

CANADIAN MANUFACTURING NEWS

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100 St. George St.
Toronto

Vol. XIV

Toronto, November 18, 1915

No. 21



SaBeN Extra HIGH SPEED STEEL



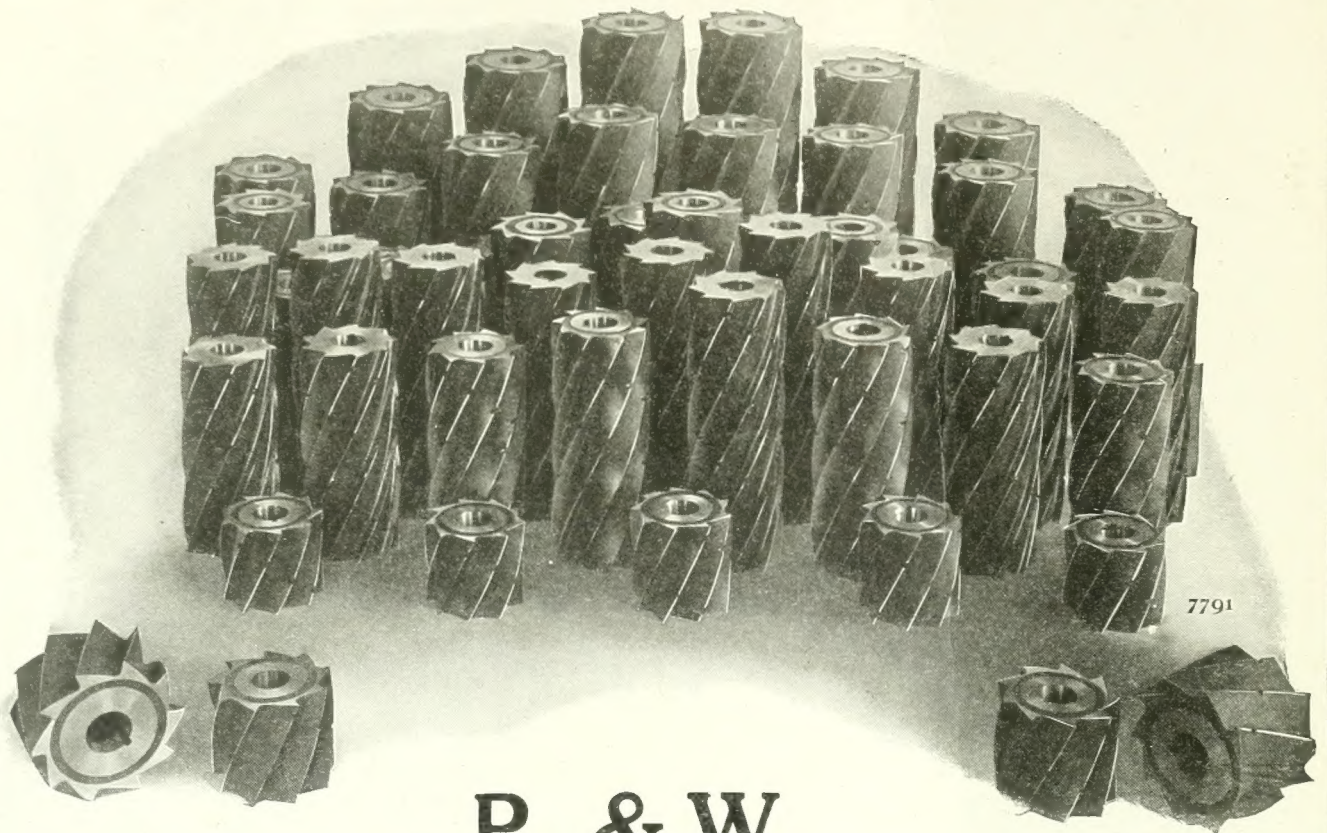
H. A. Drury Company

MONTREAL TORONTO NEW YORK

Limited

RY
1922
TORONTO

The Answer to Your Heavy Duty Cutter Problem



P. & W.

Coarse-Tooth High-Speed Milling Cutters

We are prepared to furnish promptly coarse-tooth milling cutters of High-Speed Steel adapted primarily to the heavier class of milling.

Long Life. Such cutters have the advantage of long life as the large teeth permit of more grindings. It will also be seen that less time is required to sharpen.

Increased Production. The ample chip room insures a remarkably free cutting action and will increase production by a high percentage with less power required to drive.

Strong Teeth. The teeth being larger are exceptionally strong and will easily stand the heaviest feeds without breaking.

PLACE A TRIAL ORDER WITH OUR NEAREST STORE.

Pratt & Whitney Company of Canada, Limited

DUNDAS
-Ontario

MONTREAL
723 Drummond Bldg.

