


WOMEN IN THE  
PRODUCTION OF  
MUNITIONS IN   
CANADA.

ISSUED BY THE  
IMPERIAL MUNITIONS BOARD  
CANADA

NOVEMBER, 1916

F5-12  
1916  
234

*The* EDITH *and* LORNE PIERCE  
COLLECTION *of* CANADIANA



*Queen's University at Kingston*

# Women in the Production of Munitions in Canada.

THE PICTURES HERE  
REPRODUCED HAVE  
ALL BEEN TAKEN IN  
CANADIAN MUNITION  
PLANTS AND FAITH-  
FULLY REPRESENT  
ACTUAL CONDITIONS  
AS OF THIS DATE.

Issued by the Imperial Munitions Board  
Canada

November, 1916



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## Sectional Index

	Page
Section 1—Shell Fuses - - -	7
Section 2—Light Operations - - -	21
18-Pounder Steel Sockets - - -	22
Tool Room - - -	23
Cartridge Case Clips - - -	24
Inspection - - -	25
Cartridge Cases - - -	28, 29, 30
Primers - - -	31
Section 3—General Operations on 18-Pounders -	32-43
Section 4—4.5 and 8 Inch Shells - - -	44-56
Section 5—Hospital, Lunch Room and General Accommodation	57

1915  
T-22

We have been living in a sheltered valley for generations. We have been too comfortable and too indulgent many, perhaps, too selfish, and the stern hand of fate has scourged us to an elevation where we can see the everlasting things that matter for a nation, the great peaks we had forgotten of honour, duty, patriotism, and, clad in glittering white, the towering pinnacle of sacrifice pointing like a rugged finger to Heaven.

*A. L. G. Scott*

Let us never forget the solemn truth that the nation is not constituted of the living alone. There are those who have passed away and those yet to be born. So this great responsibility comes to us as heirs of the past and trustees of the future. But with that responsibility there has come something greater still, the opportunity of proving ourselves worthy of it. And I pray that this may not be lost.

*R. B. Baden*

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: P R E F A C E :

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**T**HIS book has been prepared and issued by the Imperial Munitions Board with a view of emphasizing the practicability of woman labour in the production of munitions of war in this Country.

The photographs have been taken under the direction of the Board's Engineering Department and, to those associated with the manufacture of Munitions, will convey a technical meaning that we trust may be helpful. To others, it will broadly evidence the magnificent manner in which the womanhood of Canada, nobly backed by the workmen concerned, have rallied to the force behind the man behind the gun.

The imperative necessity for Munitions cannot be overstated. Canada will only do her share in this branch of the Empire's struggle by utilizing every human aid at her command. In this effort no one doubts the important part dilution of labour must play. We are confident of a response from employer and employee alike that will be as gratifying to our national pride as it is essential to our national existence.

The thanks of the Board is due and tendered to the manufacturers who kindly permitted access to their plants.

MARK H. IRISH,

Director, Department of Labour,  
Imperial Munitions Board  
Canada

November, 1916.



## ... NOTE ...

The material collected for the preparation of this book has been indexed and arranged under the trade and operation which they represent. They are at the service of firms considering the dilution of labour, and any information pertaining thereto can be obtained at the offices of the Imperial Munitions Board in Ottawa, Montreal and Toronto.



## Foreword

THE photographs reproduced herein are selected from a large number taken in the various factories in the Dominion. No attempt has been made to place them in sequence of operation, the operation being described with each picture.

There are many and varied appliances which have been devised by engineers for convenient handling of small parts by women workers. Close views of some of these are shown.

While the photographs may be beneficial to manufacturers of munitions, inasmuch as they show novel and ingenious methods of tooling and general production, the main object of this publication is to emphasize the possibility of the Dilution of Labour, and hence this feature is kept constantly in view.

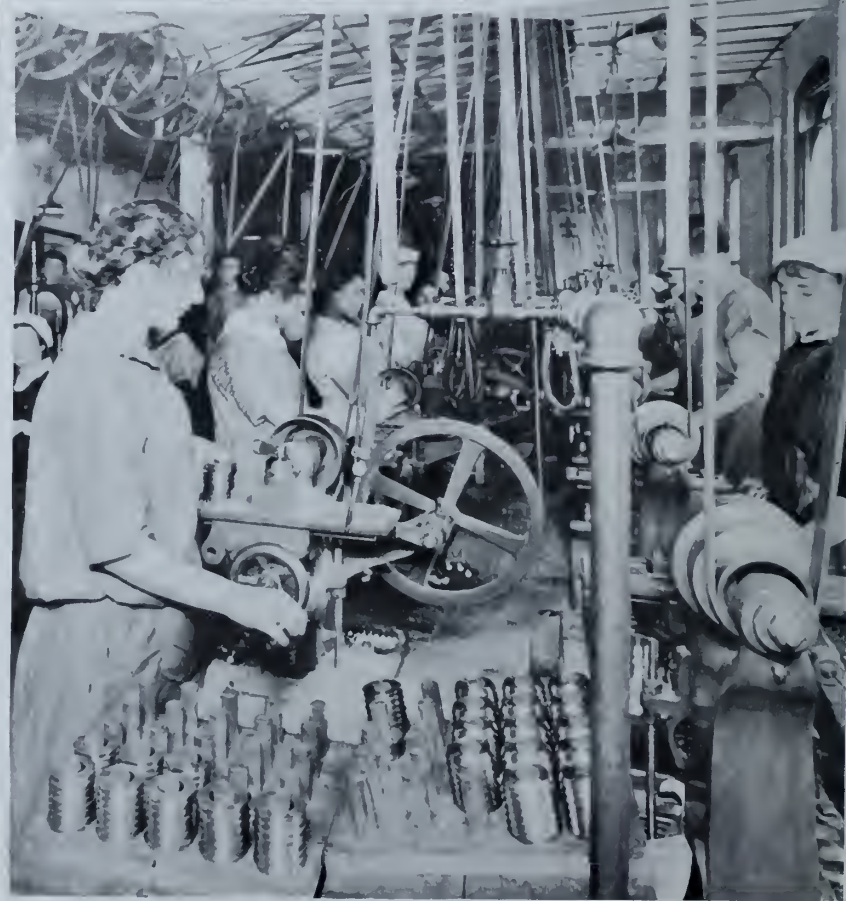
## Shell Fuses

The photographs in this section are devoted to the manufacture of shell fuses.



Milling the Undercut of  
Flash Hole in Stem No.  
80 Fuse

Note the compressed air  
nozzles handy to the oper-  
ator for cleaning.



Milling Escape Hole.  
Top and Bottom Rings  
No. 80 Fuse



General View  
of Ring  
Turning  
Department  
No. 100 Fuse

The clean, dry floor, natural light and open windows for ventilation, are all conducive to good health. Good health is conducive to good output.



Detail of Above

Turning and facing top and bottom rings; also inspecting.



Rough and Finish Turning  
of Cap No. 80 Fuse

These operations need a fair amount of physical strain, but the operator was equal to it, and guarded the point where the strain was concentrated, viz. the wrist.



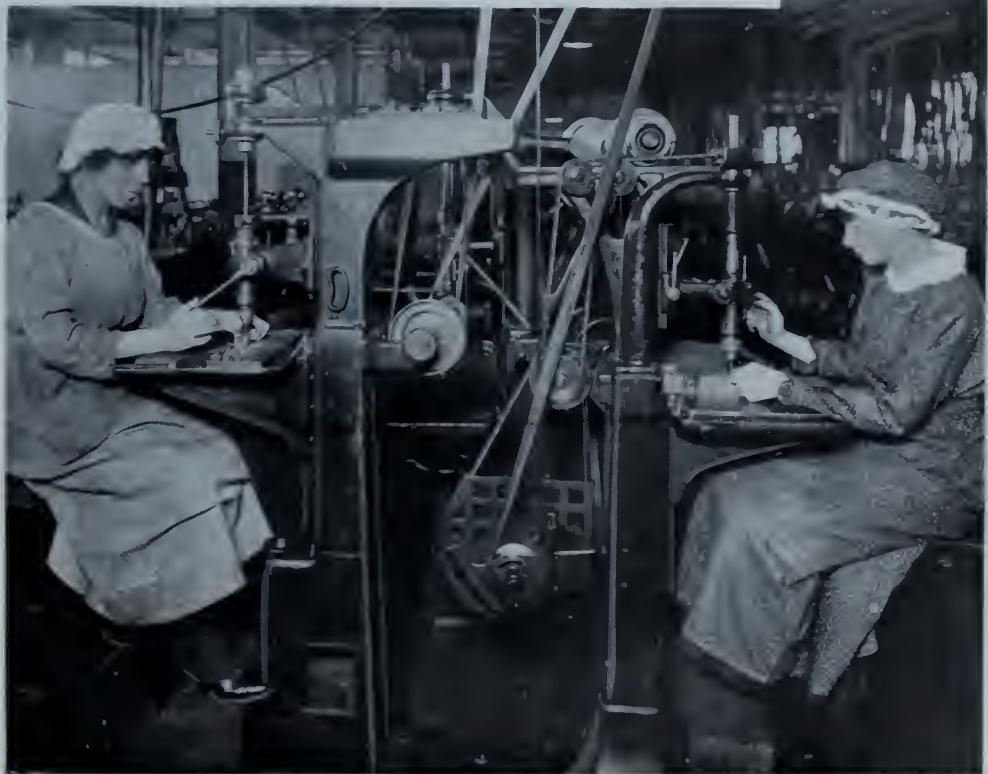
Women on Turret Lathes Executing  
Five Operations of Top and Bottom  
Rings on No. 80 Fuse as follows:

1. Chucking; 2. Boring; 3. Rough Reaming; 4. Finish Reaming; 5. Facing.





Various  
Drilling  
Operations of  
Small Parts  
No. 100 Fuse



Drilling  
Needle Hole  
of Detonator  
Needle Plug  
No. 100 Fuse

Two very ingenious jigs are in use on these drilling machines for holding the exceedingly small parts, the insertion of the part and the opening and closing of the jig was done with lightning-like action.



Assembling No 100  
Fuses

Putting in setting pins  
in bottom rings. (Front)

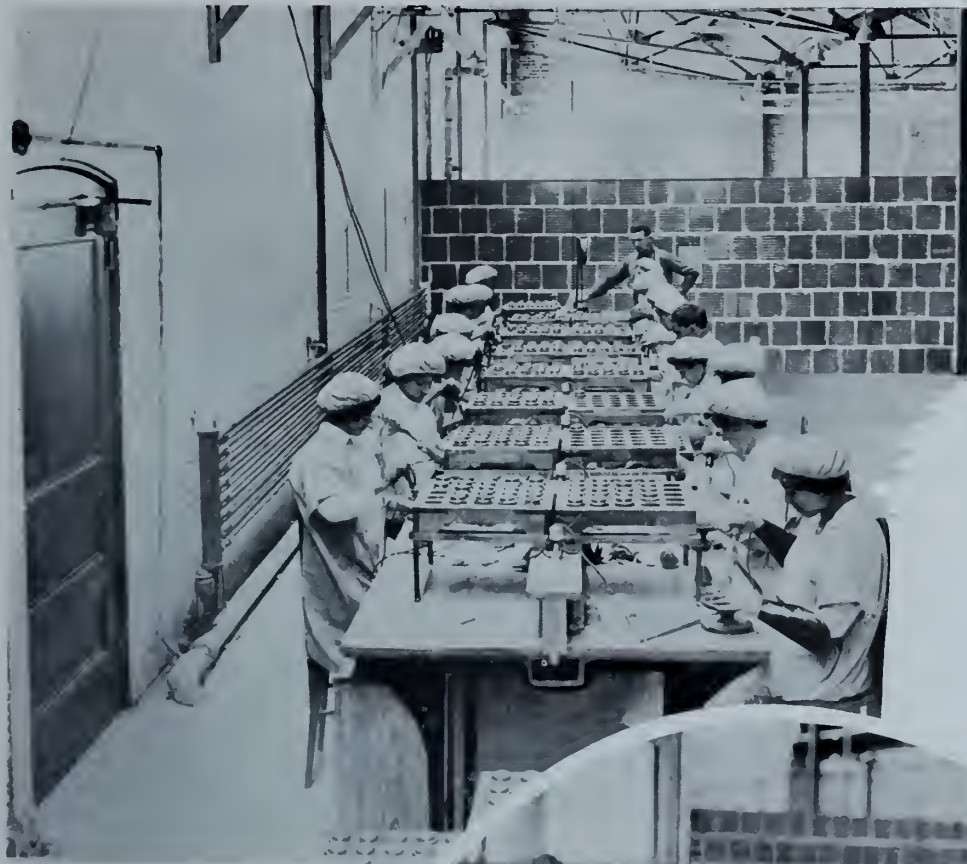
Hand reaming rings.  
(Back)



General View of  
Assembling Shop  
No. 100 Fuse

These are three excellent  
examples of clean, light  
and airy shops.





