01 $\frac{1}{2}$
Finish Base Plate.....	.02 $\frac{1}{2}$
Press on copper band.....	.03
Turn Copper Band.....	.03
Undercut in Nose.....	.01 $\frac{1}{2}$
Re-seat for fuze.....	.02
Sand Blast.....	.02 $\frac{1}{4}$
Washing.....	.01 $\frac{1}{2}$
Marking.....	.01 $\frac{1}{2}$
Luting.....	.01
Varnish.....	.03
Tapping Out Thread.....	.01 $\frac{1}{2}$
Washing.....	.01 $\frac{1}{2}$
Greasing & Boxing.....	.02 $\frac{1}{2}$
Turning Base Plate13 Banfield
Stencil Boxes, including bringing in.	.02
Cutting Off lug on plate.....	.01 (?)
Unload & File.....	.02

CANADIAN LINDERMAN COMPANY - WOODSTOCK

Centering.....	.03
Cutting off open end.....	.05 $\frac{1}{2}$
Rough Turn.....	.12 $\frac{1}{2}$
Finish Bore.....	.12 $\frac{1}{2}$
Re-Center.....	.02 $\frac{1}{2}$
Intermediate Turn.....	
Cut Off Back End.....	.05

Canadian Linderman Co. (Continued)

Nosing in on press.....	.05
Drilling & Reaming Nose.....	.04
Finish Turn.....	.09 $\frac{1}{2}$
Inside Radius.....	.05
Cut to Weight.....	.03
Wave & Groove.....	.05
Thread Nose.....	.04
Rough Base Recess.....	.03 $\frac{1}{2}$
Finish Base Recess.....	.05
Rivet Base Plate.....)	.03 $\frac{1}{2}$
Finish Base Plates.....)	
Press on copper band.....	.03 $\frac{1}{2}$
Turn Copper Band.....	.03 $\frac{1}{2}$
Undercut in Nose.....	.03
Sand Blast.....	.02
Washing.....	.01 $\frac{1}{2}$
Marking.....	.01 $\frac{1}{2}$
Washing.....	.01 $\frac{1}{2}$

PAGE-HERSEY IRON, TUBE & LEAD CO. - GUELPH

Centering.....	.02	each 2 men
Cut Off Open End.....	.03	
Rough Turn.....	.11	
Inside Boring.....	.22	
Cut Off Base.....	.03	
Re-Center.....	.01 $\frac{1}{4}$	
Nose Hammer man.....	.02 $\frac{1}{2}$	
Nose Heater Man.....	.02	
3 Helpers.....	.01 $\frac{1}{2}$	each
Bore Ream - Inside Profile.....	.07	
Finish Turn Body.....	.10	
Rough Recess for Wave.....	.02	
1 helper.....	.01 $\frac{1}{4}$	
Finish Wave & Undercut.....	.03 $\frac{1}{2}$	
Hog Out Base.....	.03 $\frac{1}{2}$	
Finish Base Plate Recess.....	.05 $\frac{1}{2}$	
Thread Base Plate Recess.....	.02	
Thread Nose.....	.02	
Screw on base plate.....	.02	each 2 men
Roll in and finish base plate...	.03	
Press on Copper band.....	.02	1 foreman
	.01 $\frac{3}{4}$	2 men
Turn Copper Band.....	.02	
Helper.....	.01 $\frac{3}{4}$	
Machining Base Plate.....	.03	
Grinding Inside Profile.....	.01 $\frac{3}{4}$	
Sand Blasting.....	.01 $\frac{3}{4}$	
Hand Tapping.....	.01 $\frac{3}{4}$	
Facing Fuze Seat.....	.01 $\frac{3}{4}$	
Varnish Room - 4 men - Foreman.....	.02	each
	.02 $\frac{1}{2}$	

PEASE FOUNDRY COMPANY - TORONTO

<u>Operation</u>	<u>Price Per 100</u>
Cut Off Open End.....	3.00
Centre	1.00
Rough Turn.	8.00
Bore.. . . .	23.00
Face Base.	4.00
Re-Centre	1.00
Re-Turn	3.00
Nose	7.00
Ream & Recess Nose	10.00
Profile & Finish Turn.	10.00
Base Recess.	8.00
Rough Band Recess.	1.50
Undercut & Wave	4.50
Shot Blast	Day Work
Shop Preliminary Inspection	
Government Preliminary Inspection	
Press on copper band -	Not Established
Rivet Base Plate -	do
Cut Off End of Base Plate -	do
Rough & Finish Face Base & Radius	do
Mark Base.....	do
Thread and Seat.....	5.00
Turn Copper Band.....	2.50
Clean & Varnish -	Not Established
Govt. Final Inspection	

These prices will not be lowered unless a change is made in operation.

Operators will not be paid at day work rates unless their machines are out of commission on account of breakdowns or lack of material for more than one hour at a time. This must be certified to by the job foreman and checked by the timekeeper.

If for any reason, a forging must be rejected or scrapped on account of mistakes on the part of the operator, a charge of \$3.00 will be made to the operator. This does not apply to flaws in the steel or other defects caused in the manufacture of the forging.

TAYLOR-FORBES COMPANY - GUELPH

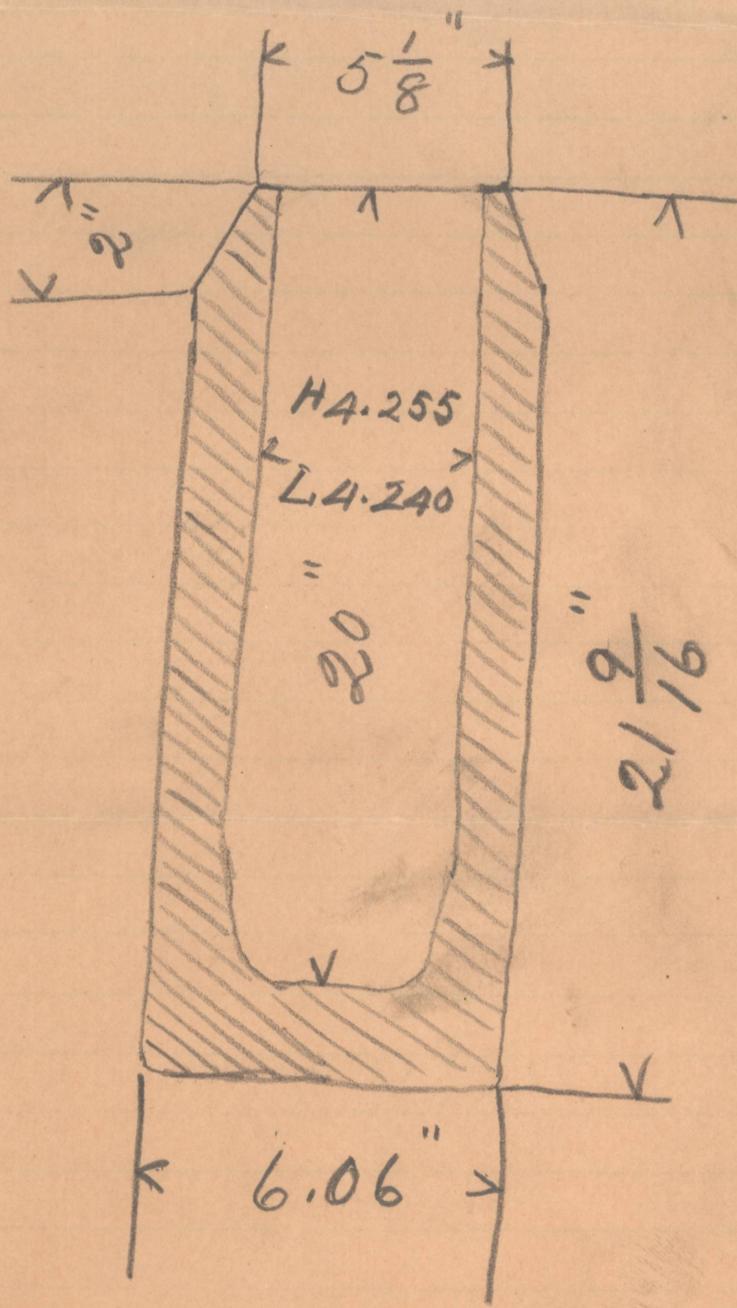
Centering.....	.01½
Cutting Off Base.....	.05
Cutting Off Open Ends.....	.03
Rough Turning.....	.20
Boring.....	.22
Re-Centering.....	.02

Taylor-Forbes Co. (Continued)

Hammer (to be divided among 4 men)08
Finished Turning.....	.09
Hogging and Finishing Base.....	.09
Waving.....	.04
Rivetting Base Plates.....	.02
Cutting off plugs square and facing base.....	.04
Band Turning.....	.02 $\frac{1}{2}$
Threading Nose.....	.03
Inside Profiling and boring noses.....	.09

HENRY HOPE & SONS OF CANADA, LTD. - Peterboro.

Cut Off Open End.....	.04
Centre.....	.01 $\frac{1}{2}$
Rough Turn.....	.13
Bore.....	.24
Rough Face Base.....	.04
Finish Face Base.....	.03 $\frac{1}{2}$
Re-Centre.....	.02
Intermediate Turn.....	.08
Bevel Open End.....	.03 $\frac{1}{2}$
Face Nose of Shell.....	.03
Rough Drill Fuze Hole.....	.03
Finish Turn Body;.....	.12
Inside Profile.....	.05
Finish Bore, Fuze Hole & Undercut.....	.05
Thread Fuze Hole.....	.02 $\frac{1}{2}$
Wave & Groove.....	.06
Recess Base.....	.08
Undercut Base.....	.01 $\frac{3}{4}$) .03 $\frac{1}{2}$
Thread Base.....	.01 $\frac{3}{4}$)
Clean Shell for Prelim. Exam.....	.01 $\frac{1}{4}$
Screw in Plug by Hand.....	-
Screw Plug Home on Mechanical Wrench	
Rivet Base Plate & Face Off.....	.03 $\frac{1}{2}$
Stamp Shells.....	
Copper Band, Press On.....	.01)
Turn Copper Band.....	.02 $\frac{1}{4}$) .03 $\frac{1}{2}$
Hand Tap and Seat.....	
Adjust Weights.....	.05 $\frac{1}{2}$
Wash in Soda Water.....	.01 $\frac{1}{4}$
Varnish.....	.01 $\frac{1}{4}$
Stencilling letters on shells.....	.00 $\frac{1}{4}$
Paint.....	.00 $\frac{1}{4}$
Wash for Inspection.....	.00 $\frac{1}{4}$
Fix Shipping Plugs.....	.00 $\frac{1}{4}$
Pack shells in boxes and screw down....	.02 $\frac{3}{4}$
Loading boxes in car.....	.01 per box
Stencil mark on boxes.....	.07 per doz.