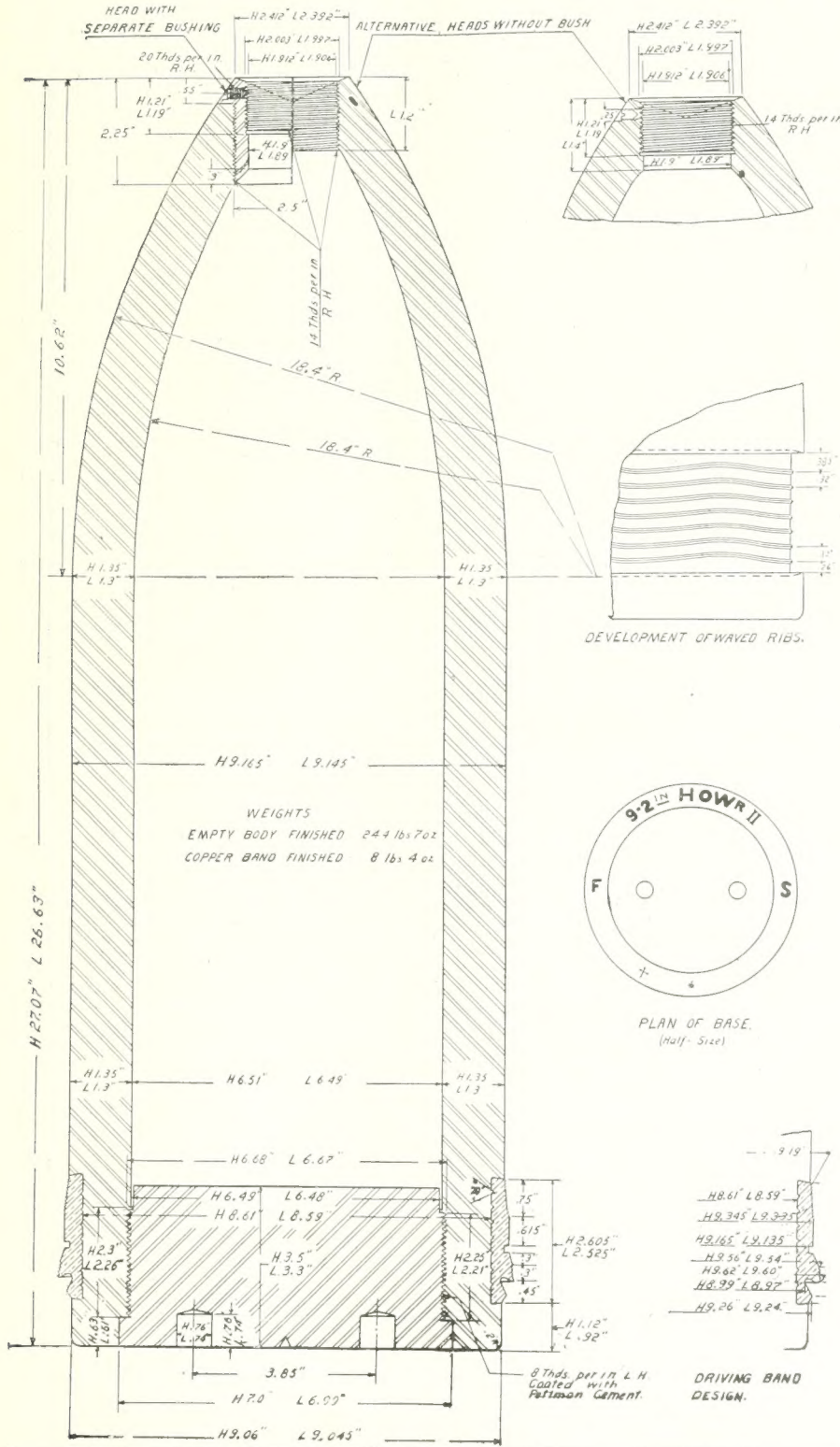
WINNIPEG
1205 McArthur Bldg.

VANCOUVER
B.C. Equipment Co.

The advertiser would like to know where you saw his advertisement—tell him.

LATHES

AND ATTACHMENTS



for the manufacture of
**6 in., 8 in.,
 9.2 in.**

HIGH EXPLOSIVE SHELLS

EARLY DELIVERY.

This Equipment is all New, Modern, Heavy.

Write Our Nearest Office For Particulars.

The John Bertram & Sons Co., Limited
 DUNDAS, ONT., CANADA

MONTREAL
 723 Drummond Bldg.
 VANCOUVER
 609 Bank of Ottawa Bldg.
 WINNIPEG
 1205 McArthur Bldg.

If what you want is not advertised in this issue consult the Buyers' Directory at the back.

The Publisher's Page

By B.G.N.

Profit Follows in the Path of Service

MANY are the conjectures as to the future of the metal-working industries of Canada when peace conditions again overtake them. It is significant that there are few pessimists and few misgivings.

¶ The experiences of the past year have stiffened our manufacturers for any emergency. They are more confident, more self-reliant, more keenly alert, more resourceful than they ever thought they could be. The marvellously quick and efficient solution of the problems connected with munition making on a colossal scale, have given Canadian manufacturers an easy confidence that will enable them to successfully tackle any problems of the future.

¶ Moreover, they will be ambitious, broad of vision, reaching out for greater things. The vast machinery that is now being employed in converting ploughshares into swords will not be scrapped. More likely will the swords be scrapped and turned again into ploughshares, and marketed in the uttermost parts of the earth.

¶ Let Canadian manufacturers maintain the same high courage and resourcefulness that has marked their work during the past nine months. Let big ideas be conceived and carried out. Let the same standard of perfection that has had to be maintained in shell making guide their work and guard their good names in making the implements of peace.

¶ We are on the threshold of a new era. A new industrial nation is being born. Let SERVICE, honesty, integrity and high quality distinguish it always. Profit follows in the path of service. Let quality prevail. Let service support quality and let good advertising back up both.

¶ Advertising has raised a giant army for the purpose of destruction. It will be used for the purposes of construction in the raising up of a giant among industrial nations—Canada.