Soldering  
the Cap of  
No. 80 Fuse



Close Operation  
of Above



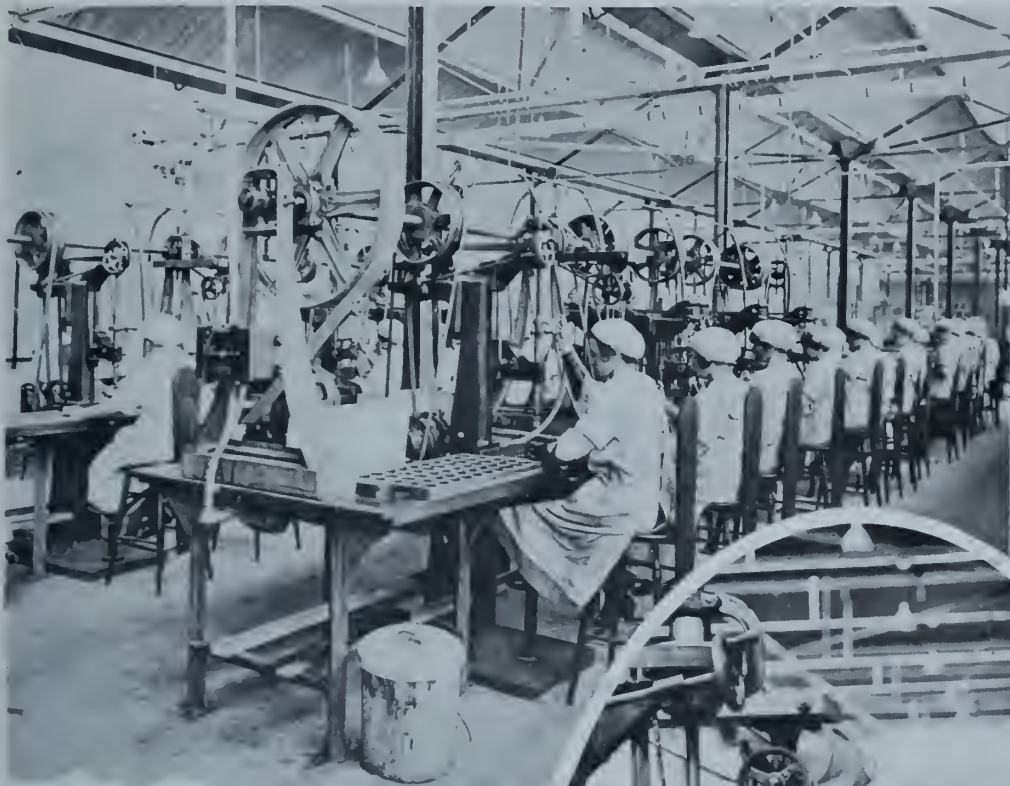


Filling the Base Charge and Packing No. 80 Fuse

Note the drinking fountain on right.

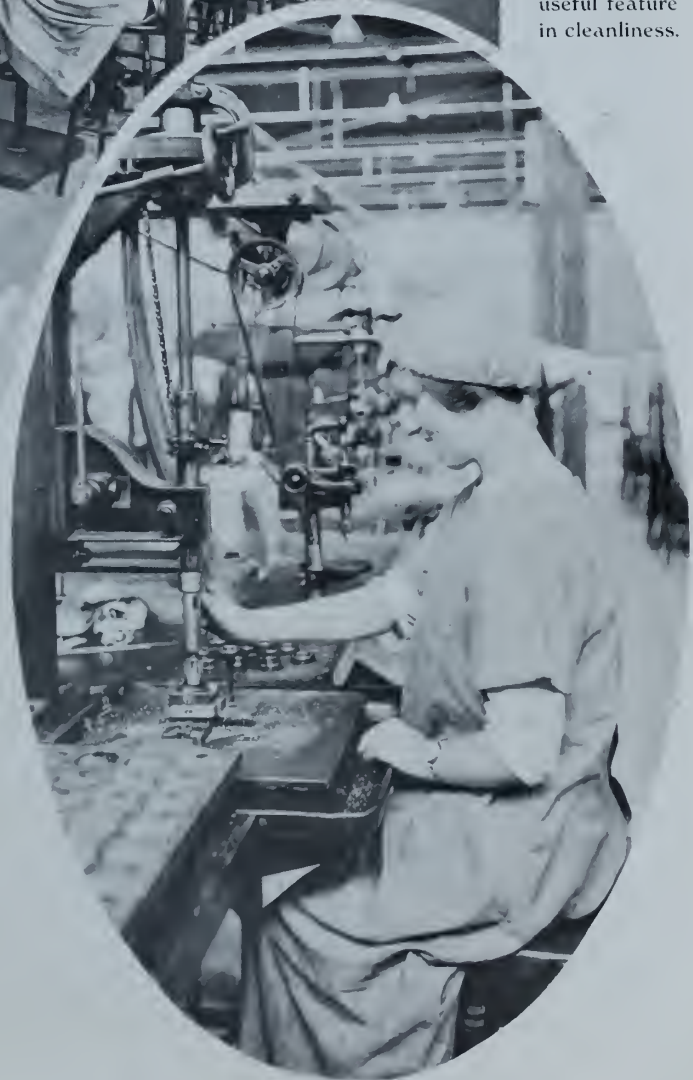


Close Operation of Filling the Base Charge No. 80 Fuse



Finishing  
the Top  
Ring of  
No. 80 Fuse

The  
"Highbacks"  
attached to the  
stools are a  
great support to  
the workers.  
The refuse  
cans are also a  
useful feature  
in cleanliness.



Close Operation of Above





Detail of Drilling  
Operation, Clearly  
Showing the Jig  
and its Usefulness



Drilling Holes  
Preparatory to  
Routing the  
Powder  
Groove, No. 80  
Fuse



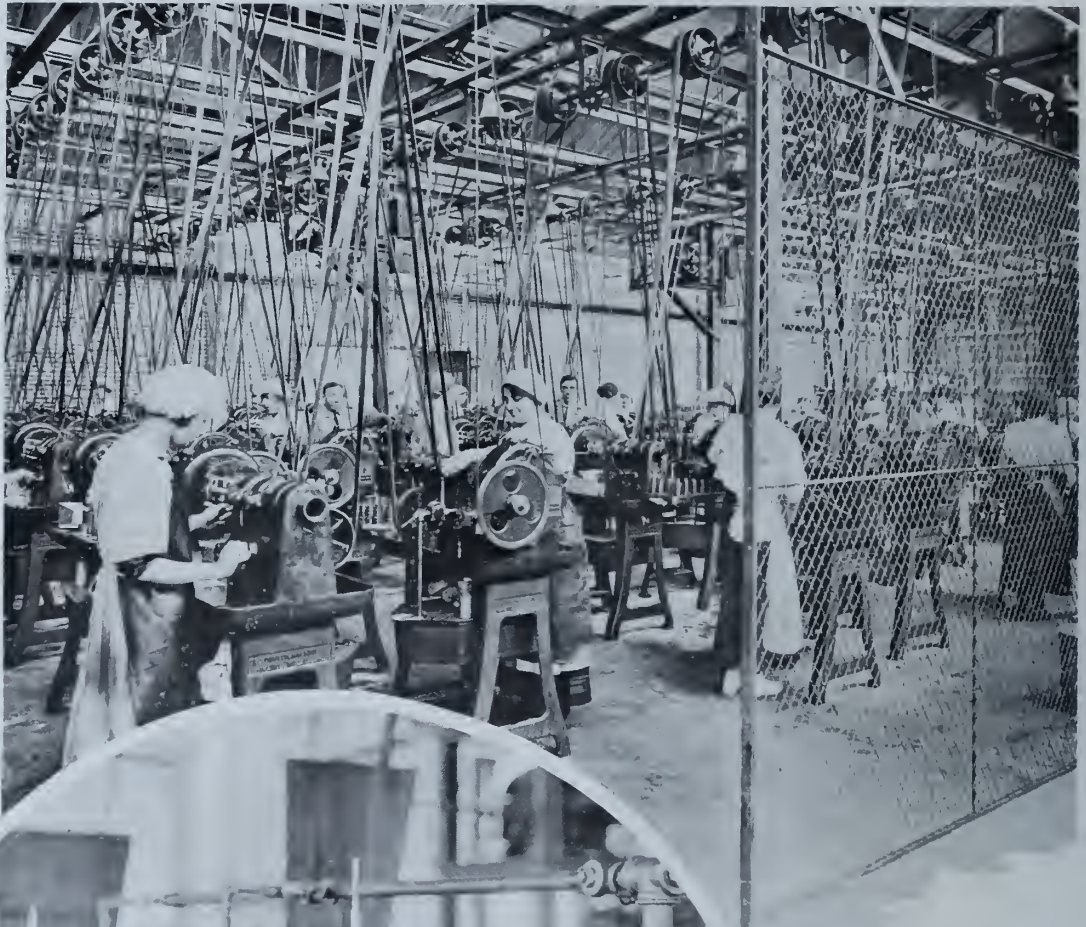


General Views of Assembly Room, No. 80 Fuse

Here are perfect examples of modern construction; in spite of the airy appearances there are plenty of fans for keeping the air moving, which incidentally keeps the workers moving. This factory was built and in operation in a very few months.



Routing  
Powder  
Groove  
No. 80  
Fuse



Drilling the Flash  
Hole No. 80 Fuse





Finished  
Assembly  
No. 80  
Fuse



Weather-  
Proofing  
No. 80  
Fuse



Foot Presses. Pressing  
Needles in Needle Plug.