IMPERIAL MUNITIONS BOARD
DISTRICT OFFICE
602 ROYAL BANK BUILDING
TORONTO

IN REPLYING PLEASE REFER

TO.....

October 15th, 1917.



The John Bertram & Sons Co., Limited,
Dundas, Ont.

Dear Sirs: Attention Mr. Henry Bertram.

Enclosed herewith as per conversation of Friday last prices on Mark III - 6" Shell operations, as followed by these various firms. Also enclosed is template of die and sizes to the press as followed by the Consolidated Steel Company, Toronto.

Yours very truly,

IMPERIAL MUNITIONS BOARD

Per.....
Production Department.

AET-J.
Encl.

6-Inch SHELL CONTRACT

Sept. 24th 1917

Imperial Munitions Board
Purchasing Department
Ottawa Ont.

Dear Sirs:-

We wish to acknowledge your favor of the 19th regarding order for 6-Inch H.E. Shell. In reply wish to advise that we are willing to accept this contract on a basis of terms of payment of two-thirds cash in the month following shipment of each lot of shell and one-third to remain on an open account for one year or in accordance with the arrangements made with the manufacturers while in Ottawa a few days ago.

There are several paragraphs we wish inserted in this contract- First as regards Item 3 in your contract regarding modification or changes in specifications to read -

"Should such modification increase the cost of production or cause to be rejected work on shell already machined or partly so, then the cost of such loss or work shall be paid by the Board."

Second- In item 4 of your letter regarding delivery paragraph reading as follows:

"Delays by reason of non-delivery of materials by the Board or strikes or damage to plant by fire, should be allowed for by the Board, providing notice in writing is given by the Contractor within one week of the occurrence of delay."

It seems to us that some such provision should be inserted in order to make the contract fair to the contractor.

We have not yet been able to estimate the cost of tooling our equipment for 6-Inch shell, and the only figure we could

Imperial Munitions Board - Ottawa

Sept.24/17

give you would be based on an estimate, which would to our mind be about approximately forty to fifty thousand dollars.

We trust we have covered all the items required to enable you to complete this contract and would therefore be glad to have you return it at the earliest possible date.

We would also desire to call your attention to the matter of forgings and components, which are to be supplied by the Board. These ought to be in our hands at an early date, so as to enable us to utilize them for experimental tests.

Yours very truly,

Treasurer

HB/EMH

NILES-BEMENT-POND COMPANY

NEW YORK.

Subject.

PLEASE CONFINE YOUR LETTER TO ONE SUBJECT.

September 3rd, 1917.

Mr. Henry Bertram, Treasurer,
 John Bertram & Sons Company, Ltd.,
 Dundas, Ontario,
 Canada.

6" shells

Dear Sir:-

We are in receipt of yours regarding the shell plant, letter being without date, and note the conditions with reference to this type of work.

We believe, after considering the situation carefully, that it would be well for you to utilize as many of the shell machines as you can in producing your regular product, and we also believe that it would be unwise for us at the present time to attempt to sell this plant, inasmuch as it has been charged off and anything obtained for it at present would really appear on our books as profit, which is not desirable under the existing conditions. None of our other plants could possibly engage in the manufacture of shells at the present time, all being loaded with orders for their standard machines and none of them with any room in which to place a plant of this character, except perhaps the Niles Works.

The suggestion you make is a good one if it could be carried out, although we do not know of very many shell orders being placed on this side at present except with such concerns as

NILES-BEMENT-POND COMPANY, NEW YORK

Folio 2 DATE September 3rd, 1917.

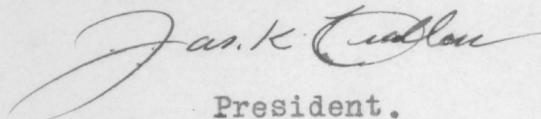
To Mr. Henry Bertram, Treasurer.

Bethlehem, Midvale and the Crucible Steel.

There are undoubtedly others engaged in this line of work but there has been little or no demand for shell equipment.

Yours very truly,

NILES-BEMENT-POND COMPANY,

A handwritten signature in cursive script, appearing to read "J. A. K. Cudde".

President.

JKC:AD

THE JOHN BERTRAM & SONS CO. LIMITED,

MACHINE TOOLS.

HEAD OFFICE AND WORKS,
DUNDAS, ONT.

DRUMMOND BUILDING,

MONTREAL, QUE.
September 7th, 1917.

Mr. Henry Bertram,
Dundas.

Dear Sirs:- 6" Shells.

While in Ottawa yesterday attending a meeting of the Board, discussion came up with regard to future orders and according to cables received from England, they are now only interested in 6" shells at the rate of 175000 per week. The question came up of changing over the 8" and 9.2 shells to 6" ~~Plats~~ and Peterson was called in to give an estimate of the cost of the change from one size to the other. His estimate averages up about \$75,000.00 for the change over from 8" to 6" shells, or in other words, about \$1.00 per shell extra required to recoup them for the change. They purpose fixing a price of \$7.00 on the shell. No doubt you will receive instructions from them if you care to take on. The amount required from our factory they have listed at 5000 per week.

The question came up of presses for nosing the shell and Peterson states that it requires a 300 ton press such as is built by R.D. Wood Co. The Chairman suggested that he order a dozen of these pressed for this purpose, but



I suggested that probably some of the factories could build their own. They will be interested to know if we would build our own press, however, this is a matter of detail and can be taken up in the future.

This order will run for six months and in all probability it will take two to three months to make the necessary changes. At that rate, you would actually have shells for four months work and it is a question whether it would be wise to take it up for this quantity. It looks as if they were going to cut out all other sizes of shells and gradually go out of the business. The reason is, that England has put it up to Canada to finance their own production and on the other hand White, the Minister of Finance feels that the strain would be too much on the country to go deeply into this question of expenditure.

Yours very truly,

John Bertram

have asked for 100,000

AB/C.

5000 per week for 17 weeks - 7th = 35000

Cost of Plant = 30000.00

Cost to produce 6" shell - 3rd =

575000.00

Montreal, Sept. 8th, 1917.

Mess John Bertram & Sons Co. Ltd.,
Montreal.

Dear Sirs:-

Attention Gen'l Bertram.

Replying to your letter of September 6th. in reference to machine tools on hand and my conversation in connection with these, we will place an order for one of the Pond Lathes 36" x 20 ft. from your Dundas shops, altered as you propose and will send you formal order within the next few days. We would, however, be glad if you would notify the works to proceed with the conversion of this lathe as quickly as possible so that we may obtain it within the next two or three months which you hope to be able to accomplish.

I am obliged to you for the interest you have taken in this matter and would ask you to see that a machine is selected that is in good condition.

Yours truly,
Sg'd H.H. Vaughan,
Vice.Pres. & Gen. Mgr.
Dominion Bridge Company, Limited.

THE JOHN BERTRAM & SONS CO. LIMITED,
MACHINE TOOLS.

HEAD OFFICE AND WORKS,
DUNDAS, ONT.

DRUMMOND BUILDING.

MONTREAL, QUE.
September 10th, 1917.

BERTRAM,
DUNDAS.



Dear Sirs:-

We are enclosing you copy of letter from Mr. H. H. Vaughan which evidently crossed the letter we mailed him on Saturday enclosing proposition on these two lathes. We trust you will give this your best attention.

Yours very truly,

John Bertram

AB/C.

THE JOHN BERTRAM & SONS CO. LIMITED,
MACHINE TOOLS.

HEAD OFFICE AND WORKS,
DUNDAS, ONT.

DRUMMOND BUILDING,

MONTREAL, QUE.

September 17th, 1917.

BERTRAM,
DUNDAS.

6" Shells

Dear Sirs:-

This morning I called at the Locomotive Company and had a look at their Bridgeford Lathes for boring 6" shells. They have twenty four of these machines in their factory and they were used only for finishing the bore and are fitted with the chucks and tools for this purpose, The machines are in good order and are being crated and placed out in the yard on account of their equipment for heavy boring. They used these lathes for the finishing and same have not been used on heavy work. They finished bored the shell at the rate of 5" per minute and they state that they could not finish these shells successfully without these tools. They tell me that the 6" shell is the most difficult one to manufacture, they had a lot of trouble finishing the inside bore.

They have sold all their equipment for nosing the shell and other machinery to Great Britian and they have nothing left but a lot of lathes and other tools not used on this size of shell. They nose the shell in with a Bliss Press which is much quicker than the hydraulic machine and is more positive in its operation. If you should come to Montreal, they will be glad to show you all this material.

Regarding price, they told me the other day that they had sold two of these machines for \$2475.00, when we called to-day, I found that it was only an offer they made to some person and they have not yet sold a machine. The price is to my mind very high and in looking over our prices when these machines were purchased, they were quoted to us at something like \$2800.00. Fraser was not in at the time but I am going to see him and tell him that if they want to sell this machinery, he had better cut his prices in two.

I understand that the Cement Company have an order for two thousand 6" shells per day.

Trusting the above information will be of
interest to you, I remain.

Yours sincerely,

John Bertram

AB/C.

CANADIAN PACIFIC RAILWAY CO.'S TELEGRAPH.



Message No.

Sheet

Time

Letter

FROM

To

Ottawa Sept. 11th, 1917.

Mr. J. H. Howard,
J. Bertram & Sons Co.,
Dundas, Ontario.

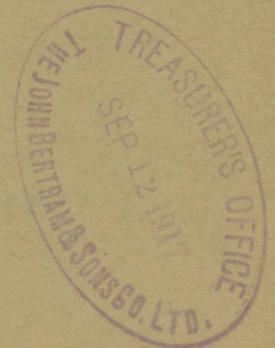
Just been advised that the extended
six inch programme has been approved Stop Therefore
we will expect you to turn your whole plant over
to the manufacture of six inch shells Stop Kindly put
work in hand as we can discuss terms of contract
any time you may find it convenient to come to
Ottawa.

Imperial Munitions Board,

W. A. Petersen.

Time: 4.55 P.M.

Charge: I.M.B.



CONFIRMATION

NILES-BEMENT-POND COMPANY

NEW YORK.

PLEASE CONFINE YOUR LETTER TO ONE SUBJECT.

Subject,

Sept. 22, 1917.