CANADIAN MACHINERY

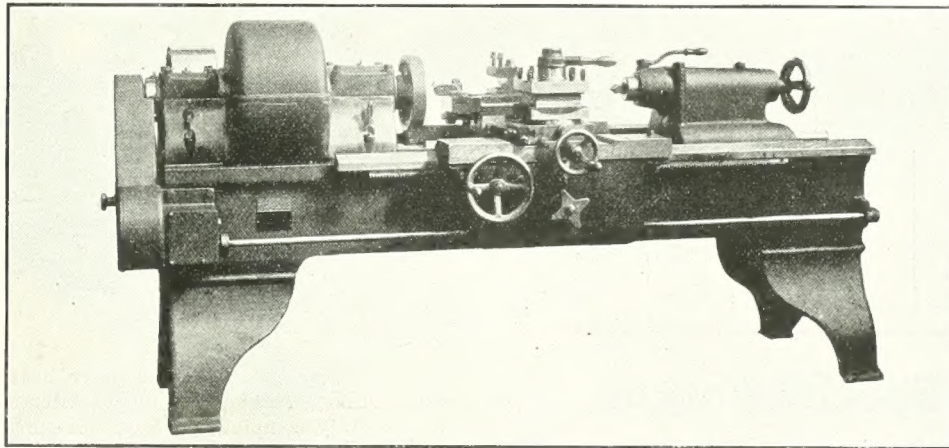
143-153 University Avenue

TORONTO

No. 1 SIMPLEX

Single Purpose Heavy Duty Geared Head Single Pulley Drive Shell Lathe

For machining 6-inch Shells and smaller



Reduced Swing Over Vs—16 inches.	Bed Length 8 feet or over
Crated Weight Plain Lathe,	3,550 lbs. approx.
Crated Weight, with Attachments,	5,000 lbs. approx.

ATTACHMENTS

For *Interior* Operations we recommend Four-bar Steel Carriage Turret and Forming Attachment.

For *Exterior* Operations we recommend Four-tool Turret Tool Post, Forming and Waving Attachments.

No. 2 Simplex lathe is suitable for similar operations on shells, up to and including 12-inch.

KELLOGG & COMPANY

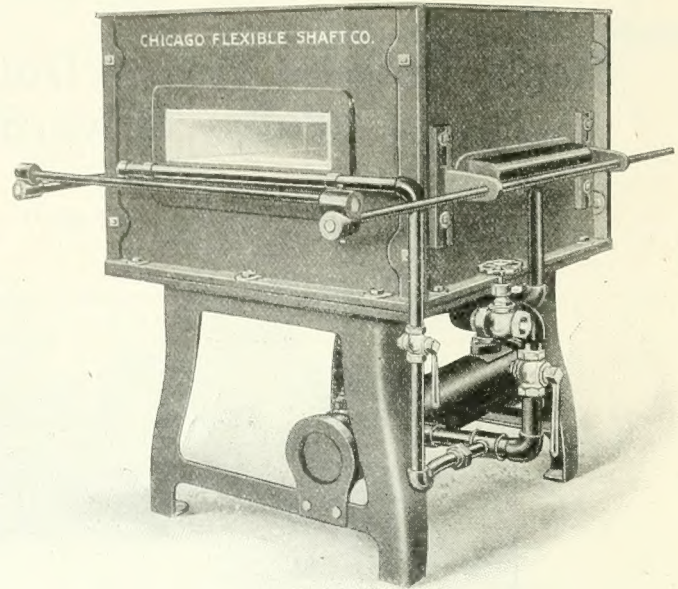
No. 1204 Traders Bank Building

TORONTO, CANADA

STEWART FURNACES

Stewart Drop Hammer Forges

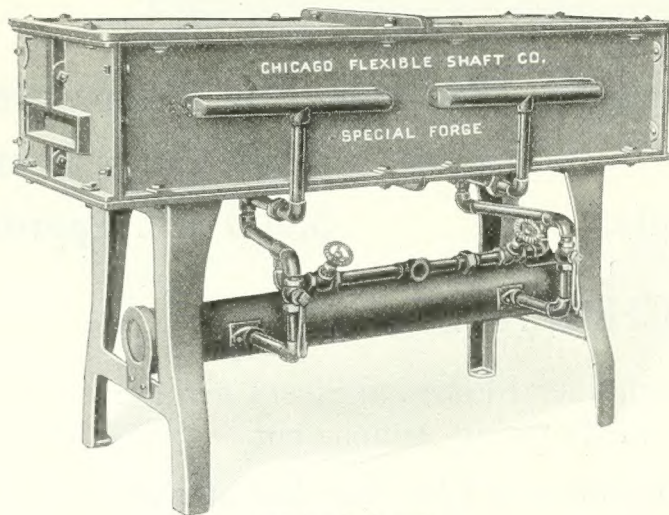
For natural or manufactured gas or oil. Will heat rods up to 5 inches in diameter. Especially adapted for drop hammer work. Equipped with brackets for adjustable rack, so that long pieces may be handled without the inconvenience of dragging rests or stands to the furnace.