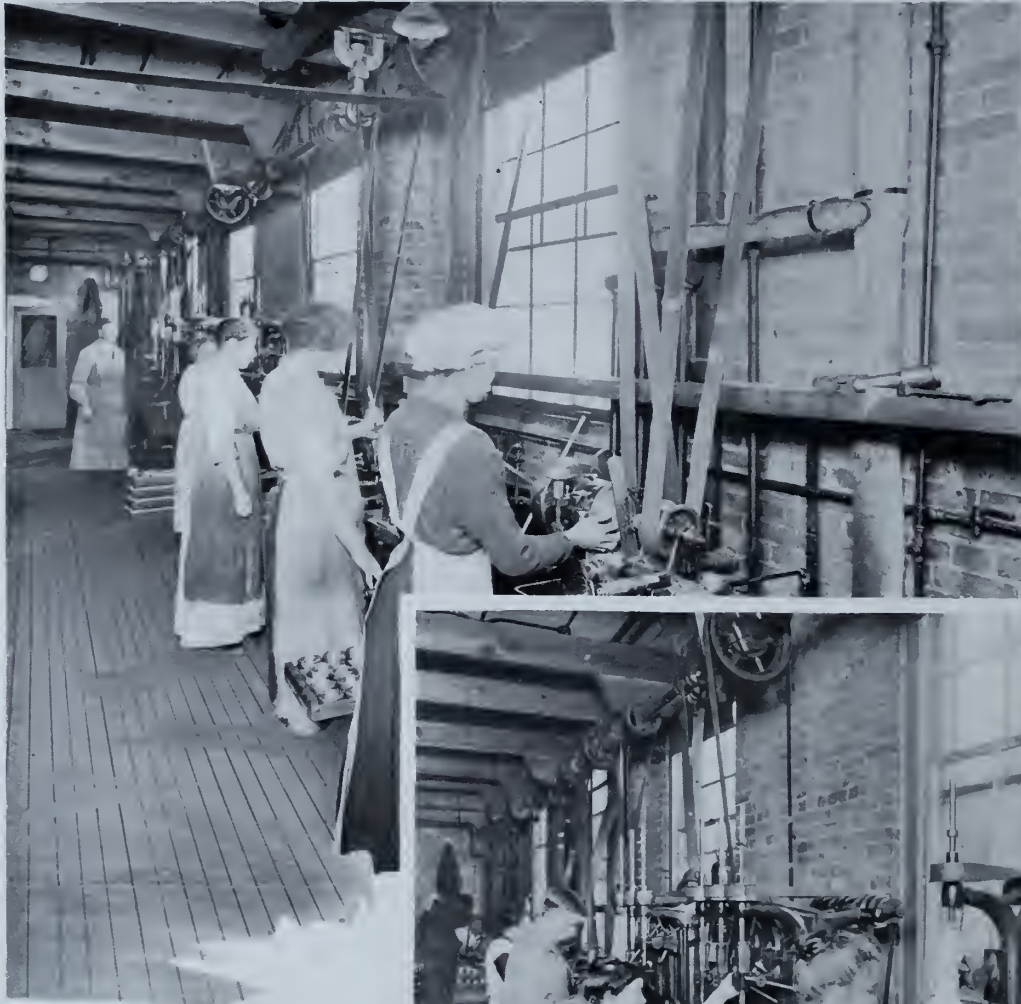
Various Milling  
Operations on Top and  
Bottom Rings  
No. 80 Fuse



## General Light Operations

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**T**HERE are many operations in the Machine Shop which can safely be assigned to women. This section illustrates such operations, from small drilling machines to heavy power presses, and yet may be fairly characterized as light operations. The tool room presents every advantage for female labour, in spite of the fact that engineering history tells us that it is the department for highly trained mechanics, but it has been clearly demonstrated that women, under the guidance of trained toolmakers, are efficient and useful. The grinding of milling taps, cutters, general cutting tools and other repetition work is particularly suitable for them. The making of jigs and dies is, and possibly always will be, a highly skilled mechanic's task, but we look forward to the time when many more women will be admitted to this branch of engineering work. Especially have the women astonished engineers in their aptitude for the handling of milling machines.



Milling  
Inside  
Thread of  
Steel  
Sockets for  
18-Pounder  
Shrapnel  
Shells

Trained Mechanic Setting  
Up Another Machine

Drilling and Tapping  
Outside Thread of Steel  
Sockets for 18-Pounder  
Shrapnel Shells







Grinding Milling Tap

The independence of this woman is strikingly illustrated by the contempt she has for the stool.



Tool Grinding



Painting Cartridge Case Clips



Tacking and Closing Assembling Strips for Cartridge Case Clips



General  
Inspection of  
Components No.  
80 Fuse



Inspection of  
Top and  
Bottom Rings  
No. 80 Fuse



Inspection of Bodies No. 100 Fuse



Inspection 18-Pounder Shrapnel





Inspection

Finishing Oversize Shells with File



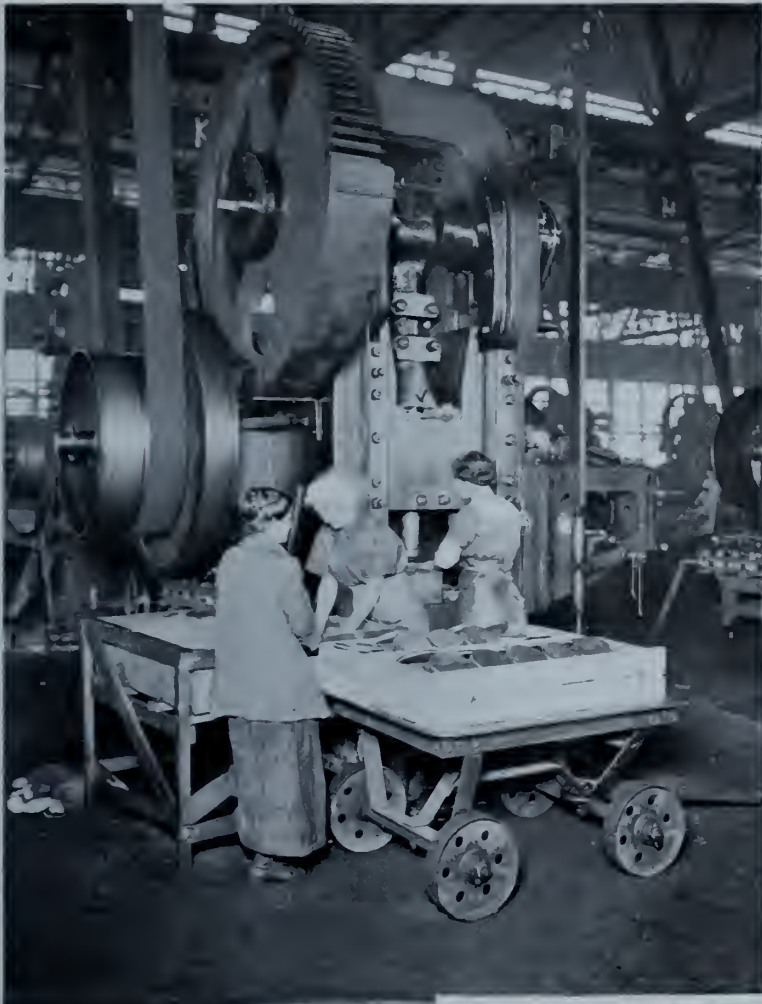
These women were able to rapidly run over shells with a file and pass them through the gauges which hitherto refused owing to the slight burrs.



Soldering  
Powder  
Cans for  
18  
Pounder  
Shrapnel  
Shells.



General View of Shop and Bank of Power Presses on Cartridge Cases for 18 Pounders.

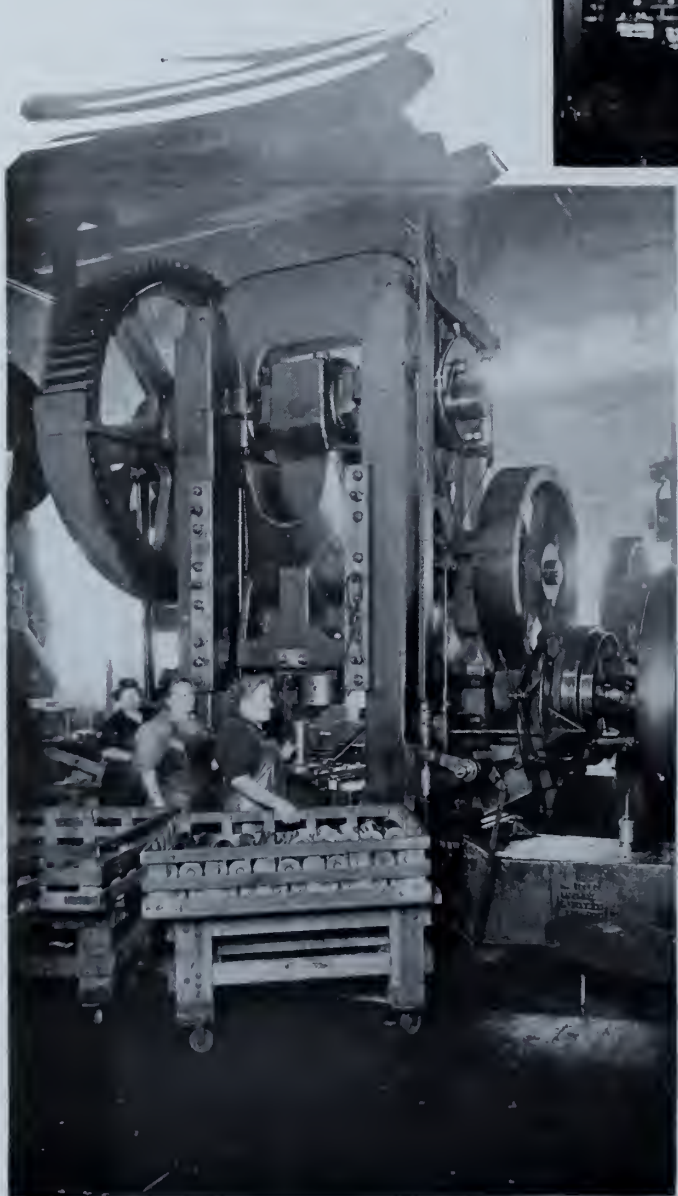


Close View of the Two First Operations of Stamping Cartridge Cases for 18 Pounders



In the upper picture the third woman has just delivered the truck of blanks; after passing through the press the work is delivered at the back of the machine, collected on a truck and conveyed to the next machine for the next operator; trucking all done by women.





Further Operations on Presses for 18-Pounder Cartridge Cases.



General Views of Shop, Women Workers on Percussion Primers



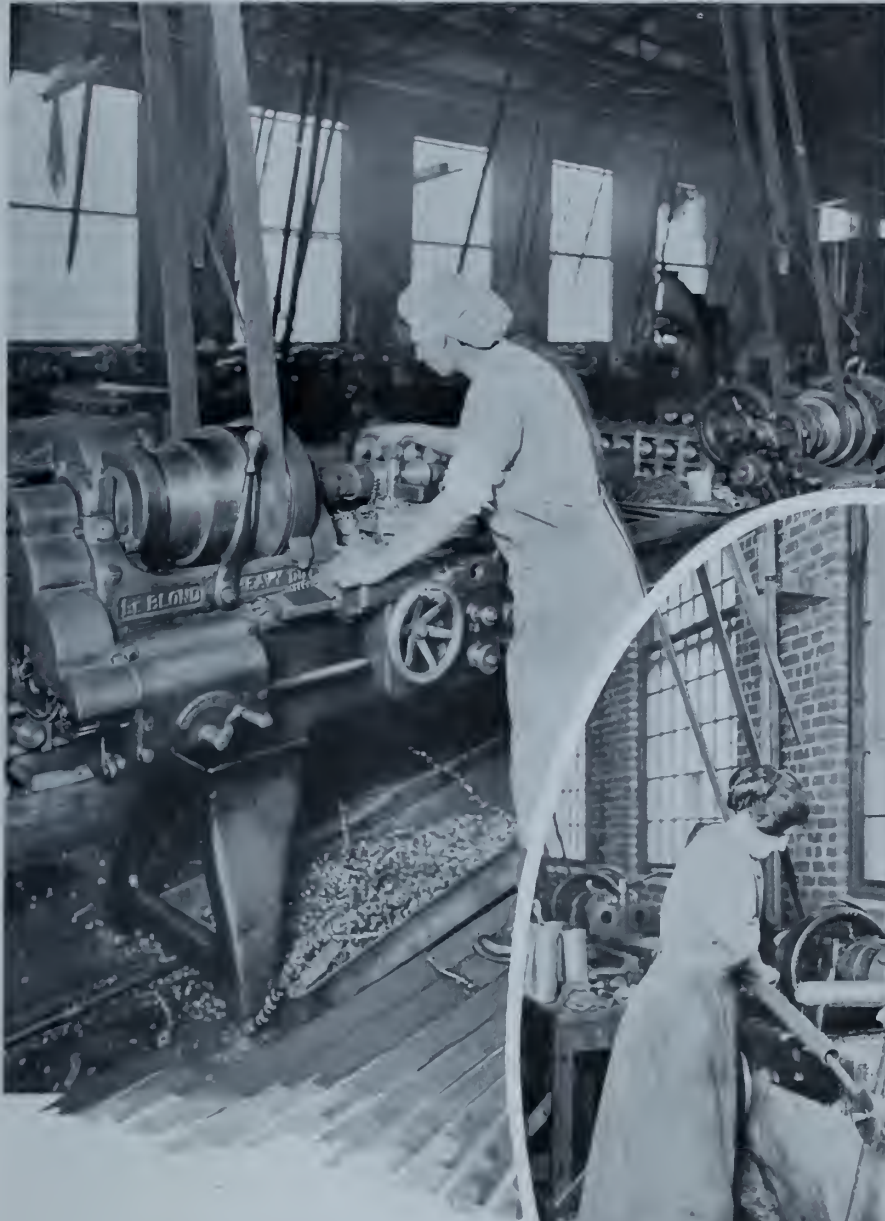
## 18-Pounder Shrapnel and High Explosive Shells

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**W**E are now entering the heavy machine shop, where twelve months ago, in Canada, no thought of woman labour was in the mind of any manufacturer. Experience has proved that there is no operation on shell work that a woman cannot do, and, as a matter of fact, is not doing, even to the heavy operations which require great physical strain, but proper selection of the female labour makes this equally suitable for women.