Mr. Henry Bertram,

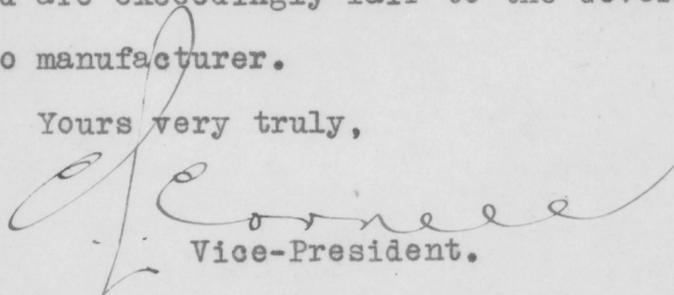
DUNDAS -

We have your letter of the 19th telling of a rumor you have heard that Brown & Sharpe are considering starting a Small Tool Factory in Montreal.

It seems scarcely possible that this rumor can have very much foundation in fact, but we shall make inquiry so that we may know Brown & Sharpe's attitude toward anything of the sort.

We are much pleased with the order you have had for the 100,000 shells. It seems to us that the terms of payment proposed are exceedingly fair to the Government and satisfactory to manufacturer.

Yours very truly,

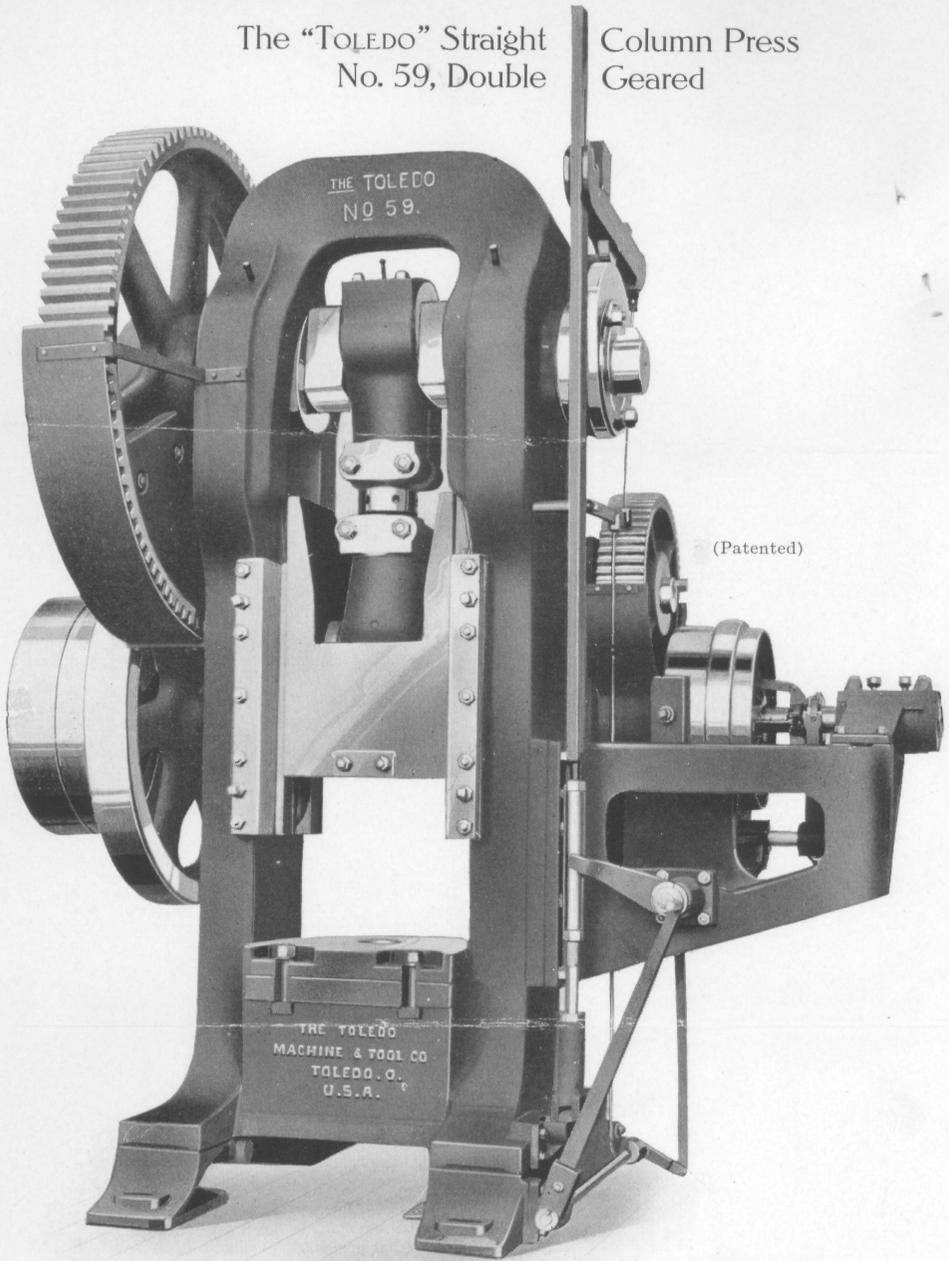
A handwritten signature in cursive script, appearing to read "J. Corneil".

Vice-President.

CLC:T

The "TOLEDO" Straight
No. 59, Double

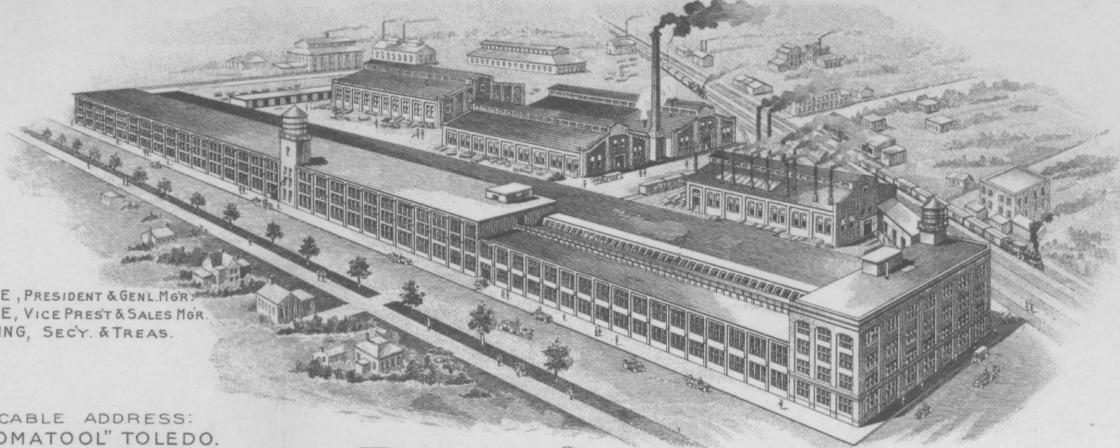
Column Press
Geared



This Press has an unusually long stroke or slide motion and is intended for drawing and reducing deep stampings in heavy steel plate, such as car journal lids, logging tool handles, blower fan blades, wagon hubs, etc.

General description, pages 6-2, 3, 4 and 15. Dimensions, page 6-56.

THE TOLEDO MACHINE & TOOL CO.



HENRY J. HINDE, PRESIDENT & GENL. MGR.
LOUIS J. HINDE, VICE PRES. & SALES MGR.
CHAS. W. GREENING, SECY. & TREAS.

CABLE ADDRESS:
"TOMATOOL" TOLEDO.
LIEBERS AND PRIVATE CODE

TOLEDO, OHIO, U.S.A. Sept. 17, 1917.

Jno. Bertram & Sons Co.,
Dundas, Ont.

Gentlemen:-

Replying to your telegram of even date we have just wired you as follows:

"No. 59 press - 10 inch stroke, friction clutch, solid frame construction, weighing about 55,000 lbs. \$5800.00 Toledo. Delivery 10 to 12 weeks."

which we hereby confirm.

We propose to furnish you with:

One

"Toledo" No. 59 Press similar to catalog illustration 6-42 excepting the machine will not have the foot or treadle lever attachment as shown in illustration. Machine will be equipped with our patented friction clutch with vertical hand lever control. Stroke or motion of slide 8 to 10" as you may specify. Die space about 23".
Price\$5800.00
Toledo.

Delivery, if order is placed at once, in from 10 to 12 weeks.

Trusting that we may receive your order, we remain-

LJH-B.

Yours truly, *The Toledo Machine & Tool Co.*

Per *L. J. Hinde*
VICE PRES. & SALES MGR.



100-9

140000-

ALON TO, 20 13 1913

DETTAELA TO 20 13 1913

101000

IMPORTANT NOTICE: APPROXIMATE QUOTATIONS AND ESTIMATES OF TIME OF DELIVERY MUST BE REGARDED MERELY AS EVIDENCING OUR BEST OPINION AS TO THE PROBABLE COST OF THE WORK REFERRED TO AND THE TIME WE BELIEVE WILL BE REQUIRED FOR ITS COMPLETION. SUCH QUOTATIONS AND DATES MUST NOT, HOWEVER, BE CONSIDERED AS BINDING. OUR SHOP RATES WILL GOVERN AMOUNTS CHARGED WHETHER MORE OR LESS THAN THE GIVEN APPROXIMATE FIGURES, AND EVERY REASONABLE EFFORT WILL BE MADE TO COMPLETE SUCH WORK WITHIN THE TIME STATED.

AS TO DELIVERY CONTRACTS, THIS COMPANY WILL USE ITS UTMOST ENDEAVORS TO FILL ORDERS AT TIMES PROMISED AND WILL KEEP SUCH PROMISES UNLESS PREVENTED BY DELAYS OF CARRIERS, STRIKES, FIRE OR OTHER CAUSES NOT DIRECTLY OR FULLY WITHIN ITS POWER TO CONTROL.

CUSTOMERS ARE HEREBY NOTIFIED THAT ALL QUOTATIONS AND SALES AGREEMENTS OF THIS COMPANY ARE MADE WITH THE DISTINCT UNDERSTANDING THAT EACH AND EVERY ONE OF THE PROVISIONS OF THIS NOTICE ARE FULLY UNDERSTOOD AND ACQUIRED IN.

DETTAELA TO 20 13 1913

THE JOYEDO MACHINE & TOOL CO

DETTAELA TO 20 13 1913

OTTAWA, September 18th, 1917.

Memorandum of Proposed Basis of Extended
Terms to be given by new Manufacture
turers of Six Inch Shells after
Discussion with Mr. FitzGerald, on
September 18th, 1917.