Specifications

No.	SIZE OF OPENING			With Blower	Without Blower
	Height	Width	Depth		
30	1 in. to 5 in.	15 in.	15 in.	\$130.00	\$ 90.00
31	1 in. to 5 in.	15 in.	18 in.	140.00	100.00
32	1 in. to 5 in.	15 in.	21 in.	150.00	110.00
33	1 in. to 5 in.	15 in.	24 in.	185.00	120.00
34	1 in. to 5 in.	18 in.	15 in.	145.00	105.00
35	1 in. to 5 in.	18 in.	18 in.	155.00	115.00
36	1 in. to 5 in.	18 in.	21 in.	190.00	125.00
37	1 in. to 5 in.	18 in.	24 in.	200.00	135.00

Special Forges



Opening both ends Specifications

	Height	Width	Depth	Price, with Blower	Price, without Blower
Opening,	2 in.	12 in.	20 in.	\$130.00	\$ 90.00
Opening,	2 in.	12 in.	46 in.	200.00	135.00
Opening,	2 in.	12 in.	56 in.	215.00	150.00
Opening,	6 in.	20 in.	66 in.	290.00	225.00
Opening,	6 in.	18 in.	72 in.	305.00	300.00
Opening,	6 in.	22 in.	78 in.	390.00	325.00

Burners arranged in two sections so heat is delivered for half lengths, if desired. Heats for bending, forming, etc.

Any good steel properly heat treated will do the work for which it is intended, as it is carefully compounded from formulas that are exact.

To "Properly Heat-Treat" means to follow instructions from the Steel Makers to the letter.

There is a certain temperature to which the steel must be brought, and the heat must be so uniform that the entire piece receives the same amount.

It is economy to get 100 per cent. efficiency from a properly hardened tool. Why pay the high grade price for raw material and get cheap grade results?

Don't blame the steel that is treated by an antiquated method.

With Stewart Furnaces the unknown quantity is eliminated.

Tell us what you want to do and get our recommendation on a "Satisfaction guarantee," covering a thirty-day trial in your own plant.

A reputation for prompt and efficient service has long been established. Spare parts for all Stewart Furnaces carried in stock for "Same Day" shipment.

Tell us your requirements when you ask for catalog and save time.

CHICAGO FLEXIBLE SHAFT COMPANY

210-230 Ontario St., Chicago, Ill.