Note the bath mat structure in front of the lathes. The generous use of lubricant which is necessary in the turning and boring operations, naturally produces a damp floor, which is particularly prejudicial to the continued efficiency of female labour. The adoption of the bath mat as here shown has proved a great aid in this direction.

We also desire to draw attention to the use of compressed air in eliminating the physical strain of tightening up chucks. A forging can be chucked or thrown out by the simple movement of a lever, operating two valves on an air piston, which open or close the chuck as the case may be. Examples of this are shown in the accompanying pictures.



Rough Turning  
18-pounder Shrapnel

Note the forging is chucked on a taper mandrel and driven up by tail stock. A very easy method of chucking for women workers.



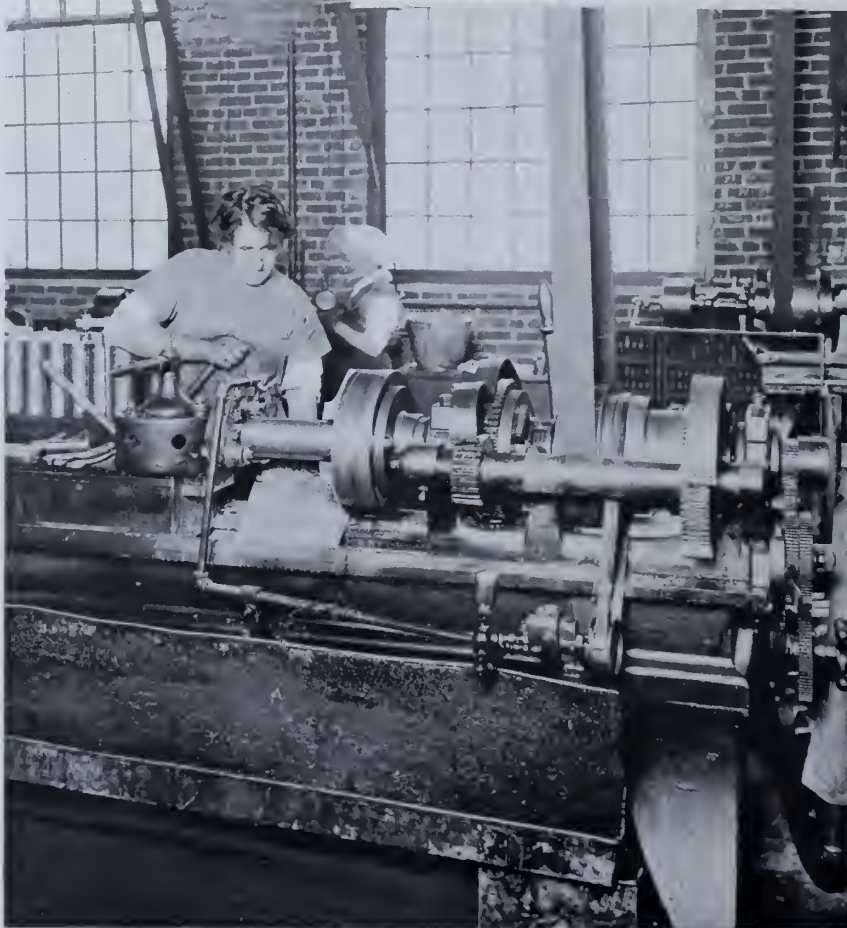
Chambering or Boring  
18-pounder Shrapnel

This is one of the hardest operations on this type of shell.



Cutting Off the Base  
18-pounder Shrapnel

Front and back tools cutting  
together.



Finish Facing,  
18-pounder Shrapnel



Waving and  
Undercutting for  
Copper Band,  
18-pounder Shrapnel

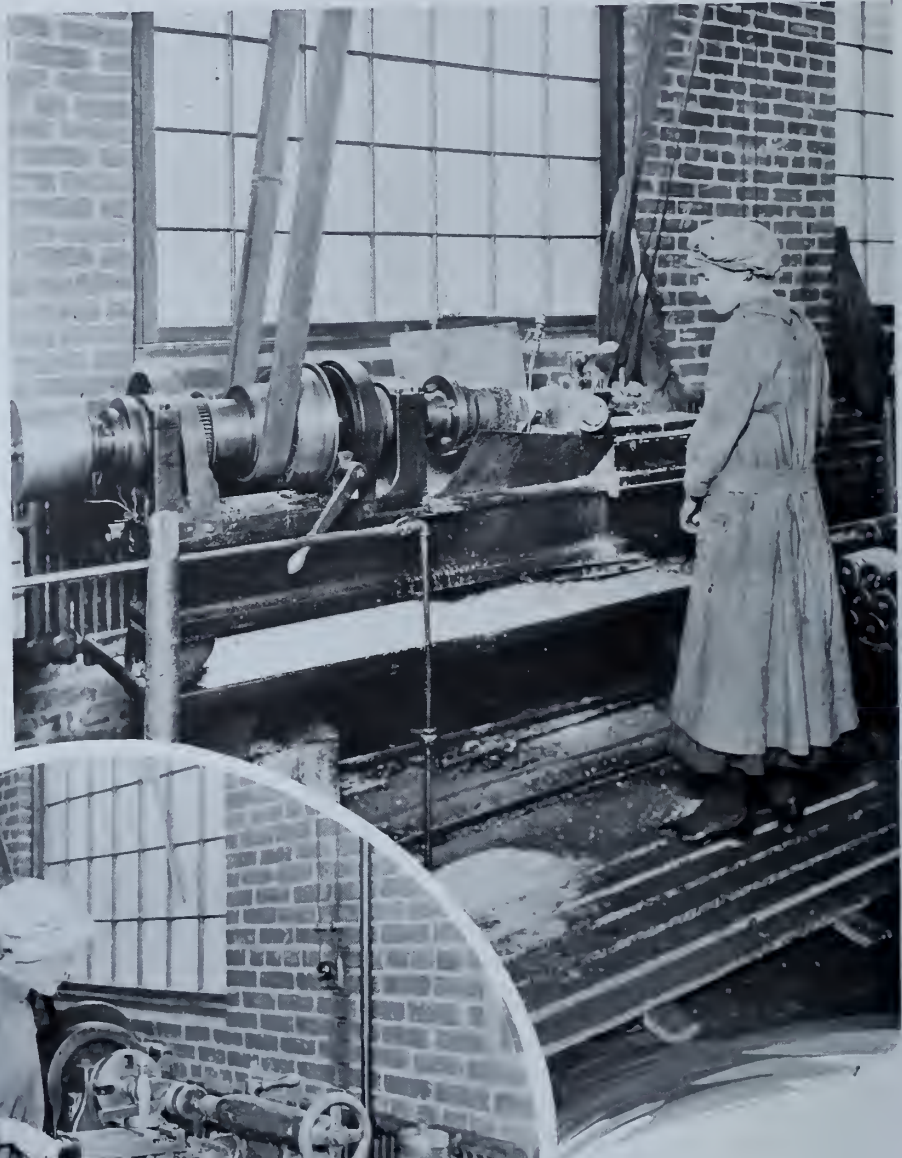
This operator working on an ordinary engine lathe had no automatic attachments, it was just a case of locking up the work with physical energy .



Undercutting the Nose  
and Cutting Crimping  
Groove, 18-pounder  
Shrapnel

Threading the  
Nose (Reaming  
and Tapping)

Note the compressed air  
chuck, air piston at ex-  
treme end of headstock.  
Automatic taps on turret.



Finish Turning and  
Profile 18-pounder  
Shrapnel.



Pressing on the Copper  
Driving Band with  
Hydraulic Press



Turning Copper Driving  
Band, 18-pounder  
Shrapnel



Turning  
Copper  
Driving  
Band



Washing  
and  
Cleaning  
Opera-  
tions





Loading and Weighing Operations.



Screwing in and Rough Turning the Brass Socket.

The jig seen here is a very simple arrangement and requires no physical strain on the part of the worker.



A



B

(A) Soldering Sockets and  
Tubes (front).

Loading (rear).

(B) Finish Turning the  
Brass Socket  
18-pounder Shrapnel





Swabbing Out Tubes and Weighing



Painting. Women are particularly adept at this operation.



Screwing in the Base Plate and Rivetting ditto, 18-pounder High Explosive Shells



## 4.5-in. and 8-in. Shells

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**W**HEN the Dilution of Labour became imperative, the manufacturer naturally thought that the heavier the shell the less adapted they were to female labour. The direct opposite has proved the case. The repetition in handling the smaller shell produced a physical strain that was not present in the slower and more deliberate moving about of the big projectile. In the smaller shell, men can conveniently, without mechanical assistance, handle them, whereas in the larger shell, men were obliged to use the assistance of machinery, and consequently men and women here became equal.

The devices for handling the larger shell, as shown in the pictures, will go to demonstrate the ease with which they are moved. Two distinct examples in the manufacture of eight-inch shells are reproduced. On pages forty-five to forty-nine are shown the block and tackle method of handling the shell bodies. On page forty-nine and thereafter a different method is seen. A roller track traverses the whole shop, and a shell from the first operation to the last is moved with the greatest of ease. At convenient places in the tracks indicators are installed which show on a dial the number of shells that have passed that point. Short sidings at right angles to the main track are provided where a shell is required for an operation, and here the shell is switched off the main track into the machine, where it is picked up and locked by hydraulic power. In the boring operation, the pressure on the boring tool is also maintained by hydraulic power, with safety cut-offs at the completion of the work. The factor of success in women's work on heavy shells is the moving devices, and the higher the perfection of these devices the higher the perfection of the output.

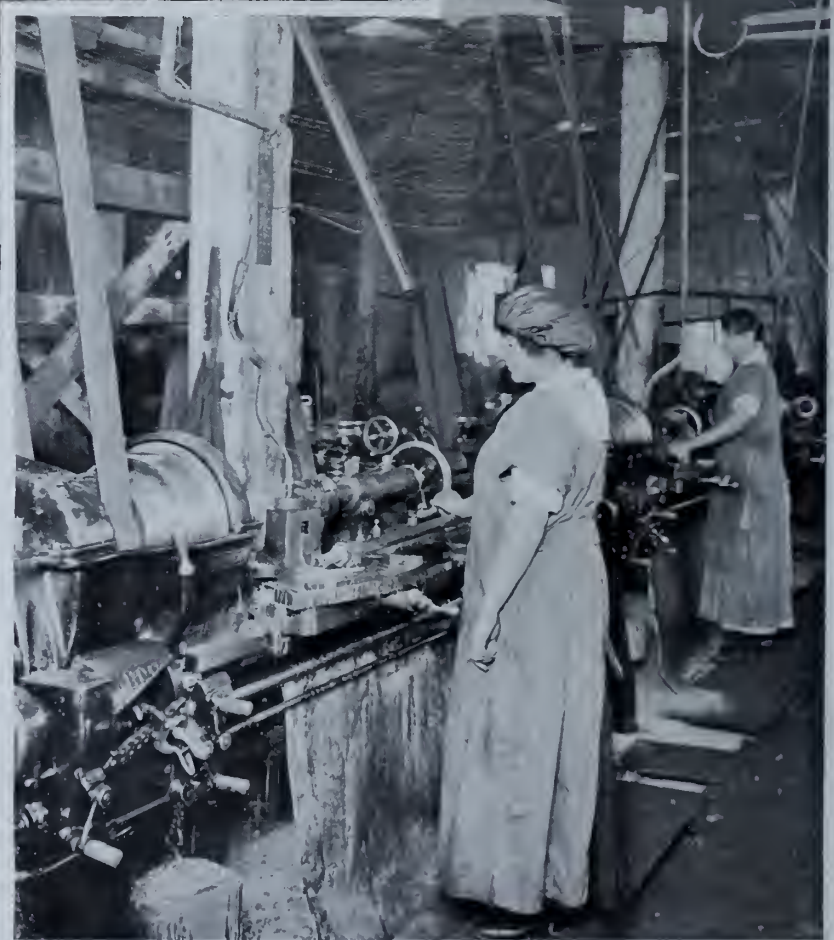
Great credit is due to the manufacturers who have equipped their plants with these modern devices for the conservation of physical energy, and we look forward confidently to the time when others will follow the lead already given, thereby opening a further possibility for the Dilution of Labour and the greater production of munitions.