PRESENT -

Representatives of following Concerns -

Canadian Ingersoll Rand
Fisher Motor Company
St. Lawrence Bridge
John Bertram & Sons
Canada Cement
Lesside Munitions Company
Gurney Foundry Company
Russell Motor Car Company
Canadian Bridge Company
Canadian Fairbanks Morse

After discussion it was agreed that the maximum
terms of the specific allotments of Mark XI ^{shall be} to 66 2/3%
cash on the Fifteenth of each Month for all shells shipped or
accepted during the preceding month. The balance of 33 1/3%
with interest at the rate of Six Percent per annum to be paid
on March 1st, 1919. It is further understood and agreed
that all scrap made is to be taken by the Imperial Munitions
Board and billed by the Contractor at Twelve Dollars per
gross ton for turnings and Twenty-four Dollars per ton for
ends. Payments for same to be made in cash on the Fifteenth
of each Month for all turnings and ends shipped during the
preceding month, f.o.b. Contractors' plant.

In case it is impossible for the Munitions Board
to give shipping instructions, Contractors to have permission
for selling same.

It is also understood and agreed that the ruling
regarding allowances for work done on defective material be
in accordance with Circular Letter issued by the Adjusting
Engineer, Mr. B. W. Seton, starting with " For the sake of
uniformity, etc", also the customary allowance for eccentric
forgings.

The price suggested by you of Seven Dollars is

accepted

accepted for the machining and assembling. All material to be supplied by the Board with the exception of base plates, varnish, gresse and luting which are to be furnished by the Contractors.

The above proposal represents the maximum that any of those present felt themselves able to do.

Sept. 20th 1917

Imperial Munitions Board

Ottawa Ont.

Edward Fitzgerald, Esq.,
Assistant to Chairman.

Dear Sir:-

This will confirm for our company the offer made to accept an allotment of 100,000 shells upon a schedule of delivery as set forth in a letter by Mr. Petersen to us of a few days ago. The price we understand is \$7.00 each f.o.b. our factory siding.

We regard to terms it is agreeable to us to have you endorse on our contract the maximum terms as set forth in memorandum at the meeting held on the 18th, namely, 33-1/3% of the price to remain as an open account, and be paid in March 1919, interest on the open account in the usual way at the rate of 6% per annum.

We have thought it well to write this letter, so that your order department will know upon what terms to issue the contract to us.

Yours very truly,

Treasurer

HB/EMH

NIGHT LETTER



The Great North Western Telegraph Company of Canada.

Exclusive connection with the
WESTERN UNION TELEGRAPH CO.

Cable Service
to all the world

Z. A. LASH, PRESIDENT

GEO. D. PERRY, GENERAL MANAGER

Receiver's No.	Time Filed	Check
2-N-D.		82 N.L.

SEND the following NIGHT LETTER subject to the terms printed on the back hereof, which are hereby agreed to.

Welland Ont Sept 19/17

Henry Bestram & Sons
Dundas.

We quoted your Mr. Simpson this afternoon by phone on one hundred thousand glass plate forgings for six inch shells twenty eight cents eight plain without lugs thirty one cents each with lugs for Welland shipments six thousand weekly beginning third week in October if our price is a little high the quality and workmanship in our glass plates and the delivery we will give justifies it as we have added only a very small percentage for our profits. (sig) L. J. Dillon

Sept. 20th 1917

Canada Forge Co. Limited

Welland Ont.

T.J.Dillon, Esq.,
President.

Dear Sir:-

Your personal telegram regarding metter of baseplate I understand Mr. Simpson has arranged with you to supply our requirements, but before doing so, I understand, we are going to receive two samples from you, so that our people can select the one they want to work to.

We hope you will have these samples here at an early date, as we are arranging for tools for handling this work.

Yours very truly,

Treasurer

HB/EMH



CANADIAN PACIFIC R'Y, CO.'S TELEGRAPH NIGHT LETTERGRAM

The Canadian Pacific R'y Co.'s Telegraph transmits and delivers this night lettergram subject to the terms and conditions printed on the back of this blank. J. McMILLAN, Manager Telegraphs

RM
4

Ottawa ont 14 H.R. 8 1/2 pm

Henry Bentzen 70 P. B. & S.



The chairman has called a meeting of eight inch and nine point two inch contractors for Tuesday

morning to discuss matters relating to manufacture stop can you arrange to be present. please advise

J. M. B.

W. A. Peterson
Peterson

TELEGRAM.

The John Bertram & Sons Co., Limited

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.

C.P.R. - PAID

10.00

Sept. 15th 1917

W.A.Petersen
Imperial Munitions Board
Ottawa Ont.

Will be in Ottawa Tuesday morning as per wire last evening.

Henry Bertram



Telegram

FORM T. D. 1G

CANADIAN PACIFIC R'Y. CO.'S TELEGRAPH

NIGHT LETTERGRAM

The Canadian Pacific R'y Co.'s Telegraph transmits and delivers this night lettergram subject to the terms and conditions printed on the back of this blank.

J. McMILLAN, Manager Telegraphs

41-3884
Ottawa Ont
Sept 14 1917

J. Bertram & Son
would like to have contract for
6 inch shells definitely settled
upon. Could you send some one
to Ottawa to confer with me
Monday or Tuesday of next
week. But please word when
I may expect you Imperial
Munition Board

W. A. Peterson



TELEGRAM.

The John Bertram & Sons Co., Limited

C.P.R.- PAID

DUNDAS, ONTARIO

4.30

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.

Sept. 14 1917

Imperial Munitions Board
W.A. Petersen
Ottawa Ont.

Replying your wire date will meet you Tuesday morning next.

John Bertram & Sons Co.

Sept. 13th 1917

Imperial Munitions Board

Ottawa Ont.

W.A.Petersen, Esq.,
Superintendent of Production

Dear Sir:-

I have noted your telegram of the 11th regarding placing our plant on production of 6"shell.

We take it that the price fixed is \$7.00 each f.o.b. here and terms of payment will be discussed when we call at Ottawa at an early date.

Will you kindly confirm this and oblige,

Yours very truly,

Treasurer

HB/EMH

CONFIRMATION

TELEGRAM.

The John Bertram & Sons Co., Limited

DUNDAS, ONTARIO

Send the following ^{CPR PAID} message, without repeating, subject to the terms and conditions ^{11.16} printed on the back of regular message blank, which are hereby agreed to.

Jany 7th 1918

C.L. Cornhell
Niles-Bement-Pond Company
111 Broadway
New York, N.Y.

Please refer ours December twenty seventh necessary we should notify Imperial Board what our decision regarding terms are.

John Bertram & Sons Co. Ltd



CANADIAN PACIFIC R.Y. CO'S TELEGRAPH

TELEGRAM

FORM T. D. 1

All Messages are received by this Company for transmission, subject to the terms and conditions printed on their Blank Form No. 2, which terms and conditions have been agreed to by the sender of the following message. This is an unrepeated message, and is delivered by request of the sender under these conditions.

J. McMILLAN, Manager Telegraphs. Montreal.

New York 8 21
A. Brewster, Treasurer J.B. Sons,
Telegrams received referring
letter December twenty seventh
executive committee approves
shell contracts on basis
of allowing credit one third
deferred payment.
G. L. Council
~~vice president~~
vice president.



Agenda for Wednesday

Mc Cullin to Cweat to Ontario Report

Cost of Buildings Estimate 1.087.155 No. 10 Stuka 7³⁰ 79362.51
Send Contract 179534.00

Extras

Steam pipes 164.00
Drinking fountain 71.00
Toilet in Latheshop 7024

7259.00

266185.31

add 54c for Architects Expenses

Estimated Receipts and Expenditure to May 31st 1917
based on shipments according to contracts

Receipt (plus estimated cash balance Jan. 1st) - \$2004,000.00
IMPERIAL MUNITIONS BOARD 31st 1918 ----- Dec. 27 1917 ,000.00

6" SHELL CONTRACT

Office Contract	220,000.00	
Buildings & Plant	500,000.00	
Wares	150,000.00	
VICE-PRESIDENT / NEW YORK	130,000.00	
	970,000.00	970,000.00

C.L. Cornell, Esq.,

Dear Sir;- In addition to this there will be required for Victory Bond

Subscriptions. On our present order covering 150,000 6" H.E. shells the price and terms of payment are as per the following extract taken from their order -- year at 5% on the security of the contract.

Price and Terms

\$7.00 each f.o.b. cars your works, Dundas Ontario.
 freight charges to be prepaid and billed to the Board,
 such charges to be shown as a separate item on the in-
 voices covering each shipment.
 Payment will be made within thirty days of date of shipment
 (subject to satisfactory evidence thereof having been
 furnished) subject, however, to a deduction from each
 invoice of 33-1/3 of the amount thereof. Payment of the
 amount of the said deduction shall be deferred until
 the first day of March 1919 or such other date as may
 from time to time be mutually agreed upon. Interest at
 the rate of 6% per annum, computed monthly shall be paid
 to the contractors on the first day of each following
 month so long as the amount of the said deduction shall
 remain unpaid."

1st Order -- 150,000 @ 7.00 ----- \$ 1,050,000.00
 1/3 deferred payment 350,000.00
 Balance available to June 30th -- \$ 700,000.00

2nd Order - 300,000 @ \$7.00 -- 2,100,000.00
 1/3 deferred payment 700,000.00

Balance available to Oct. 31st -- 1,400,000.00

given on the first order mentioned above. I am therefore asking for your advice in the matter as you will note it would mean a million and

VICE-PRESIDENT : NEW YORK

Dec. 27 1917

Estimated Receipts and Expenditure to May 31st 1917
based on shipments according to contracts

Receipt (plus estimated cash balance Jan.1st)	-	\$904,000.00	
Overdraft Estimated May 31st 1918 -----		66,000.00	
Expenditure			
Office contract		\$20,000.00	
Buildings & Plant		500,000.00	
Wages		350,000.00	
Misc. Vouchers		100,000.00	
		<u>970,000.00</u>	<u>970,000.00</u>

In addition to this there will be required for Victory Bond Subscription \$262,000.00. This item however will not require special financing, as the Bank is compelled by the Government to carry this for one year at 5½% on the security of the script.

From February to June we would have an overdraft (exclusive of War Bond Account) running from 20,000.00 in February to \$200,000.00 in April, but the whole amount (including War Bond Account) would be covered in July.

It might be well to point out that the one-third of the value of the first 6" shell contract deferred in payment is what really causes the temporary cash shortage during the equipment of the new additions to the shell plant, and the matter of deferred payments on the second contract, while double the amount of the first, will not be a very serious matter unless, of course, unforeseen contingencies arise.