GENERAL SUPPLY CO. OF CANADA, Canadian Distributors

OTTAWA

MONTREAL

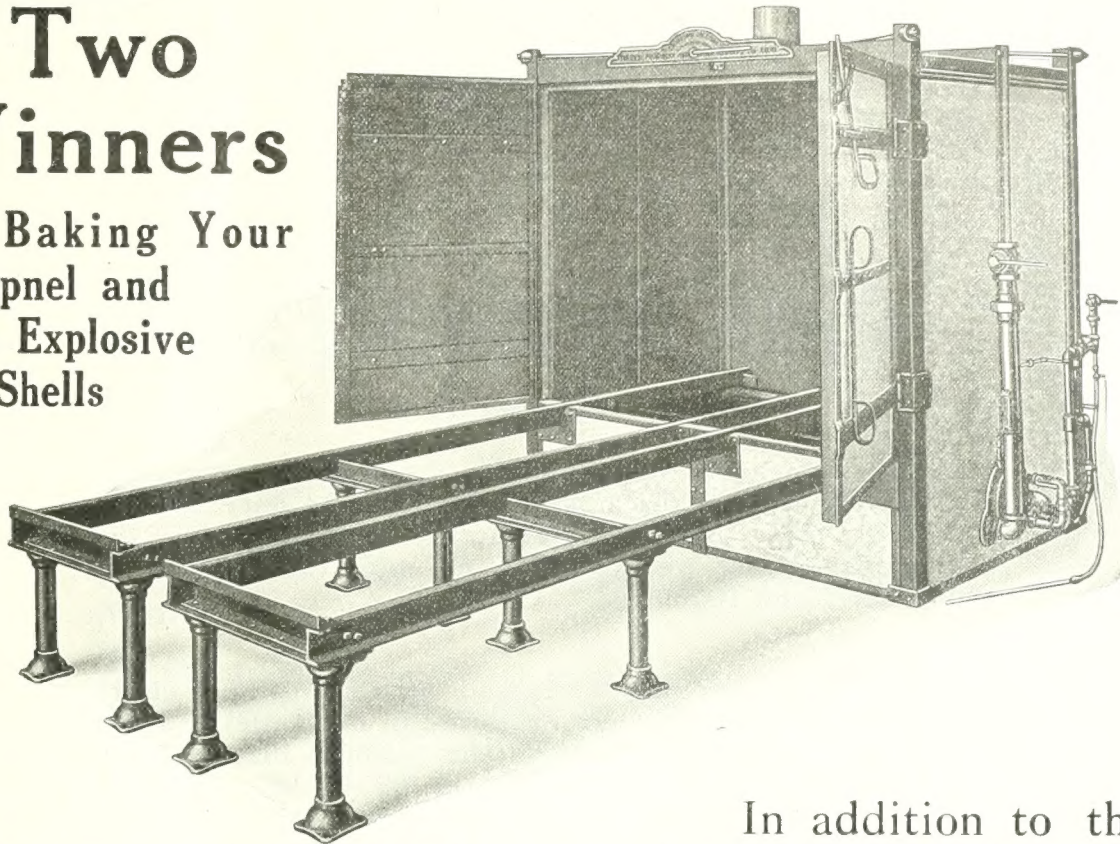
TORONTO

WINNIPEG

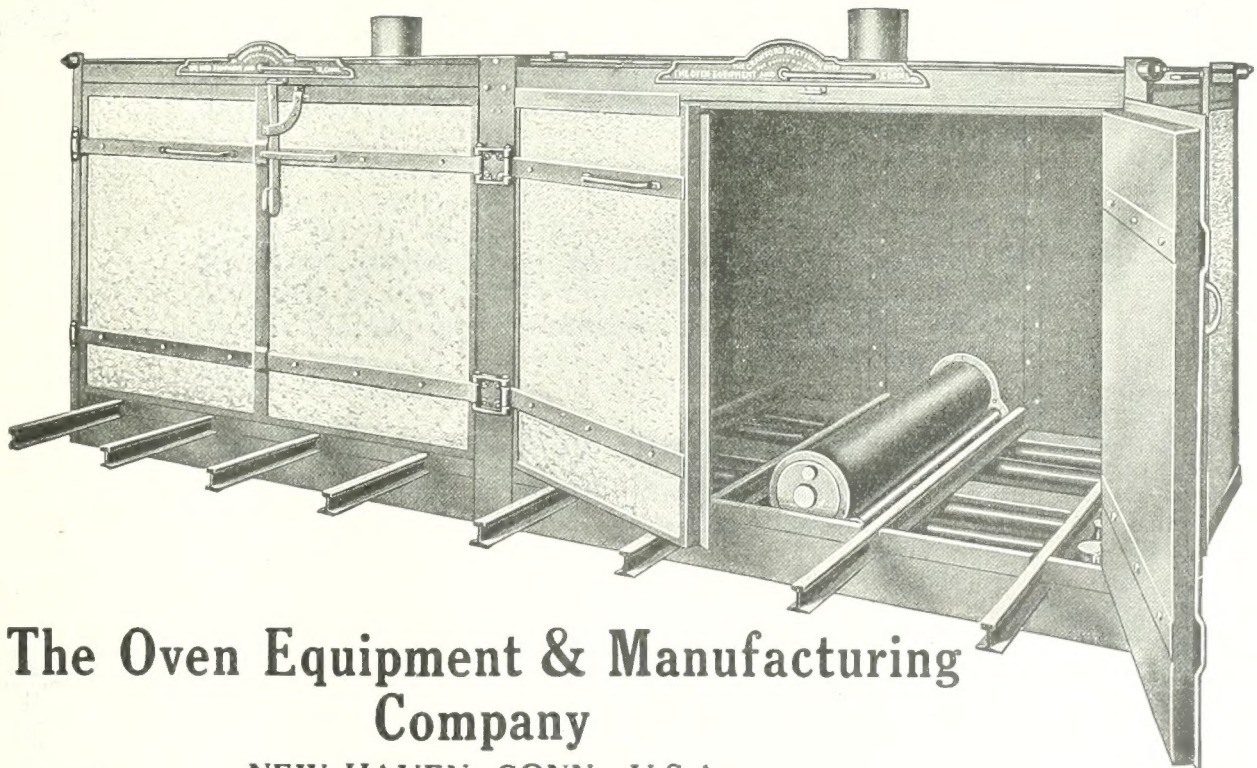
The advertiser would like to know where you saw his advertisement—tell him.

Two Winners

for Baking Your
Shrapnel and
High Explosive
Shells



In addition to the constructing of Special Oven Equipment we design and build trucks suitable for handling any size of shell.



The Oven Equipment & Manufacturing Company

NEW HAVEN, CONN., U.S.A.

Canadian Representatives: THE A. R. WILLIAMS MACHINERY CO., LIMITED, TORONTO, CANADA

If what you want is not advertised in this issue consult the Buyers' Directory at the back.



Our Sacred Duty

To contribute to a Fund for the relief of the unemployed does not discharge or liquidate the duty we owe to the brave men who are sacrificing their lives in the Trenches that we may live and enjoy the Blessings of Liberty and Happiness.

Better by far that we extend our Charity in an effort to use in our Mills, our Factories, in our Cities and our Homes all over this fair land, the products that Canadian labor produces, so that when the Boys come marching Home, they will be welcomed back to a Prosperous and Happy Canada.

Their sacrifice is worthy of our greatest effort—Our Duty is Plain; Canada with Canadian Labor and Capital can produce, manufacture and distribute, products sufficient to keep the Wheels of Industry Turning to the limit. The song of Prosperity and Happiness should ring out all over the land.

Let us sincerely pledge, to the extent of our needs, to purchase materials produced in Canada by Canadian Workmen, and the result of our efforts will return to us the Blessings of a Prosperous and Happy Nation.

The Steel Company of Canada, Limited

Hamilton - Toronto - Montreal - Winnipeg





Our Material Duty

Consideration, Courtesy and Right Intent, all add to the sum of Human Happiness. Not only do they benefit those to whom they are extended, but they survive in various forms, and add to the well-being of the Business World.

Quality plus Service is the basis on which prices are made. Competition in Quality and Service is a healthy condition, but competition in price alone tends to business ruination. All Service rendered has a far-reaching effect which tends to a better understanding, and Quality is remembered long after the price is forgotten.

Let the Standard of the Canadian Manufacturer and Producer be as High as the Best, and "Made in Canada" officially stamped on any article correspond with the mark "Sterling" on Silver.

Let us attune ourselves to the Highest Standard of Quality and Service, and pledge to devote to this end all the means we possess, in the belief that Bigger Business will result through the gratitude of those we serve.