Second Rough Cut,  
4.5 High Explosive

These shells are handled by women without the aid of any lifting devices.

Finish Turning and  
Profile 4.5 High  
Explosive Shells

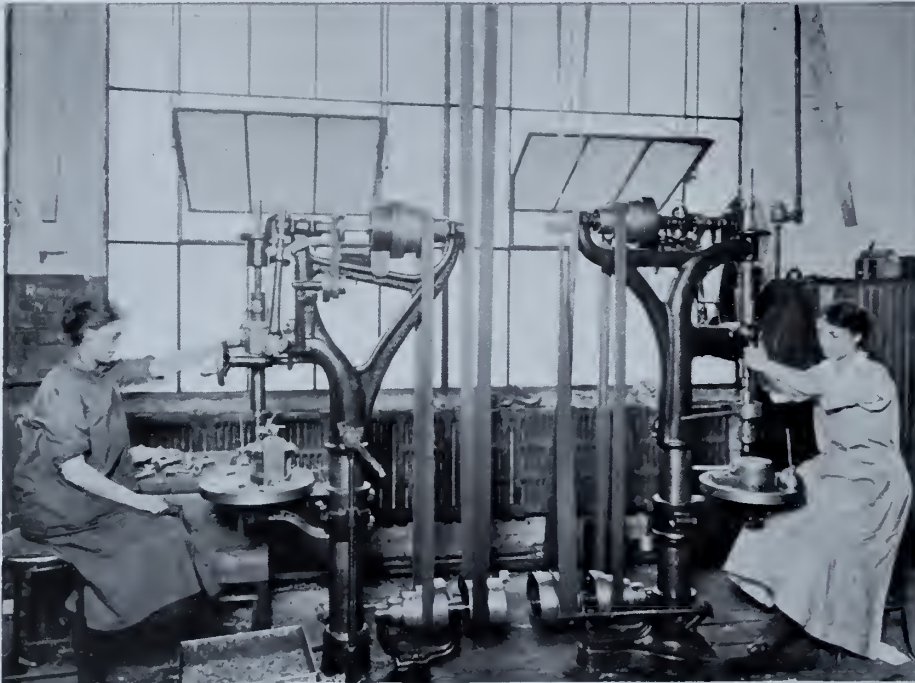




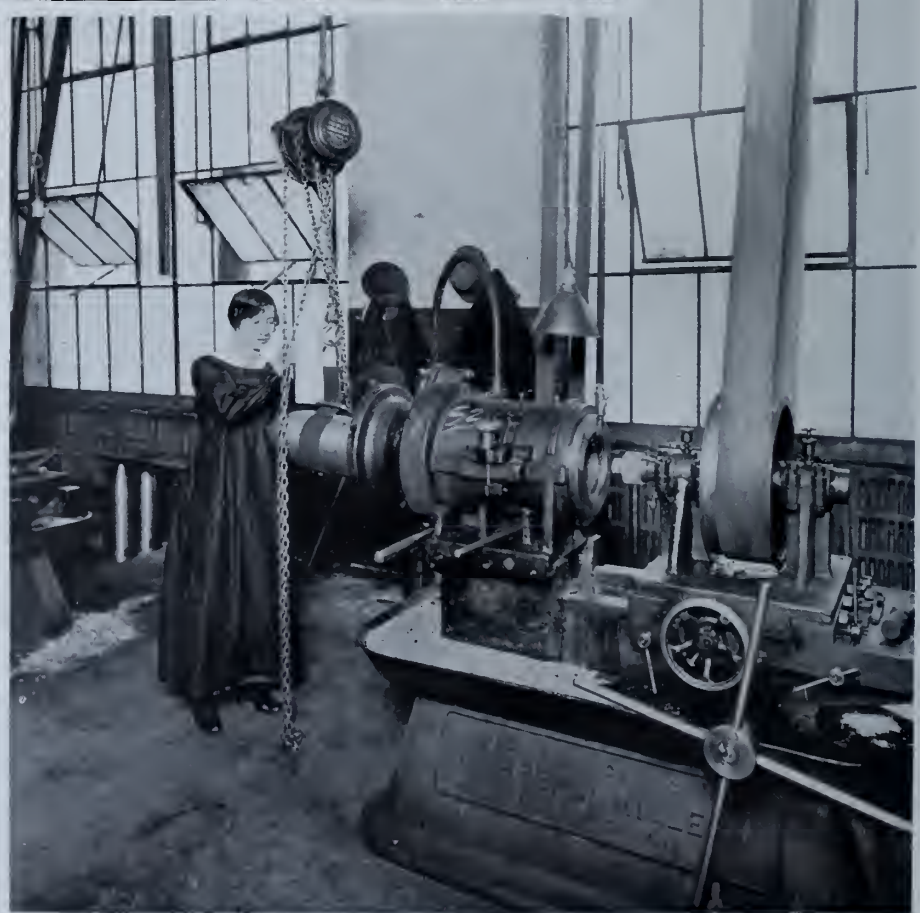
Varnishing 4.5 High Explosive



Milling Thread on Adaptor for 8 inch Shells

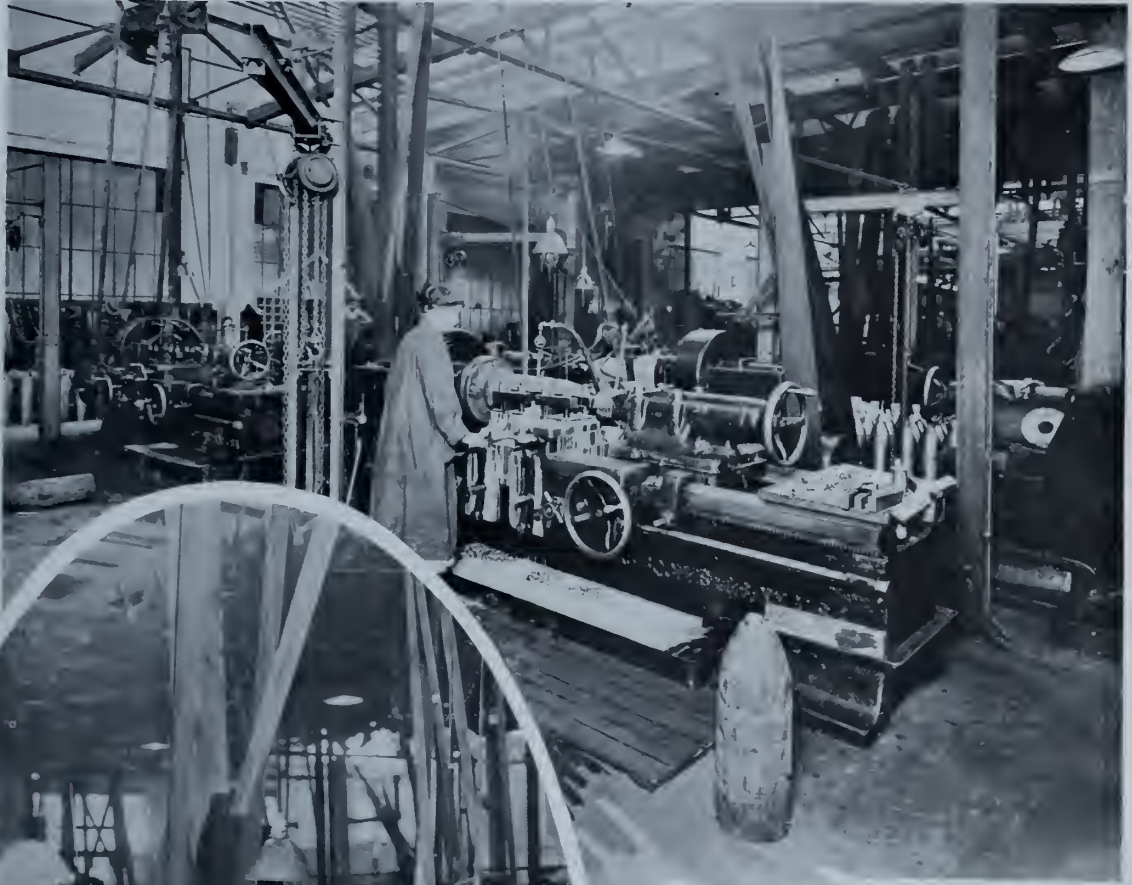


Drilling and  
Tapping Wrench  
Holes in Adaptor  
8-inch Shell Work



Operator Feeding  
8-Inch Shell Into  
Milling Machine  
for Milling Thread  
in Base. The  
small jib carries the  
centering breech  
of machine, and it  
is easily replaced  
after shell is  
entered.





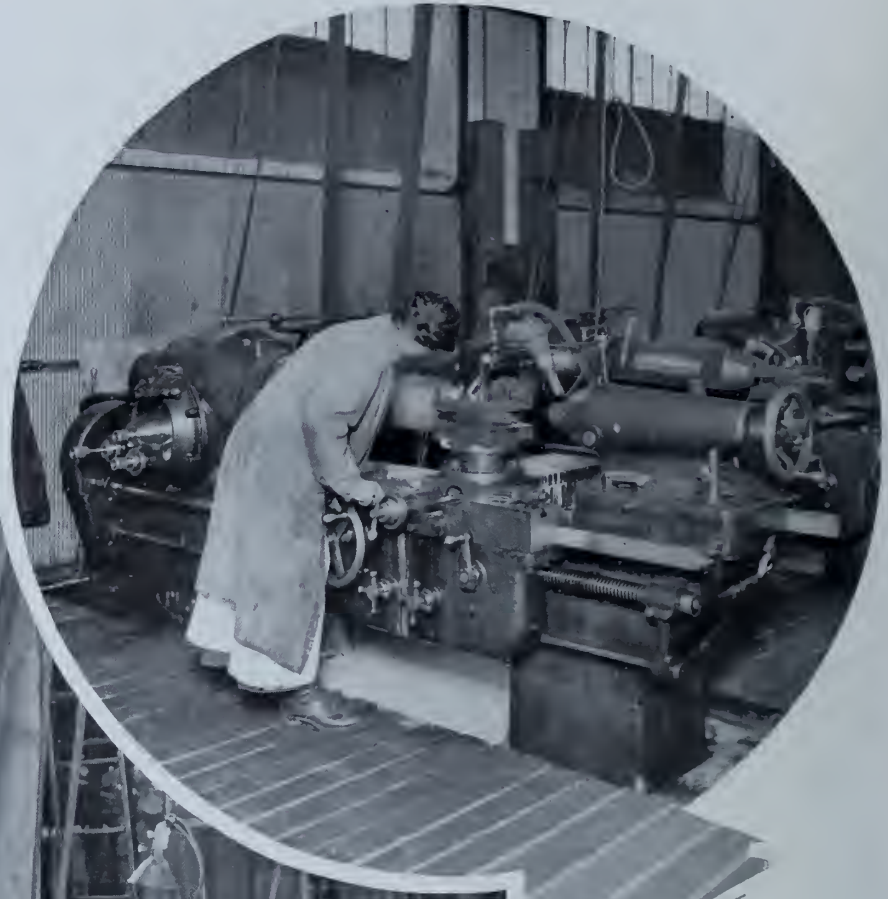
Rough Turning 8-inch Shell.