We explained to the Board that on account of the fact that we would have to spend a large sum of money on a new shop for this order that we may not possibly be able to extend the same terms as given on the first order mentioned above. I am therefore asking for your advice in the matter as you will note it would mean a million and

VICE-PRESIDENT : NEW YORK

December 27 1917
Dec. 27 1917

you think it necessary,
fifty thousand dollars standing at 6% until the end of next year, or possibly a part to end of 1919, which is quite a large sum of money, and I would not care to make a decision without consulting with the other members of the Board. If you think that we should extend any terms in which the balance of payment will be held over will you please indicate the amount and at the same time with the understanding that we are not obliged to give extended payments unless we feel we are comfortably able to do so.

In connection with the above I have already written to say that the equipment for the new shell shop would run into about \$250,000. The building of the storehouse, including the steel work, will likely run us into from two hundred and sixty to two hundred and seventy thousand dollars or an expenditure of plant of \$510,000. more or less. This, of course, does not include the cost of the cranes which would be probably \$40,000. more. The estimate for plant on a 6" shell contract of the above size would be \$420,000 according to the figures of the Board. Of course you will remember that a lot of our equipment goes in at cost instead of at purchase price, but we propose to use the purchase price on everything even although we make it ourselves for estimate of cost of plant.

There will be no trouble financing this scheme even if it is not convenient for you to have us draw on the \$250,000.00 transferred to you. If that could be returned in February next, we could get along without any overdraft. It might therefore be advisable, if you consider it wise to do it, to decrease the amount of credit we give on any sums, or we might cut it out altogether, if

VICE/PRESIDENT : NEW YORK

December 27 1917

you think it necessary.

I would be much obliged if you would kindly wire us your decision on receipt of this letter, so that we can advise the Board what our decision would be.

Yours very truly,

Treasurer

HB/EMH

Dec. 27 1917

Imperial Munitions Board
Purchasing Department
Ottawa, Ont.

Gentlemen;-

We have your favor of the 21st
regarding additional order for 6" shell.

We are consulting our Directors
regarding the matter of credit and terms
of payment, and as soon as this is decided
we will write you further in the matter.

Yours very truly,

Treasurer

HB/EMH

BERTRAM 6-Inch SHELL EQUIPMENT

OPER. #1 -- Centering

5- Bertram Drills

OPER. #2 -- Cut off open end

3- R. & V. Cutting Off Machines

1-

OPER. #3 -- Rough Turn

10- Bridgeford Lathes

OPER. #4 -- Bore

8- Pond Lathes

1- 4' by 4' Riptank 1750. x 4
2750 x 4

7000
11000
5000

*Robert
Lodley
Walt-Schuler
E. G. ...*

OPER. #5 -- Cut off Base

4- Cut Offs *Hall*

OPER. #6 -- Re-centering

2- Lathes

OPER. #7 -- Forge nose

Furnace #560 Ea - 2 wanted
John Ferguson - u Gray Toronto Steel Blast Makers
H.S. Steel Forge - 250 Entia

Say for oil - need - 1668 per 100 shells.

See Engr in ⁽¹⁰⁰⁰⁰⁰⁾ tanks.
re upright tanks,

OPER. #8 -- Boring nose

8- Davis Lathes

OPER. #9 -- Finish Turn

4- C.M.C. 32" Lathes
6- 26" Bridgeford Lathes

OPER. #10 -- Facing to weight and counterboring base

4- 26" C.M.C. Lathes

OPER. #11 -- Wave Rib

3- Bertram Lathes

OPER. #12 -- Threading nose

3- Bertram machines

OPER. #13 -- Shot blast

Gray su mms

OPER. # Preliminary Inspection

OPER. #14 -- Press copper band
West Tire Setter

OPER. #15 -- Rivet base and face plus
3- Bertram Lathes

OPER. #16 -- Facing seat
1- 20" Drill

OPER. #17 -- Washing

OPER. #18 -- Dry with swab

OPER. #19 -- Vernish

Use present method

OPER. #20 -- Baking

7- Heating Ovens
2-

OPER. #21 -- Turn copper band

3- R. & V. Band Machines

Final Inspection

OPER. #22 -- Mark on base

B.B. machine

BASE PLUGS

3 Lathes

Cut off Base

See Doyle - re tanks.
x" Gray - Short
" Smart Turner. 2 Centric
pumps.
#26⁰⁰ En for pump. ^{saw a subbed} Consolidated
Stat C

Brown & Boege re Marking Masha

Canadian Stewart
1-48" Lath - 12" Centric

Machinery in Toronto

Bradley



7'6" x 16"

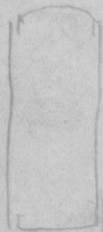
- 8 diam 14 - 4250 ft 2300

1-27'6" x 8'3" Stat Cael → 2015

Hydraulic Press Stat G - 1950

Chambers -
W.B. Cole.

Doyle - 2 - 2" tap clamps



$66\frac{2}{3}$ Cash

$33\frac{1}{3}$ diff

Weed Drawing over

Western Electric Co for drawing
and amending
Millians & Wilson

Base plus 3 lbs. Cost 31¢
1500 on double shift per day for each
hammer

60¢ - Payments, suggested may accept
payment in 1918, interest @ 6% on any
deferred payments - open @ Dec in Jan 1919,
end of May 1918.
\$12⁰⁰ ^{with} scrap, belong to producer. S. Scrap Board
will handle

Shall Ents - fair price, 24⁰⁰¢ per ton

Subject to regulate by the Board
Copies regulate same as before

THE NILES TOOL WORKS CO.*Hamilton, Ohio**Subject.*

OUTSIDE CONTRACTS.

N.B. Confine your Letter to one Firm Subject Matter only

Dec. 29, 1917.

Mr. Henry Bertram,
 %Jno. Bertram & Sons Co. Ltd.
 Dundas, Ontario.

Refer to File No.

Dear Sir:

Our Mr. Guthrie, who has been visiting a number of shops in the central part of the country within the last few weeks, endeavoring to learn which of them might be prepared to build some machines for us, called on the P. B. Yates Machine Co. of Beloit, Wisc. This concern has a very excellent equipment in its Beloit Works and is interested in considering our proposal. He learned that they have a shop also in Hamilton, Ontario, which was formerly known as the Berlin Wood Working Machinery Co. This shop also needs work and the writer is of the opinion that you may be interested, in view of the fact that your Machine Tool Department is so limited under existing circumstances. It is possible that you might consider having the Hamilton, Ont. concern do some work for you, being able perhaps, to furnish the castings if you can obtain the molders and run your foundry to something like its capacity.

I am sending you this information for what

Hamilton, Ohio

PAGE 2 TO Henry Bertram SUBJECT Outside Contracts. DATE 12-29-19th

it may be worth, not knowing exactly what the conditions are with you. Kindly give the subject attention and if you wish you can write me here what conclusions you reach.

Yours very truly,

THE NILES TOOL WORKS CO.

Jack Cullen
President.

JKC*H*L.

Jan'y 3 1918

Jas. K. Cullen, Esq.,
C/o Niles Tool Works
Hamilton, Ohio.

Dear Sir:-

We have your favor of the 29th and note with interest the efforts you are making to secure material from some of the works in the West. We might say, for your information, that when we first went into the heavy shell business we tried by every means possible to get the Yates Company at their works at Hamilton, Ontario, to take up the manufacture of a large quantity of our single purpose axle lathes for the turning operations on 8" and 9.2" shell, but notwithstanding every inducement we were unable to move them on the proposition. Immediately on receipt of this letter we again called up the Manager today and asked him what position he was in to take up some of this class of work, but we were told that the matter would have to be taken up with the Beloit Works and the manager from Hamilton was going there for some time to talk the matter over, - the indications being that they are not very strong on going into anything of this nature.

We, however, ran across a better proposition. The Sales Manager of the Otis Fensom Elevator Company here, which is a branch of the Otis Fensom Company at Yonkers, called us up and stated he had had a conversation with Mr. Merryweather, whom we understand is either connected with the British Mission or some officer in your own War Office who stated that the British Ministers were very badly in need of heavy machines such as wheel lathes, horizontal boring

Jas. K. Cullen, Esq., Hamilton Ohio

Jany 3 1918

machines and other machines, and we stated we would be glad to have them come up and look over some machines which we are proposing to have built for our additional 8" shell equipment. We require about ten or twelve machines which would suit their equipment very nicely.

The Otis Fensom Elevator Company have gone out of the manufacture of shells. They have a magnificent ^{SHOP} under capable and good management and believe we could have a number of machines built by them. They have all sorts of machines up to planers of a capacity of 60x 60" and 16 ft length of table. We believe this would be a fine opportunity, if we could get them to take it on, for them to manufacture anything in the line of machinery you would like to have done on your orders. Could you suggest an order for something in the way of machine tools which these people would be able to handle? We would imagine they could make lathes up to 48", we to plane the bed of those of undue length and probably wheel presses and such as radial drills and small boring mills up to 51". If we were to place an order with them for a number of these do you think you could dispose of the stuff. We think we could work very favorably with the Otis Fensom People, as they are much more capable than the Yates Machine Company, and besides that they do a better class of work and the management is good.

If we can be of any further assistance in this matter please command us and we will get the matter under way.

Yours very truly,

HB/EMH

Treasurer

WASHINGTON STEEL & ORDNANCE COMPANY

CABLE ADDRESS
"SUBTENSO, NEW YORK"
A.B.C. CODE

30 CHURCH STREET
NEW YORK

THE WHEELER-STERLING
ARMOR PIERCING
PROJECTILE

PITTSBURGH OFFICE
1541 OLIVER BUILDING

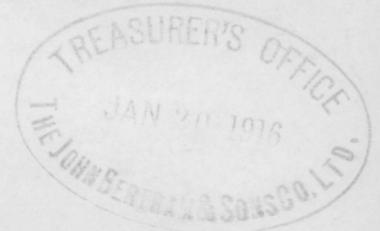
TELEPHONE CORTLAND 6088

WASHINGTON, D. C. OFFICE
GIESBORO MANOR

January 18, 1916.

IN REPLY PLEASE REFER TO B-1-10

The John Bertram & Sons, Co., Limited,
Dundas, Canada.



Dear Sirs:- 6" HIGH EXPLOSIVE SHELL.

We are in receipt of your letter of January 17th asking if we could supply from three to six 6" British High Explosive shell Mark XVI, and in reply wish to state that we shall be glad to do what we can to assist you in this matter.