We are all one. No one can Thrive alone. No one Suffers alone. Industrial Prosperity tends to Happiness for all, and the Manufacturer who nails to the mast the Flag of Quality and Service is assisting in the development of a better and saner Business condition.

The Steel Company of Canada, Limited

Hamilton - Toronto - Montreal - Winnipeg



A New Machine for Spraying

The Insides of Shells and Tubes



This machine fills an important want. Sprays paint, graphite, varnish or Shellac on the interior of shells to prevent corrosion. The operation is clean, simple and very effective. Simply place the shell in the hole, then either press down by hand or use a foot lever, and the liquid is automatically sprayed on the interior. Just enough is released to cover the surface.

IT ELIMINATES ALL LOSS OF LIQUID AND SAVES MUCH TIME AND LABOR.
It is practically fool proof and can be operated efficiently by an inexperienced man.

PROMPT SHIPMENT.
Write us for particulars to-day.

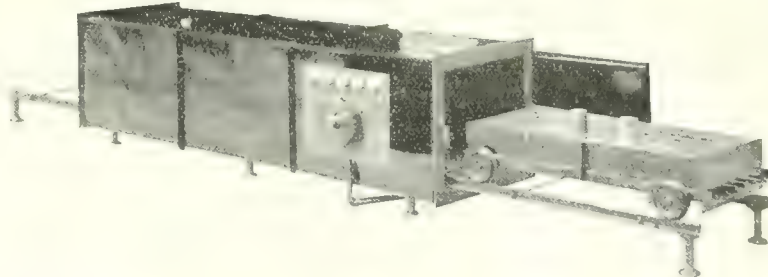
Spray Engineering Co.
93 FEDERAL ST., BOSTON, MASS.

CANADIAN AGENTS:
Rudol-Belnap Machinery Company. Montreal, Toronto

HOSKINS

TRADE MARK REGISTERED

Made
in
Canada



23 Now
in Use
in Canada

ELECTRIC BAKING OVENS

FOR BAKING THE VARNISH IN HIGH EXPLOSIVE SHELLS

The electric oven is the most satisfactory for this line of work. The absence of injurious gases and fumes insures protection of the varnish. The electric unit runs almost the full length of the oven, insuring perfect heat distribution. The temperature control is simple, and the temperature of the oven can be properly regulated to within a few degrees. The HOSKINS Electric Oven is built on the same lines as the HOSKINS Electric Furnaces. This efficient construction makes possible the operation of the oven with from 20% to 30% less current than other types of electric ovens. Send for bulletin No. C-106.

CANADIAN HOSKINS LIMITED

Electric, Gas and Oil Furnaces and Pyrometers.

Eastern Office: 112 St. James St., Montreal, Que. General Office and Factory: WALKERVILLE, ONT.

The advertiser would like to know where you saw his advertisement—tell him.



TATE-JONES FORGING FURNACES, PENN'A STEEL CO., STEELTON, PA.

FORGING FURNACES FOR HIGH EXPLOSIVE SHELLS

“Tate-Jones” Forging Furnaces for High Explosive Shell Work are properly designed and constructed to give maximum output per unit of fuel burned and per square foot of floor space occupied.

Properly heated billets mean for you more rapid production and fewer rejections.

Write us about the size and number of shells you desire to handle for information in regard to “Tate-Jones” Forging Furnaces.

Ask for Bulletin “Shells and Shell Furnaces”

TATE-JONES & CO., Inc., **PITTSBURGH, PA.**
FURNACE ENGINEERS

Ontario Agents: Rudel-Belnap Machinery Company, Toronto

If what you want is not advertised in this issue consult the Buyers' Directory at the back.



Red Cut High Speed Steels

Just now, when the attention of every user and buyer is riveted on the high speed steel situation, we feel that a brief statement from the makers of Red Cut is appropriate.

DELIVERY: We are operating twenty-four hours a day, and new additions to our mills and equipment are constantly increasing our present large output. To firms in urgent need of High Speed Steel, we suggest that a list of the required sizes and quantity be sent us, and we will promptly advise delivery possibilities.

MATERIALS: Realizing that contracts for tungsten ore from foreign lands were becoming more and more liable to non-fulfillment, we recently acquired additional valuable tungsten ore property in Boulder County, Colorado. The purchase of these mines, rich in tungsten, assures us of a sufficient quantity of this scarce ore for fulfillment of all orders we will accept.

GRADES: When you see the mark **Red Cut Cobalt** or "**Red Cut Superior**" on a bar of high speed steel, your mind will automatically connect the words with exceptional quality and uniformity. A man is known by the company he keeps, and high speed steel is known by the quality and quantity of valuable elements it contains, such as tungsten, vanadium, etc. The phenomenal success of the Vanadium-Alloys Steel Company, and the enviable position it occupies to-day in the hearts of the trade, was not obtained by legerdemain, but by strictly adhering to the principle of quality and service.

VANADIUM-ALLOYS STEEL COMPANY
PITTSBURGH, PA.

The advertiser would like to know where you saw his advertisement—tell him.

Nova Scotia Steel & Coal Company, Ltd.

Head Office,
NEW GLASGOW,
N.S.