Note the lifting tackle on jib behind operator.



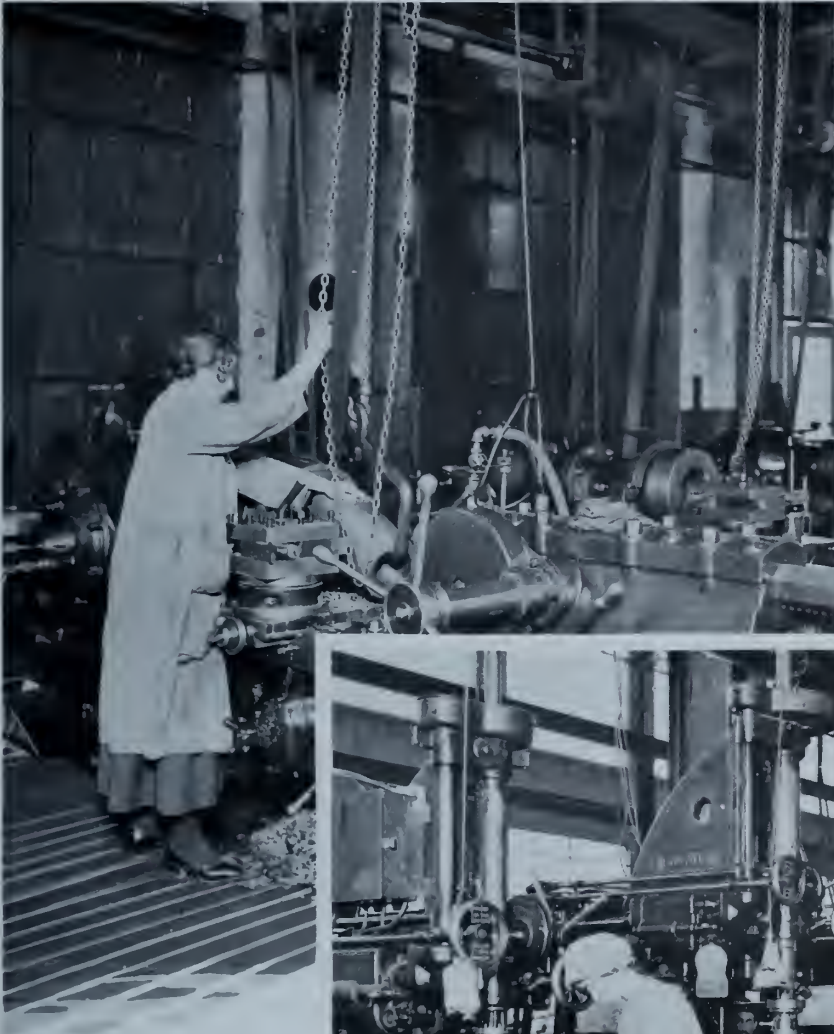
Finish Turning 8-inch Shells.

Boring the Fuse Hole  
8-inch Shell



Undercutting and  
Waving of 8 inch Shells





Handling an 8-inch Shell Body with Lifting Tackle Previous to an Operation

### Recessing and Tapping Shell for Adaptor

1st machine, the shell is being entered in the jig.

2nd machine, the shell is nearly home.

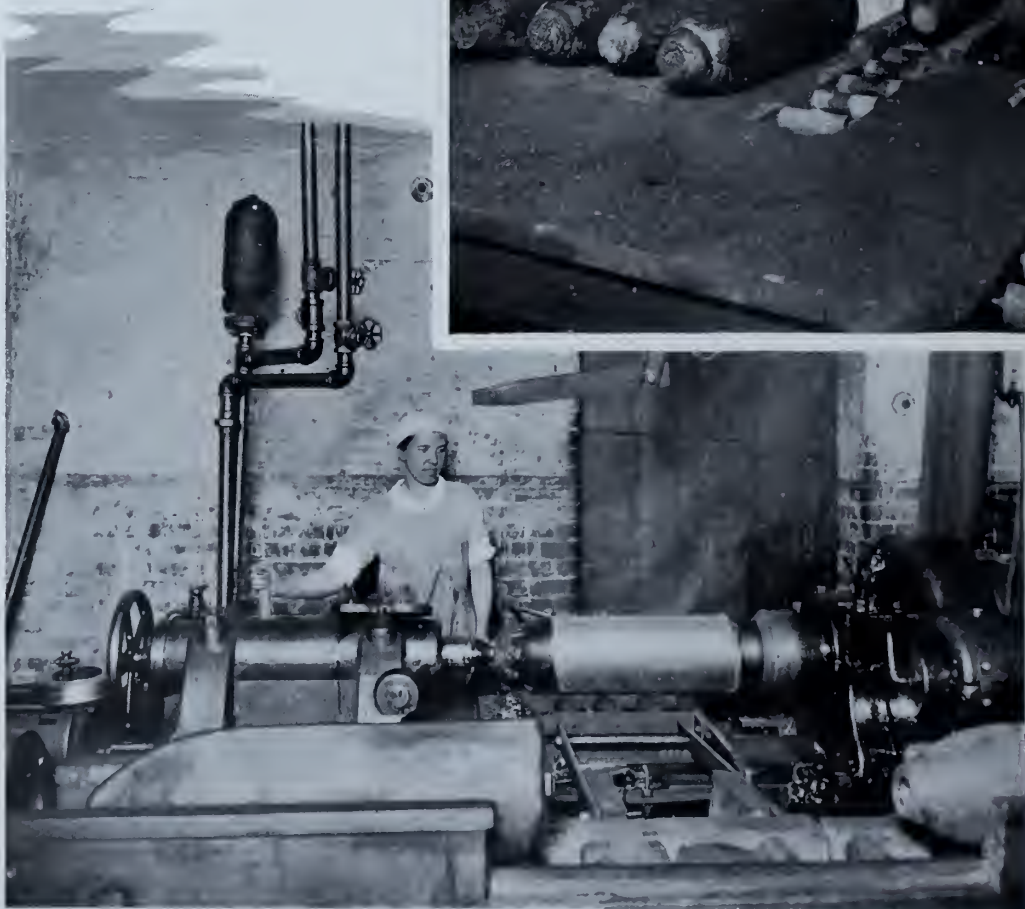
3rd machine, the jig by hydraulic power is upset, centered and closed ready for work.



The two photographs on this page strikingly illustrate the difference between two systems of handling 8-inch shells. In the upper picture the shells are transported from one machine to another by means of low trucks, from which they have to be lifted by chain blocks into the machine, and vice versa when the operation is completed. In the lower picture is seen the roller track previously described, also a good example of the short tracks at right angles to the main track, which, in this case, is for the purpose of inspecting. After inspection the shell is rolled on to the next track to go to the machine for the next operation.

### Drilling the Nose.

This is the first operation. The forgings are being fed into the works through the central opening. The self centering jig is seen on the idle machine, after this operation the forgings are rolled along the roller track to the machines doing the rough turning.



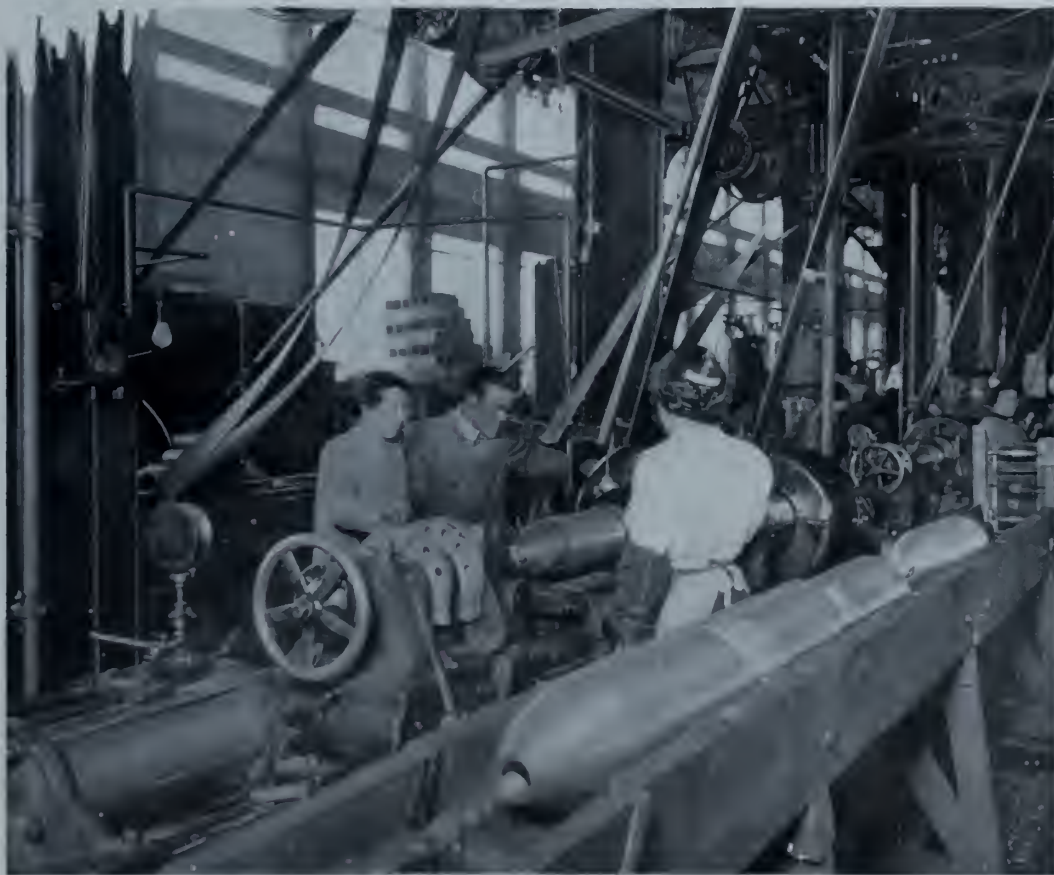
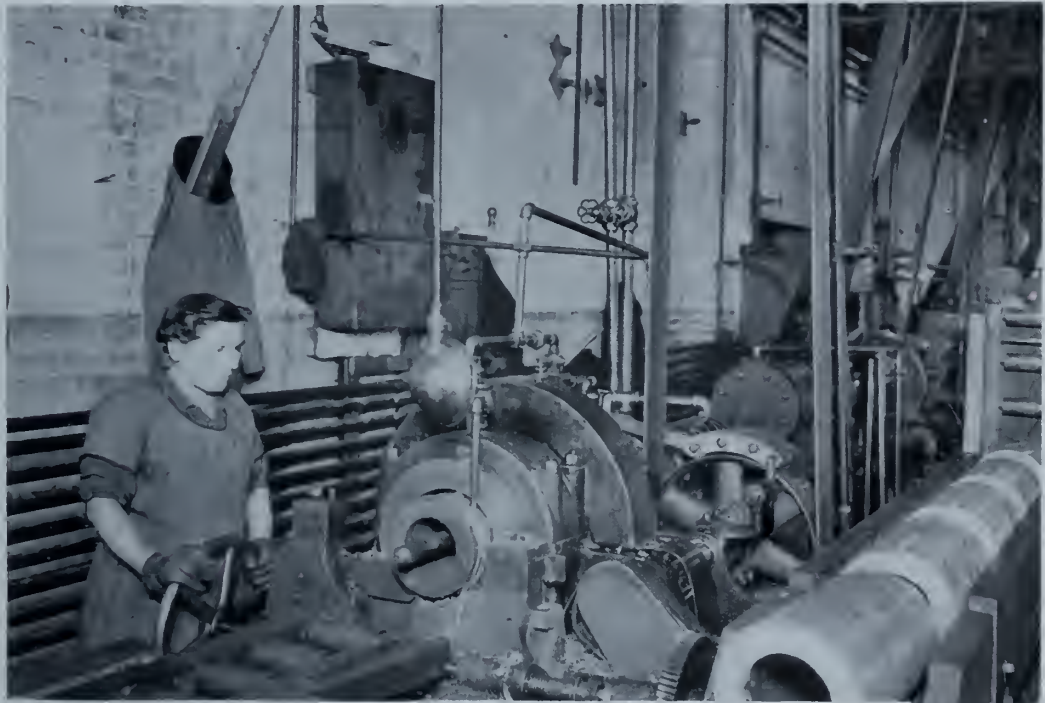
Machines  
Doing the  
Rough  
Turning

A clear view of the simple method of handling is shown here. Hydraulic power not only holds the forging during the operation but lifts it into place.