If the British Government Inspectors here are agreeable, we could supply you with the number of finished shell you require at the price of \$23.50 each, plus freight expenses, and make the shipment immediately as we have a large number of these shells going through regularly.

We think, however, it will be necessary for us to submit the proposal to the British Inspectors, and are doing this pending receipt from you of further information as to whether you would like us to forward these shell to you at the price named, which is the price we are receiving for them from the British Government.

Yours very truly,

WASHINGTON STEEL & ORDNANCE COMPANY

A handwritten signature in cursive script that reads "W A Burton".

WAB/B
pgh wash
LJF

EQUIPMENT required for doing the Machine work on

6-Inch HIGH EXPLOSIVE SHELLS

at the rate of 24 per hour.

-----000-----

OPER. #1 -- Cutting Off open end.

4- Hall & Sons 6 $\frac{1}{2}$ " Cutting Off Machines
Price each fob cars Brantford Ont - - - - \$675.00

Time: 6 per hour each machine

OPER. #2 -- Centering

Use Vertical Drill equipped with suitable
fixture for centering the shell

Time: 15 per hour.

2- 24" Hamilton Drills @ \$350.00 each

OPER. #3 -- Rough turn shell.

12- Heavy Duty 26" Engine Lathes or 32" Engine
Lathes

Time: 2 per hour each machine

8- C.M.C. 32" x 14' Lathes at \$2640.00 each fob Galt
4- Bertram 32" x 14' " at \$2875.00 " " Dundas

OPER. #4 -- Rough boring to bottom of inside

4- 36" Sliding Head Drills, carrying
suitable cutter bar

Time: 6 per hour each machine

4- 32" Hamilton Drills at \$530.00 ea. fob Dundas

EQUIPMENT for Machine work
on 6-Inch H.E. Shells (Continued)

OPER. #5 -- Rough and finish boring, counterboring for thread, facing
end of shell and roughing on nose

6- 26" or 32" Heavy Duty Lathes with turret supplied
with power feed, and arranged for each tool to get
suitable supply of cutting compound.

Time: 2 per hour each machine

12- C.M.C. Special Boring Machines at \$3600.00 each
fob Galt Ont

OPER. #6 -- Waving & Undercutting operation

2- 26" Heavy Duty Lathes with Waving and Under-
cutting attachments, complete with suitable
chuck at \$2500.00 each

Time: 6 per hour each machine

OPER. #7 -- Boring out baseplug and rounding corner

3- 24" Davis Special Turret Lathes

Time: 4 per hour each machine

6- 24" Davis Lathes at \$1400.00 each fob Dundas

EQUIPMENT for Machine Work
on
6-Inch H.E. Shells (Continued)

OPER. #8 -- Finish turn body diameter

8- 20" or 24" Engine Lathes, using compression
chuck to grip shell base, and expanding
arbor to hold nose of shell

Time: 3 per hour each machine

8- 20" to 24" Lathes at \$1000.00 each

#136-248-250-251-138-139-140-156

OPER. #9 -- Threading of Base

1- Bertram Thread Milling Machine

Time: 20 per hour at \$1500.00

OPER. #10 -- Threading the Nose

1- Bertram Thread Milling Machine at \$1500.00

Time: 20 per hour

EQUIPMENT for Machine Work
on
6-Inch H.E. Shells (Continued)

OPER. #11 -- Pressing copper band to place

1- Goldie & McCulloch Hydraulic Press
at \$650.00 fob Galt

Time: 30 per hour

OPER. #12 -- Copper Band Turning

1- Bertram Special Machine at \$1500.00

Time: 20 per hour

OPER. #13 -- Screwing in Baseplug

Either hand or machine operation

OPER. #14 -- Facing off Baseplug in position

Machine operation

3- Lathes at \$1000.00 each
#281-282-166

Time: 10 per hour each machine

EQUIPMENT for Machine Work
on
6-Inch H.E. Shells (Continued)

OPER. #15 -- Cutting off square of baseplug with Hack Saw

5- Saws now in shop at \$25.00 each

OPER. #16 -- Turning off plug in place

2- 18" or 20" Engine Lathe

Time: 12 per hour

2- Mueller Lathes at \$1000.00 each
#263-264

OPER. #17 -- Rolling baseplug in position

Time: 25 per hour

Special Machine at \$100.00

OPER. #18 -- Finish facing end of shell and baseplug

2- 18" or 20" Engine Lathe

Time: 12 per hour

2- Lathes at \$1000.00 each
Nos. 262-244

EQUIPMENT for Machine Work
on
6-Inch H.E. Shells (Continued)

OPER. #19 -- Marking Base of Shell

1- Brown Boggs Marking Machine at \$750.00

Time: 30 per hour

OPER. #20 -- Baking

Using suitable furnace or air drying varnish

After baking, the nose plug can be assembled and light finishing cut taken off the nose to make perfect contour to shell.

---000---

Baseplug machining operations to be handled same as 18-pr are now handled. Use Thread Milling Machine for threading.

---000---

Machining Noseplug--Operations
Rough forging being furnished

Facing end, turning large thread diameter, counterboring and rough boring forging

4-Davis 24" Turret Lathes at \$1400.00 each

EQUIPMENT for Machine Work
on 6" H.E. Shells (Continued)

Machining Noseplug--Operations
Rough forging being furnished

Chuckling the large diameter and boring to finished size, counterboring for end of thread, and rough turning nose of forging.

4- Davis 24" Turret Lathes at \$1400.00 each

Threading internal thread and external thread

1- Bertram Thread Milling Machine
No.2 arranged - - \$1225.00

Drilling and fixing screw hole and wrench hole

1- 3-Sp. Drill Press at \$240.00

Base Plug-- Hollow milling

Drill Press at \$250.00

Base Plug -- Turning

2- Lathes at \$850.00 each -- \$1700.00

Base Plug-- Thread Milling

1- #2 Miller arranged at \$1225.00

Steel + Radon

6" shell
1000 per WK

5 1/2 hrs @ 35° Lw. 1.93

5 1/2 " @ 50° Ex 2.75

4.68

Plant \$102500

distributed over 50000 shells say - 200 per

Profit 5 1/2 hrs @ 1.55 6.33

S.P. 13.01

includes Builders 1.00
14.00

50,000 shells @ 14.00 = 700,000.00

5500 hrs

6" Shell HE - XVI - L - Equipment

Operation No.	Description	Quantity	Equipment	Cost
1	Centering	- 05	1-Drill	350.00
2	R body turning	- 45	8- Angle lathe	16000.00
3	R turn bore	1 - 15	12- " "	24000.00
4	F turn bore	- 30	24" Lathe "	8000.00
5	Turn to wt & combustion	- 20	24" Davis " 3	5000.00
6	Thread miller B + Nose	- 10	2- Machine "	2800.00
7	Screwing plug & place	- 05	Equipment	150.00
8	Rivets base plug & facing	- 15	24" Lathe (3)	4200.00
9	varnish & indicate	- 20	26" - (9)	18000.00
10	Pressing band to place	- 05	1- Steam hammer	2000.00
11	Copper band turning	- 15	Angle lathe 3)	6000.00
12	Marking base	- 05	1- Brown Baggis	800.00
13	Sensory socket to place	- 05	head	50.00
14	Turning socket	- 15	24" Lathe	11200.00
15	Facing base plug	- 10	24" " Lathe	2800.00
16	varnishing	- 15		1000.00
17	Painting	- 15		1000.00
				<hr/>
H - 240				102450.00
5 - 00 Total time				Equipment for
10% for defectm				10 per hr -
				<hr/>
5 - 30				

SHELL H.E. 6" GUN MARK XVI-1

Sept. 22nd 1915

Shell Committee

Yours very truly,

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 only is to be machined to shape of shell after being screwed into place. All component parts to be furnished FOB. our works, same to be properly tested to the requirements as set forth in your specifications.

For a minimum order of 50,000 shells to be delivered at the rate of 1000 shell per week, the price we estimate would be \$15.00 per shell FOB. our works.

This estimate covers machining from the hollow forging, which should be delivered by the forge faced and rough machined to length.

If solid forgings are supplied and same are rough machined on the outside, we will furnish the shells at \$16.00, complete as above.

In our opinion the equipment we figure on using would produce 1000 shells per week, but at the end of six months, same could be increased to 1600 or 2000 per week at a minimum of cost for equipment, providing sufficient orders are guaranteed to continue for twelve to eighteen months.

We shall be very pleased to go further into our propo-

Shell Committee - Ottawa

Sept. 22nd 1915

sition when convenient.

Yours very truly,

Treasurer

HB/EMH

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, 6-inch Gun,
Mark XVI. | L |;**

forged steel, with fixing screw

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

57
24
1589

Approved, 13th June, 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, without adapters.

(1) The drawing mentioned in the general specification is R.L., No. 22,334A (1), full size.

(2) *Nose Bush* (clause 7 of general specification).—The bush in this shell is to be made of mild steel, and provided with a tommy hole and a fixing screw as shown on the drawing. The bushes must be a good fit but easily removable.

(3) *Proof* (*vide* general specification, clause 16).—The shell will be fired for recovery from a 6-inch B.L. or Q.F. gun with such a charge as will give a chamber pressure not less than 17 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, without Adapters, Forged Steel

General Specification to govern manufacture and inspection

57
24
1520

Approved, 16th May, 1915.

NOTE.—The following Specification contains conditions which apply to all Shells, B.L. or Q.F., High Explosive, forged steel, without adapters, with the exception of those detailed in footnote* below. 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 exceptions referred to in the Note above are:—
Shell for 6-inch and 5·4-inch B.L. and 3·7-inch Q.F. Howitzers; Shell, B.L., High Explosive, 5-inch Howitzer, Mark VI; Shell, Q.F., High Explosive, 4·7-inch, Mark VI. NT; Q.F. or Q.F.C. 4-inch and Q.F. 12 and 14-Pr. Shell; and all shell below 2·75-inch.

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 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 steelmakers' cast and ingot numbers will be maintained by the Contractor upon every shell throughout manufacture. Where hollow forged shell are submitted for test by day's work of drawing, the date of drawing must be similarly maintained.

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) Two test pieces will be taken from the finished base plate at right angles to each other, and must both be capable of standing the tests shown.

TENSILE

Tenacity, tons per square inch		Elongation in a 2-inch test piece, or such piece as can be cut from the shell provided that $\frac{\text{length}}{\sqrt{\text{area}}} = 4.$ (Minimum)
Yield (Minimum)	Breaking	
Longitudinal test . . . 19	35 to 49	17 per cent.
Test from base plate . . . 19	35 to 49	12 "

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 casts of shells 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 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 test:—

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 shell is to be turned and finished to the form and dimensions shown on the drawing.