Western Sales Office,
Room 14 Windsor Hotel,
MONTREAL

Manufacturers of

STEEL

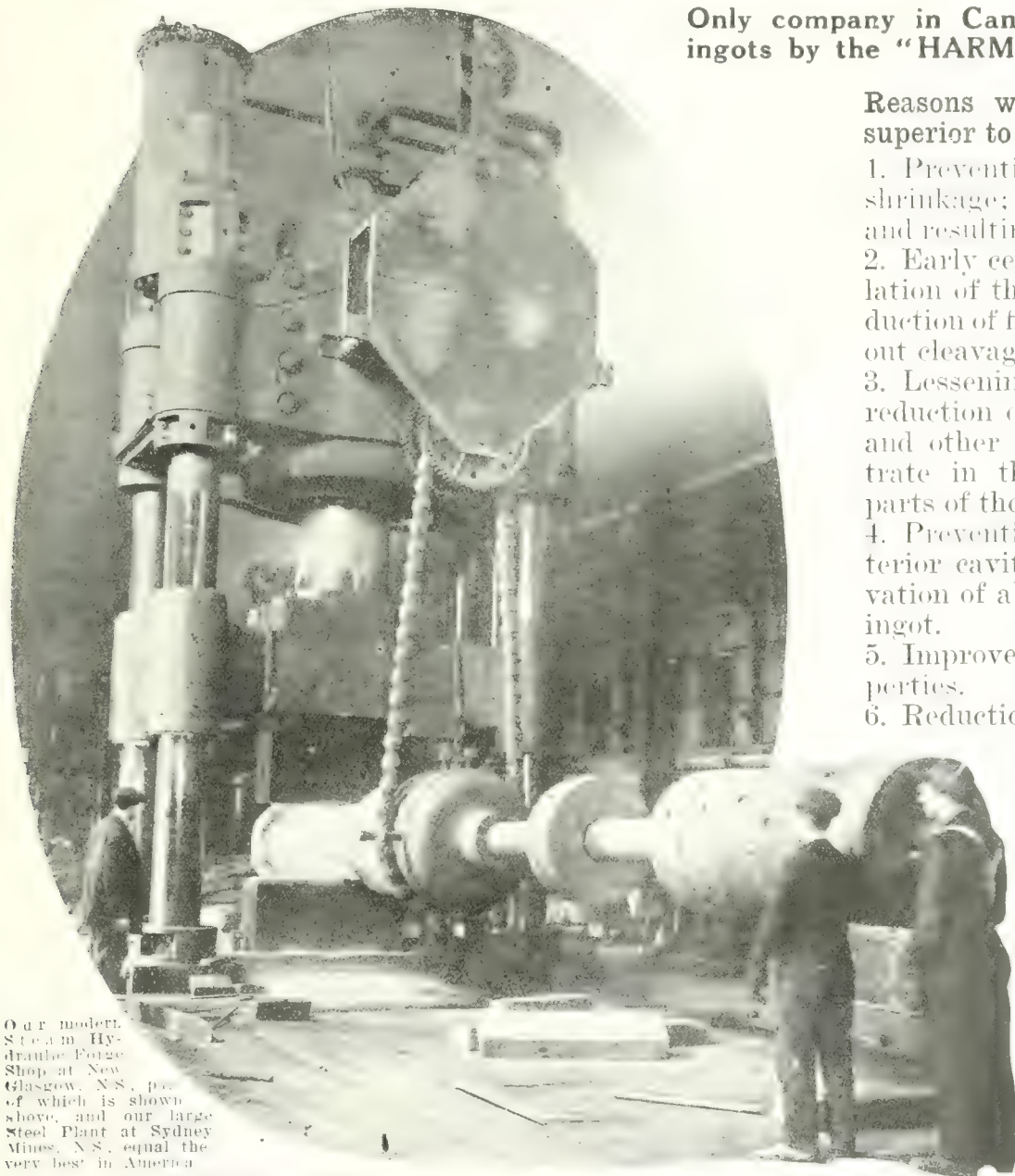
FOR SHRAPNEL SHELLS,
AND SHELL BLANKS.

Only company in Canada producing steel ingots by the "HARMET" Liquid Process.

Reasons why these ingots are superior to the ordinary kind:

1. Prevention of cracks, due to shrinkage; of internal stresses and resulting cracks and fissures.
2. Early cessation in the crystallization of the metal, and the production of fine crystallization without cleavage planes.
3. Lessening of segregation, i.e., reduction of tendency to carbon and other impurities to concentrate in the central and upper parts of the ingot.
4. Prevention of "Pipes" or interior cavities, and thus preservation of absolute solidity in the ingot.
5. Improvement in physical properties.
6. Reduction in waste of ingot.

WE CAN SUPPLY FORGINGS OF ALL SHAPES AND SIZES, MADE OF ORDINARY OR "HARMET" FLUID COMPRESSED OPEN-HEARTH STEEL ON THE SHORTEST NOTICE.



Our modern Steam Hydraulic Forge Shop at New Glasgow, N.S., part of which is shown above, and our large Steel Plant at Sydney Mines, N.S., equal the very best in America.

If what you want is not advertised in this issue consult the Buyers' Directory at the back

HANDLE HEAVY H.E. SHELLS ECONOMICALLY WITH QUICK-ACTING I.-R. AIR HOISTS



Quick Action
Accurate Control
Minimum of Power

First cost is low and maintenance cost is practically nothing.

These Air Hoists, equipped with suitable grapples, form a most satisfactory means of quick, economical handling of heavy High Explosive Shells.