Dual  
Operation

Cutting off the  
nose and base.  
Base end only is  
seen.

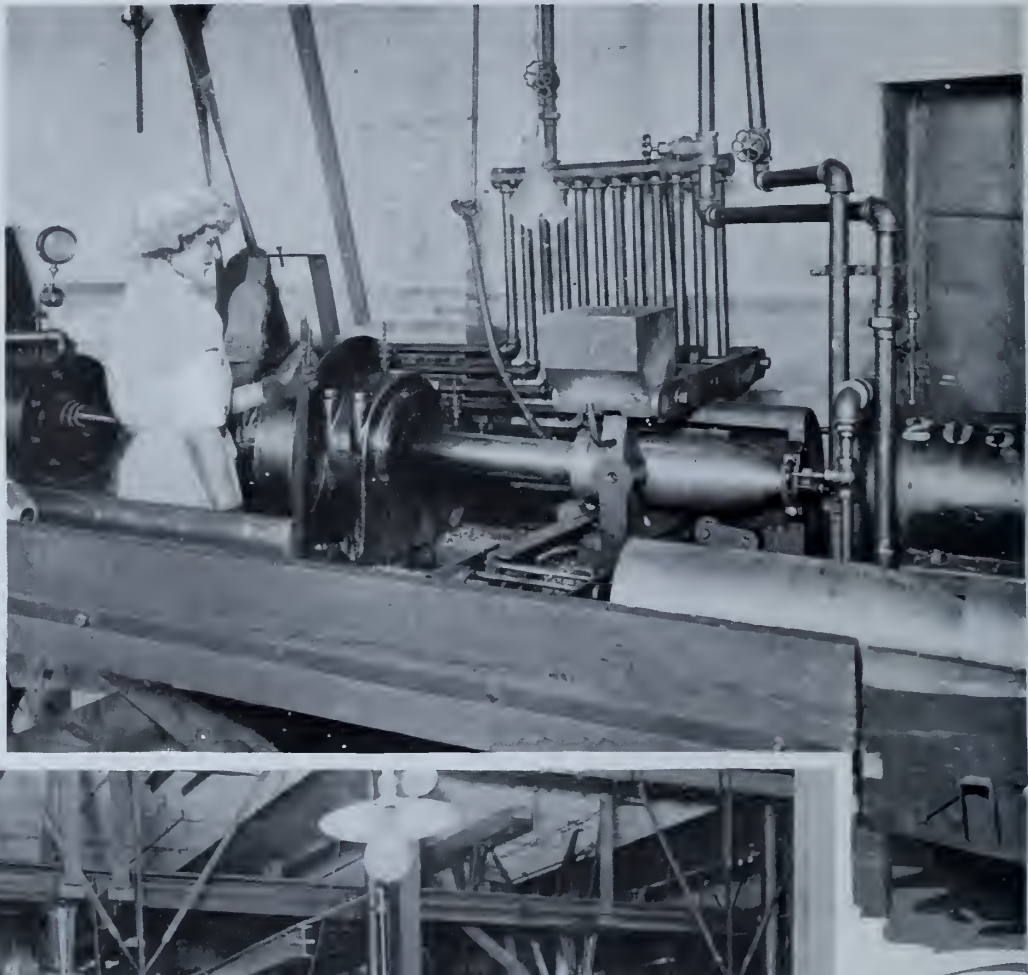


View of  
Three  
Machines  
Finish  
Turning  
and Turn-  
ing the  
Profile.

The opening  
in the roller-  
way track  
seen to the  
right of the  
picture  
is to facilitate  
movement of  
workers pass-  
ing from place  
to place, and  
open and close  
at will.

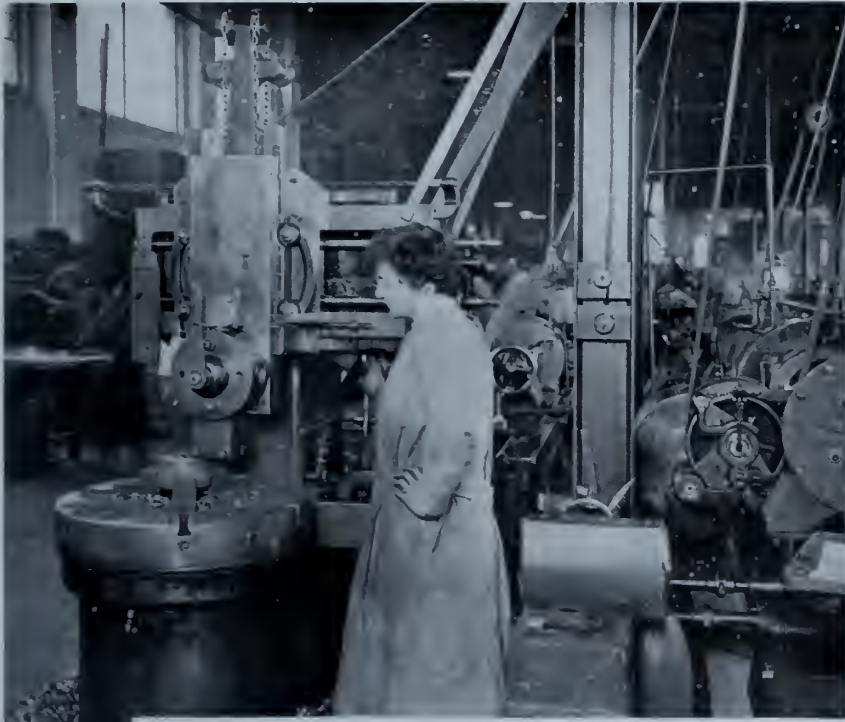
### Rough Boring

A good view of the Hydraulic cylinder and ram carrying boring tool is seen in this picture. As before mentioned a guide is attached to the ram which cuts off the pressure when the boring tool has reached its limit. The use of these automatic devices gives the women great confidence and they do their work with plenty of zest.



Inspection



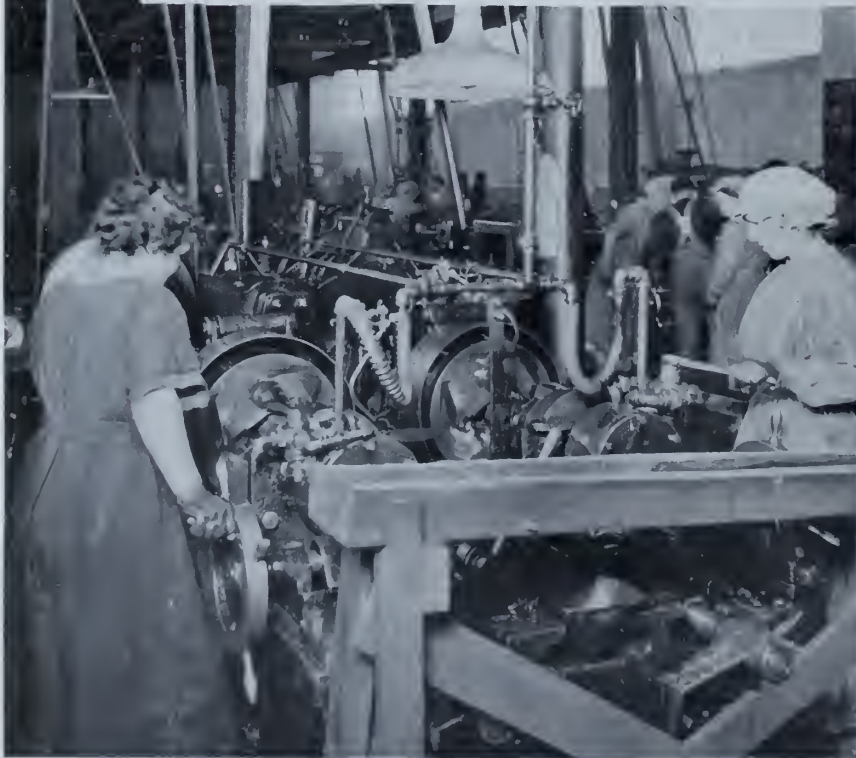
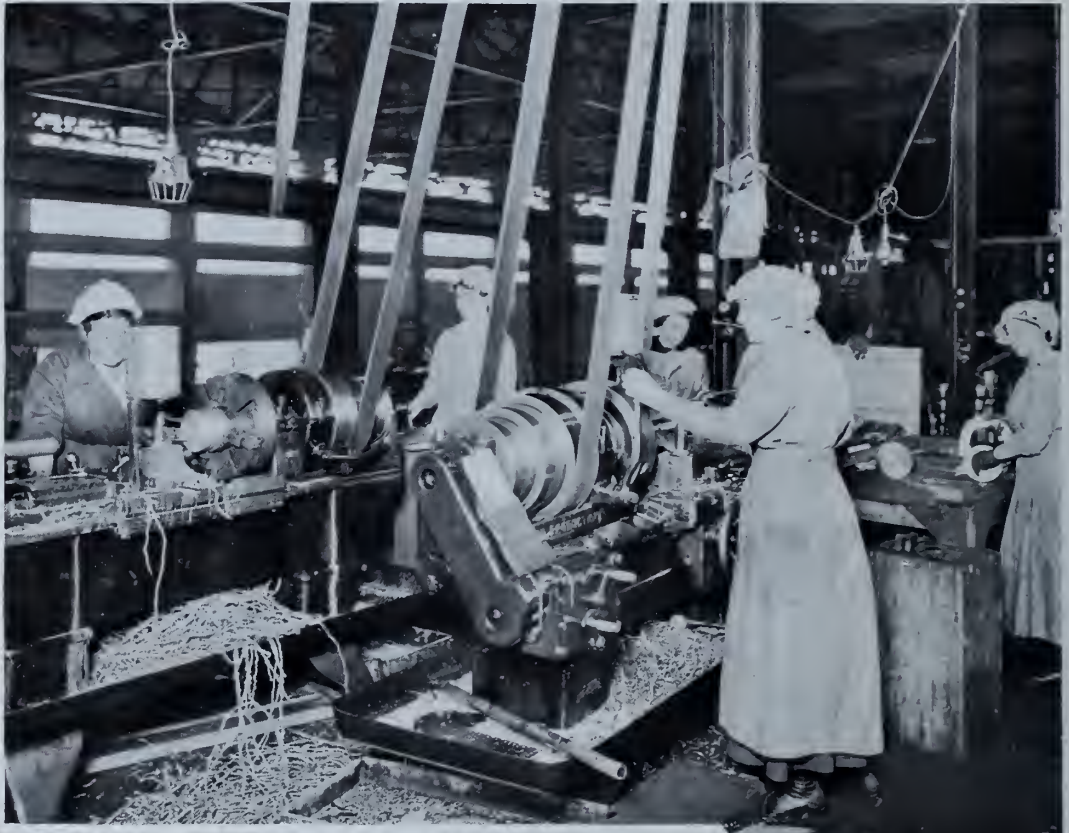