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.

A base plate made from plate steel is to be fitted in the base as shown on the drawing; the grain of the material is to be at right angles to the axis of the shell when the plate is in position. The steel is to be of the best quality, and free from lamination, flaws, cracks, surface and other defects; it must be uniform in structure.

Special attention is called to the fact that the bottom of the recess for the base plate must be quite flat and smooth turned and that the face of the base plate in contact with it must be smoothly turned but may have a slight camber on it (see drawing) so as to ensure sound seating.

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 the recess for the base plate has been cut, and after they have been grooved and finish machined internally and externally, but before varnishing or banding, will be submitted for preliminary examination.

Any shell which is not finished to the satisfaction of the Inspecting Officer, or which has any flaw or imperfection, will be rejected.

Base plates must be submitted separately when machined ready for insertion.

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 degs. 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 re-varnished 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.

This varnish 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.

13. *Marking*.—The shell will be stamped on base or on the side in front of the driving band 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 are to be stamped on the head.

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 at the Royal Arsenal, Woolwich, unpainted, 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 of shells 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 as may be required as described in Clauses 5 and 16, and such driving bands as in Clauses 15 (c) 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.

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, 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 to be then 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 Clause 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 Clause 15 (c) 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, plugs for the protection of the tracer holes (if shown on the drawing) 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, Woolwich, on completion of the tender contract.

PROPOSED METHOD

for producing 6-Inch High Explosive Shells--Mark XVI

Steel billet to be cast about $7\frac{1}{2}$ " in diameter and of sufficient length to allow for the 40% to be cut off the ingot as per regulations. Ingot then to be heated and forged to about $3\frac{3}{4}$ " diameter. Bottom of shell to be then squared and shell cut off to desired overall length.

MACHINING OPERATIONS as follows,-

OPER.#1-- Centering

Using drill press equipped with V block

TIME: 4 minutes

OPER.#2-- Rough Turning

26" to 32" Engine Lathe could be used but we would recommend Plain Axle Lathe as being greater producer.

TIME: 45 minutes

OPER.#3-- Rough boring

Use High Duty Drill Press or Axle Lathe with square tool holder clamped on carriage. From this square tool holder would be a square bar of about 3" across the flats which would be supported close to the mouth of the shell. Shell to be held in suitable chuck. If the work is done in Axle Lathe character of the square bar for holding the tools would enable roughing and finishing tools to be used.

TIME: 1-1/4 hours

OPER.#4-- Finish Turn Body

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

TIME: 30 minutes

OPER.#5-- Facing to weights and counterboring base

Use one Davis 24" Turret Lathe

*TIME: 20 minutes

1/2 hrs Bone Thread free

OPERATIONS on 6-Inch High Explosive Shell-Mark XVI
(Continued)

9.2
1 hr
OPER.#6 -- Thread Milling base and nose of shell

Use Bertram Thread Milling Machine

TIME: Both ends 10 minutes

OPER.#7 -- Screwing base plug into position cementing same with Pettman Cement

TIME: 5 minutes

OPER.#8 -- Rolling or rivetting base plug into place and facing off flush with bottom

Use 26" Engine Lathe or Bertram No.3 Axle Lathe

TIME: 15 minutes

1/2 hr
OPER.#9 -- Waving & Undercutting

Use Bertram No.3 Axle Lathe

TIME: 20 minutes

OPER.#10 -- Pressing copper band to place.

5 min
Use 1500# Steam Hammer with suitable dies, and heating copper band before placing in position

TIME: 5 minutes

OPER.#11-- Copper Band Turning

15 min
1- Bertram No.3 Axle Lathe equipped with copper band turning attachment and special equipment for undercutting on copper.

TIME: 15 minutes

OPER.#12 -- Marking the base

5 min
This will be done on Brown Boggs 6" Marking Machine

TIME: 5 minutes

OPERATIONS on 6-Inch High Explosive Shell--Mark XVI
(Continued)

OPER.#13 -- Screwing socket in place

5 min

This work will be done under large Drill Press having suitable driver, shell itself being held in wing chuck.

TIME: 5 minutes

OPER.#14 -- Turning off socket

15 min

Use Bertram No.3 Axle Lathe or Standard 26" Lathe with suitable equipment for bevelling the nose and turning outside to exact shape to conform with the rest of the shell.

TIME: 15 minutes

After the shell is in this state it has to be varnished inside and baked for eight hours at 300 degrees of heat. Before shipment to be painted all over with vaseline.

2" Shell from Serial 1212
1212

OPERATIONS ON 6-INCH HIGH EXPLOSIVE SHELL--MARK XVI
(Continued)

OPER. 413 -- Retaining socket in place

This work will be done under large drill press having suitable driver, shell itself being held in wing chuck.

TIME: 5 minutes

OPER. 414 -- Removing old socket

Use Norton No. 3 Axis Lathe or Standard 28" lathe with suitable equipment for bevelling the nose and turning outside to exact shape to conform with the rest of the shell.

TIME: 15 minutes

After the shell is in this state it has to be vandyked inside and baked for eight hours at 300 degrees of heat. Before equipment to be painted all over with vasoline.

6" Shell from Solid total time 5 hrs
9.2 - - - - - 12 hrs 58 min

WASHINGTON STEEL & ORDNANCE COMPANY

CABLE ADDRESS
"SUBTENSO, NEW YORK"
A.B.C. CODE

30 CHURCH STREET
NEW YORK

THE WHEELER-STERLING
ARMOR PIERCING
PROJECTILE

PITTSBURGH OFFICE
1541 OLIVER BUILDING

TELEPHONE CORTLAND 6088

WASHINGTON, D.C. OFFICE
GIESBORO MANOR

August 30, 1915.

The John Bertram & Sons, Co. Ltd.,
Dundas, Canada.

Dear Sirs:-

Your letter of August 27th addressed to the writer in regard to the possibility of securing certain shell forgings and finished shell has been duly received.

We shall be glad to assist you by selling you at a nominal figure the forgings and finished shell you require, as follows:-

	<u>FORGINGS</u>		<u>FINISHED SHELL</u>	
6" Mk. XVI	\$5.00	- 10 -	\$15.00	50 17 33.
9.2" Mk. II Howtr.	17.00	- 30 -	50.00	
12" Mk. II Howtr.	40.00	- 80 -	120.00	

If you will kindly give us the necessary shipping instructions, we will attend to the forwarding at an early date.

Kindly inform us in the case of the forgings whether you would require a head forgings for the 6", and base plugs forgings for the 9.2" and 12".

We shall be glad at any time if we can be of any service to you.

Yours very truly,

WASHINGTON STEEL & ORDNANCE CO.

W. A. Burton,
per J. F. B.

WAE/B
Pgh Wash.

C-1-10

Ordered Sept 1st 1915

CABLE ADDRESS
"STEELMAKER, NEW YORK"

ADDRESS ALL COMMUNICATIONS TO THE COMPANY

U. S. S. P. CO'S PRIVATE CODE
UNITED STATES STEEL CORPORATION CODE
A. I. CODE. A. B. C. CODE. (4TH & 5TH EDITIONS)
WESTERN UNION CODE. LIEBER'S CODE
BENTLEY'S COMPLETE PHRASE CODE

UNITED STATES STEEL PRODUCTS COMPANY

Exporters of the Products of

CARNEGIE STEEL CO. AMERICAN STEEL & WIRE CO. AMERICAN BRIDGE CO. NATIONAL TUBE CO.
ILLINOIS STEEL CO. AMERICAN SHEET & TIN PLATE CO. THE LORAIN STEEL CO. SHELBY STEEL TUBE CO.
TENNESSEE COAL, IRON & RAILROAD CO.

30 CHURCH ST., NEW YORK, U. S. A.

IN REPLY PLEASE REFER TO.....

September 17, 1915.

Messrs. John Bertram & Sons Co., Ltd.,
Dundas, Ontario, Canada.

Gentlemen:

We beg to acknowledge your letter of September 15th, confirming your telegram to me at Pittsburgh.

We also beg to acknowledge your request that we send you one (1) 6" Shell Forging along with the 9.2" and the 12". Your order has been entered for shipment, less Carload, at the following prices:

6" -----	\$12.00
9.2" -----	30.00
12" -----	75.00

f. o. b. our Works, Pittsburgh, Pa.

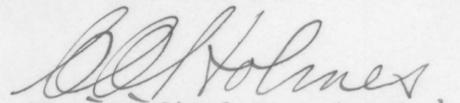
In accordance with our instructions covering all war materials, terms will be net cash upon presentation of invoice, but please note that we are making presentation of invoice to you through the mails.

We trust the forgings will be in your hands promptly.

Assuring you of our interest and continued co-operation, we are,

very truly yours,

UNITED STATES STEEL PRODUCTS COMPANY.


Manager Steel Department.

AWM/JM.



MACHINE OPERATIONS

on 6-Inch HIGH EXPLOSIVE SHELLS, forgings being furnished.

OPER. #1 -- Cutting Off Open End of Shell, measuring distance from the bottom of the inside.

Use Cutting Off Machine of suitable size having back and front tools operating at the same time.

TIME: 6 shells per hour

OPER. #2 -- Centering

Use any standard Drill Press of suitable size equipped with fixture consisting of spindle shaped to suit the interior of the forged shell. This fixture can be so arranged that when swung into position it comes perfectly central with the centering drill, and after the centering has been done it can be thrown over and shell slipped off.

TIME: Each shell 4 minutes

OPER. #3 -- Rough Turning

For this operation we would recommend 32" Engine Lathe or if the machines could be secured, plain single purpose High Duty Lathe. Lathe to be equipped with suitable driving arbor.

TIME: 45 minutes

OPER. #4 -- Boring

We would recommend for this operation heavy Turret Boring Machine of Stanley or Gisholt Type, or 32" or 36" Engine Lathe with extra heavy turret on carriage. Shell is held in suitable chucks and bars are arranged to have ample flow of cutting compound.

TIME: 55 minutes.

OPER. #5 -- Finish Turn Body

Use 26" Engine Lathe arranged with special compression chuck, forming attachment on bed, and nose of shell running in ball bearing centre fitted to reamed hole.