Rough turning the  
Adaptor base for eight  
inch shells  
First operation



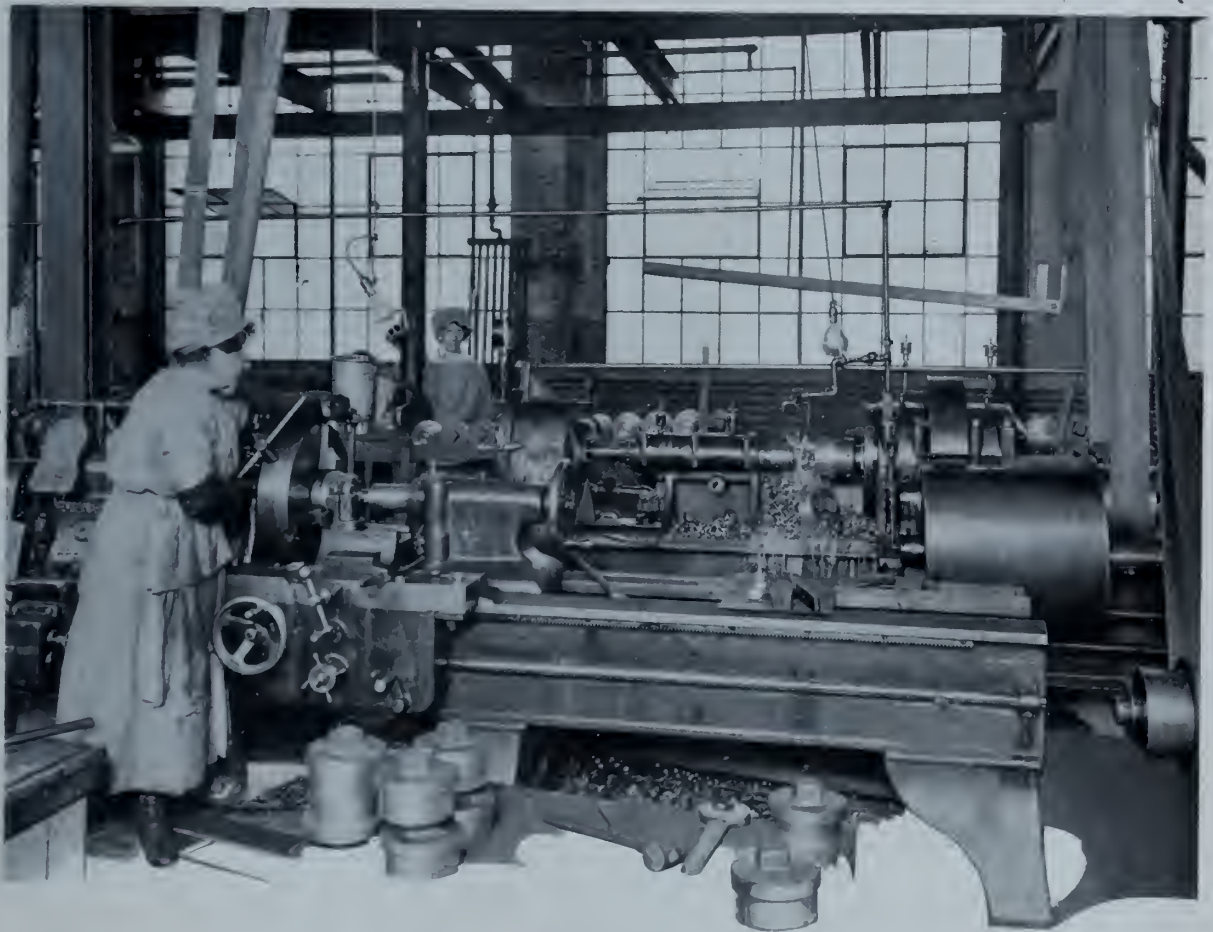
Rough  
turning  
the  
Adaptor  
  
Second  
operation

Finish  
Turning  
the  
Adaptor



Threading and Chasing  
Adaptor Thread

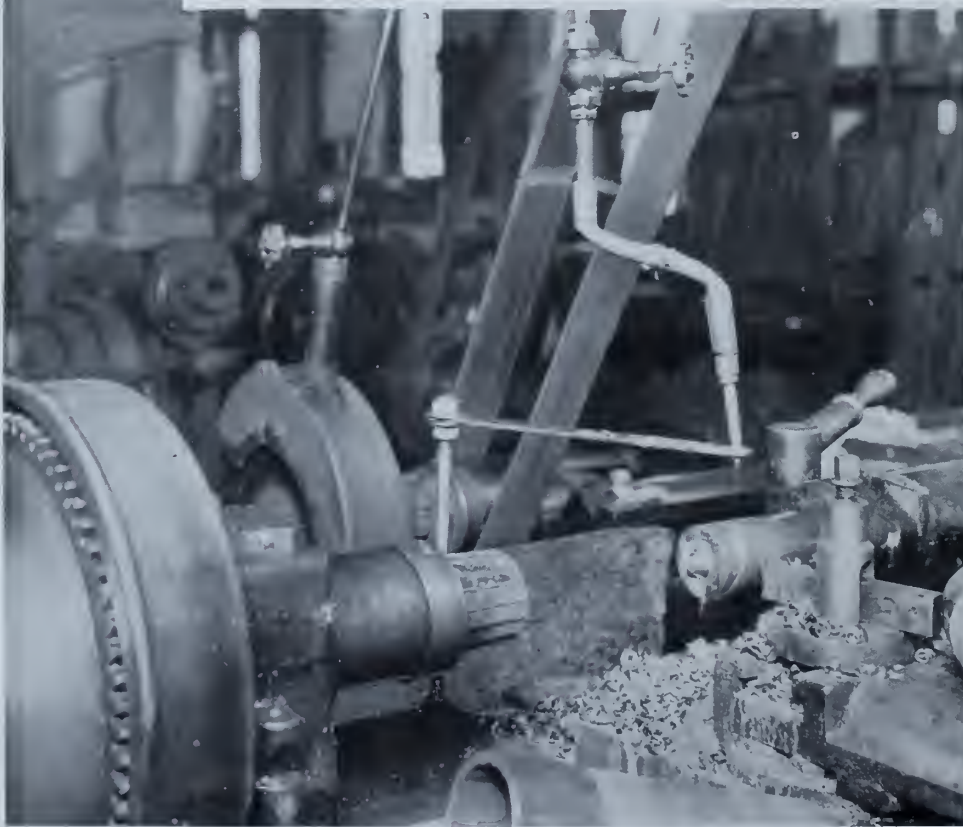
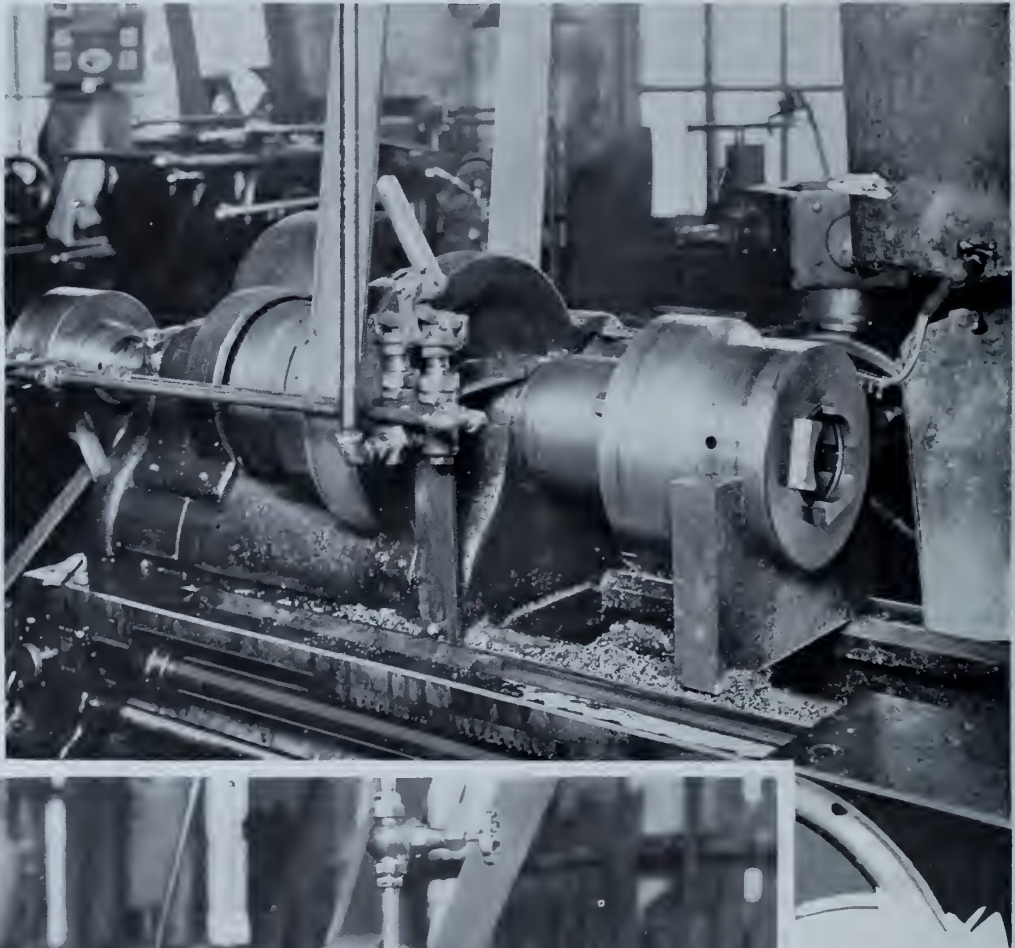




Finishing Base of Adaptor

General  
View of  
Compressed  
Air Chuck

The adoption of this chuck for women workers is to be highly commended. The moving of the lever (in the centre of the picture) opening or closing the chuck at will. The air piston is clearly seen at the end of the headstock.



Driving Centre  
Attachment,  
Avoiding  
Laborious  
Chucking

Forgings are quickly chucked in and out of the lathe by means of this taper mandrel, the forgings being driven tight on to the mandrel by the tailstock centre without unnecessary energy.



## Spacious Lunch Rooms

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**S**PACIOUS Lunch Rooms, or Canteens, are provided in many plants where light refreshments can be purchased by the workers. The majority of the hands bring their own supplies, but tea, coffee, milk and sugar are nearly always provided by the manufacturer to the women, free of charge. Some employers, who use over a six-hour shift, allow ten minutes forenoon and afternoon for tea. In many cases these canteens are supervised and managed by the Young Women's Christian Association, as a patriotic contribution, those in charge being voluntary workers.

We cannot too highly commend the welfare feature of woman labour on the side of pure commercialism. It produces greater efficiency, greater output, and greater contentment where it is present than where it has not been introduced

Matrons, where the number exceeds one hundred, are almost indispensable as a means of adjusting the many small irritations that are magnified in a woman's mind by neglect or inability to make them known to one of her own sex.



Entrance to Hospital  
Department. Women (left)  
Men (right)



General Operating Room  
Operating table near right hand window. Sterilizing apparatus to left of picture.



Women's  
Ward



Looking Through  
Men's Bathroom to  
Men's Ward

HOSPITAL, LUNCH ROOM AND  
GENERAL ACCOMMODATION

Mid-day  
Lunch, Enjoy-  
ing their Well  
Earned Meal  
Cloak and  
Hat Racks in  
Background







The  
Lunch  
Counter

Almost ready for the 12 o'clock whistle. The tea and coffee mugs are ready to be filled, and are free to the women workers.

General  
View of  
Lunch  
Room

24 tables.  
Capacity of  
each table,  
30. Total,  
720. Dimen-  
sions of  
room, 66 ft.  
x 150 ft.



HOSPITAL, LUNCH ROOM  
AND GENERAL ACCOMMODATION

Matron's Office  
and Accident  
Ward



Views of  
Lunch  
Counter  
and  
Lunch  
Room







The official badge for women munition workers in Canada, issued by the Imperial Munitions Board. The badge is provided after 30 days' employment, and a service bar is added for each six months' continuous work at one plant.

I CAN'T! does nothing.  
I'LL TRY! does wonders.  
I WILL! does everything.