TIME: 20 minutes

MACHINING OPERATIONS on 6" High Explosive Shell (Continued)

OPER. #6 -- Facing to weight and counterboring base

Use 24" Turret Lathe with suitable chuck and tools

TIME: 20 minutes

OPER. #7 -- Thread milling nose of shell

Use Bertram Thread Milling Machine

TIME: 5 minutes

OPER. #8 -- Rolling or rivetting baseplate into place and facing off flush with bottom

Use 26" Lathe with suitable chuck and steady rest and tools for rolling operation.

TIME: Each operation 15 minutes or 30 minutes

OPER. #9 -- Waving and undercutting

30" Lathe or single purpose lathe of same strength equipped with Bertram Waving & Undercutting Attachment, suitable chuck and cams.

TIME: 20 minutes

OPER. #10 -- Pressing copper band to place

Use Hydraulic Wheel Press or suitable size Steam Hammer, (from 1150# to 1500# hammer would do) with dies of suitable shape.

TIME: 5 minutes

OPER. #11 -- Copper band turning

We would recommend for this simple head and tailstock on a short bed. Head could be made with two-speed cone taking 6" belt, and would not require back gear. Attachment to be added would be the double cutting off rest with suitable tools.

TIME: 15 minutes

MACHINING OPERATIONS on 6" HIGH EXPLOSIVE SHELL (Continued)

OPER. #12 -- Marking base

This would be done on Brown Boggs Marking Machine

TIME: 5 minutes

OPER. #13 -- Screwing socket into place

This could be done under large drill press, having suitable driver, and shell held in wing chuck.

TIME: 5 minutes

OPERATION #14 -- Turning off socket in place

Use 26" Engine Lathe with suitable equipment for shaping the nose and bevelling the front

TIME: 15 minutes

-----000-----

We have not discussed the work on the plug which you stated was to be provided finished. You would also on your time estimate have to figure on allowance per shell of 20 minutes for baking and varnishing.

If the plug had to be made time required for same would be 50 minutes, made from the forging on special Chucking Machine with suitable tool equipment. This would give a total time of 4 hours and 34 minutes for the work, plus 50 minutes if you make the nose piece.

*Filled out by
heat chaser*

HEAT RECORD
CONSOLIDATED STEEL CO., LIMITED

HEAT NO.

NO RECEIVED

DATE	OPERATION	No.	MACHINE DEFECTS	STEEL DEFECTS	FORGING DEFECTS	REMARKS
	CUT OFF					
	CENTRE					
	ROUGH TURN					
	BORING					
	CHAMFER					
	FACE BASE					
	RE-CENTRE					
	RE TURN					
	GRINDING					
	INSP. BORE					
	FORGE					
	DRILL AND FACE					
	INSIDE PPROFILE					
	FINISH TURN					
	THREAD FUSE HOLE					
	WEIGH					
	FACE TO WEIGHT					
	WAVING					
	BASE RECESS					
	UNDERCUT AND FUSE SEAT					
	PREL'Y INSPECTION					

May 31, '8

Heat Chasing

If a heat chaser is required, a form can be provided, on which he can check the number in each heat, as it passes each operation, taking his record from the daily time cards, at the machines, which will show the number finished in each heat.

He can locate at once any shells held up at any point, and thus have the shells machined in their proper turn.

May 3/18

Method of checking heat nos.

The number of shells finished on each heat, at each operation, shall be entered on a heat record card.

The quantities are to be taken from the daily time cards, and shall be checked by the clerks in the shell time dept.

If at any time the quantity reported on any heat should be over or under the correct amount, an ^{investigation and} adjustment must be made at once, to all reports and records concerned.

Heat record cards will be filed under heat numbers, so that the number of shells machined in any heat can be shown.

It may not be necessary to check all heats, but all heats will be subject to being checked.

This method should keep the records, reports, and piece work correct

May 3, 1918.

INSTRUCTIONS FOR THE USE OF DUPLICATE TIME CARDS

1. Keep the cards clean.
2. All operators must use the duplicate time cards when on piece work or day work.
3. A Time Card is required for each operation a man works on during the day.
4. Under no consideration put more than one operation on one card.
5. The Inspector is required to hand to each operator, when he starts, a duplicate time card bearing the date, the operator's number, name and the name of the operation on the outside of the card, only, which is the part printed in black.
6. The Inspector will indicate the number of good, defective, rejected or spoiled pieces by punching out that number on the duplicate card. He shall also mark the heat numbers, and the number finished in each heat, on the back of the operator's card.
7. When the production reaches 200, 400, 600, 800, 1000, 1200, 1400, 1600, 1800 or 2000, the Inspector will issue a new card and destroy the old one.
8. The Inspector will mark the total number of hours for the day, and the number of hours on the job on each operator's card.
9. The operator must not write anything on the time cards.
10. The hours marked on each Man's card must correspond with those registered on the time recorders.
11. All Time Cards must be ready for collection from the chief Inspector's office, where they will be placed by the Inspector of each operation, at quitting. *time.*
12. On the Saturday when the pay ends, the time cards will be collected at noon, and they must be marked A.M. New cards will be issued for the afternoon which must be marked P.M. This is necessary to divide the two pays.
13. After the cards have been collected and the wages computed the outer part of the card will be returned to the operator, which will show the amount he has earned on each operation.
14. Any error that might arise must be reported at once to the time clerk.
15. Any day work, which a piece worker may have, must be certified and initialed by his foreman.

The John Bertram & Sons Company, Ltd.

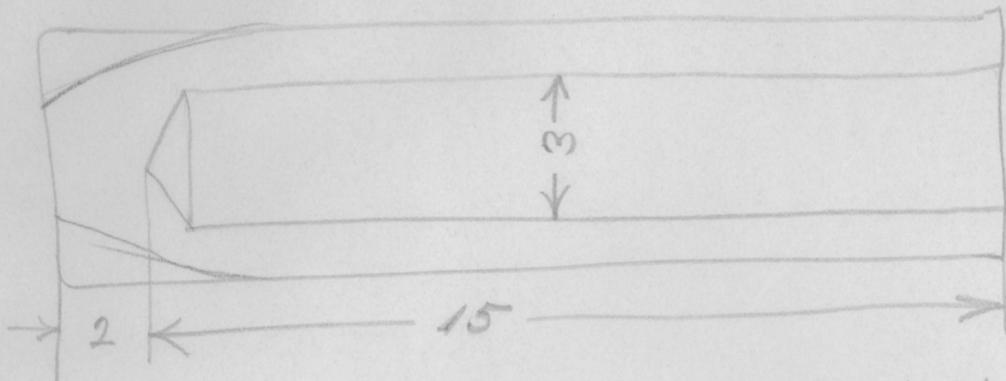
6" Spool - 100 per unit

No	Description	Q	M	
1	Center eye		05	1
2	R 7/8" turning		45	8
3	R 7/8" bore	1	15	12
4	Flange body		30	
5	Trin to wt + e Bar		20	3
6	Thread mill		10	2
7	Sec plug in place		05	
8	Rough bore plug 1/2" long		15	3
9	Worm + undermill		20	9
10	Bronze Cop band		05	1
11	Copper band turning		15	3
12	Marking base		05	1
13	Sec socket to plan		05	hand
14	Turning socket		15	
15	Face, bore plug		10	
16	Turning		15	
17	Planing		15	

	240
5-	00
	30
5-	30

100¢

6 in H. E. Shell



Drilled 15 inches deep with 3 inch drill running
80 R.P.M. = 62.83 ft cutting speed. using
.01 feed per rev. would require 18.75 min.

PROPOSED METHOD

for producing 6-Inch High Explosive Shells--Mark XVI

Steel billet to be cast about $7\frac{1}{2}$ " in diameter and of sufficient length to allow for the 40% to be cut off the ingot as per regulations.

Ingot then to be heated and forged to about $7\text{-}\frac{3}{4}$ " diameter. Bottom of shell to be then squared and shell cut off to desired overall length.

MACHINING OPERATIONS as follows,-

OPER.#1-- Centering

Using drill press equipped with V block

TIME: 4 minutes

OPER.#2-- Rough Turning

26" to 32" Engine Lathe could be used but we would recommend Plain Axle Lathe as being greater producer.

TIME: 45 minutes

OPER.#3-- Rough boring

Use High Duty Drill Press or Axle Lathe with square tool holder clamped on carriage. From this square tool holder would be a square bar of about 3" across the flats which would be supported close to the mouth of the shell. Shell to be held in suitable chuck.

If the work is done in Axle Lathe character of the square bar for holding the tools would enable roughing and finishing tools to be used.

TIME: 1-1/4 hours

OPER. #4-- Finish Turn Body

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

TIME: 30 minutes

OPER.#5-- Facing to weights and counterboring base

Use one Davis 24" Turret Lathe

TIME: 20 minutes

OPERATIONS on 6-Inch High Explosive Shell-Mark XVI
(Continued)

OPER.#6 -- Thread Milling base and nose of shell

Use Bertram Thread Milling Machine

TIME: Both ends 10 minutes

OPER.#7 -- Screwing base plug into position cementing same with Pettman Cement

TIME: 5 minutes

OPER.#8 -- Rolling or rivetting base plug into place and facing off flush with bottom

Use 26" Engine Lathe or Bertram No.3 Axle Lathe

TIME: 15 minutes

OPER.#9 -- Waving & Undercutting

Use Bertram No.3 Axle Lathe

TIME: 20 minutes

OPER.#10 -- Pressing copper band to place

Use 1500# Steam Hammer with suitable dies, and heating copper band before placing in position

TIME: 5 minutes

OPER.#11 -- Copper Band Turning

1- Bertram No.3 Axle Lathe equipped with copper band turning attachment and special equipment for undercutting on copper.

TIME: 15 minutes

OPER.#12 -- Marking the base

This will be done on Brown Boggs 6" Marking Machine

TIME: 5 minutes

OPERATIONS on 6-Inch High Explosive Shell--Mark XVI
(Continued)

OPER.#13 -- Screwing socket in place

This work will be done under large Drill Press having suitable driver, shell itself being held in wing chuck.

TIME: 5 minutes

OPER.#14 -- Turning off socket

Use Bertram No.3 Axle Lathe or Standard 26" Lathe with suitable equipment for bevelling the nose and turning outside to exact shape to conform with the rest of the shell.

TIME: 15 minutes

After the shell is in this state it has to be varnished inside and baked for eight hours at 300 degrees of heat. Before shipment to be painted all over with vaseline.

W. A. Burton

4 hrs -

*Forging for 6" Mark XVI -
Fin Shell*

5.00

15.00

*Forging for 9.2 Mark II -
Fin Shell*

17.00

50.00

*Forging for 12" Mark II
Fin Shell*

40.00

120.00