*Write Us Your
Requirements to-day*

Canadian Ingersoll-Rand Company, Limited

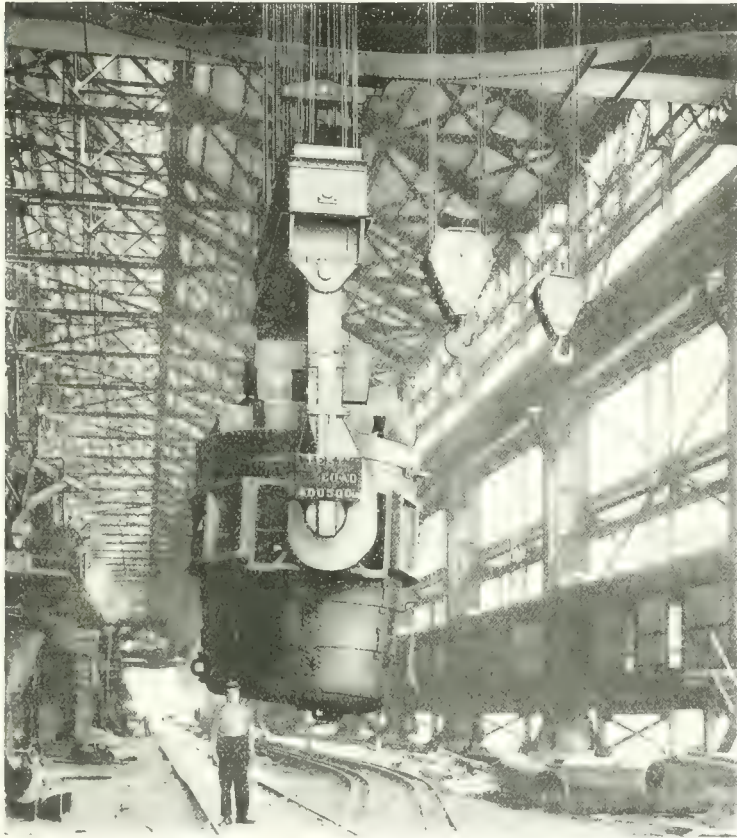
COMMERCIAL UNION BUILDING, MONTREAL

Vancouver Nelson Winnipeg Timmins Cobalt Toronto Sydney

Works : SHERBROOKE, QUEBEC

The advertiser would like to know where you saw his advertisement—tell him.

“ALLIANCE”



TEST LOAD ON
175-TON FOUR-
GIRDER LADLE
CRANE—OF
WHICH TYPE
ALONE WE
HAVE BUILT
UPWARDS OF
—130—

In addition to our line of Standard Cranes, for every service from 5 to 200 tons capacity, we build more large and special types than all others combined. This is significant since the big earning capacities of the large industries are at stake, and they must have the best Cranes available.

THE ALLIANCE MACHINE COMPANY

ALLIANCE, OHIO

NEW YORK

PITTSBURGH

BIRMINGHAM

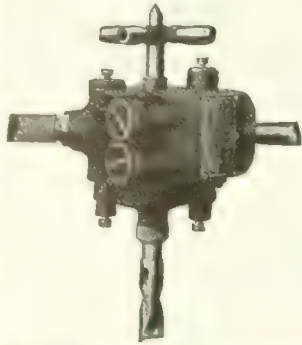
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CLEVELAND

CLEVELAND SAND RAMMERS

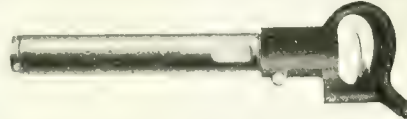
For Floor, Flask, Bench and Core Ramming



Cleveland Rammers are "ideal" for foundry, as they are simple in construction, have high speed and practically no vibration. The packing is adjustable and excludes all dirt. They are preferred, as the upkeep is so very moderate.

CLEVELAND RIVETING HAMMERS

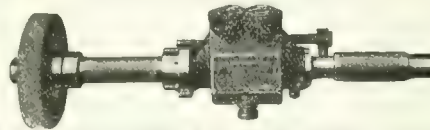
Are made in 20 styles and sizes, suitable for all classes of riveting in B. floors, Stack Tanks, Truck Frames, etc.



They have a driving capacity of 1/4 in. to 1 1/2 in. Rivets.

CLEVELAND PORTABLE GRINDER FOR ALL CLASSES OF WORK

Adapted to the grinding of Grey Iron or Steel Castings. This Machine is operated by compressed air and develops high speed and great power.

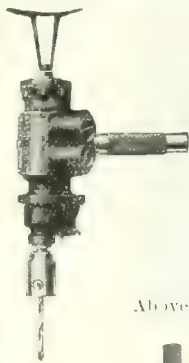


pressed air and develops high speed and great power. It is made in

Two sizes, Nos. A and AA, speed 3300 and 2700 R.P.M., respectively. This Machine will interest you because of its manifold uses in shop and field operations.

CLEVELAND LIGHT WEIGHT FOUR-PISTON AIR DRILL

The "C" Type Non-Reversible Drills are all alike in construction and capacity, but are equipped differently, each type having its own symbol letters. They are adapted for Tell Tale holes and for any drilling within their capacity: 9/16-in. in steel; 1-in. in wood



BOWES AIR HOSE COUPLINGS

Over 1,000,000 in general use

AIR  TIGHT

Above cut shows Never-Slip Clamp attached to the Bowes Coupling. Write for Bulletin Nos. 29-33

Cleveland Pneumatic Tool Co. of Canada, Limited
80 Duchess St., Toronto, Ont.

Cleveland Air Drills are made in 18 styles and sizes. They are the most efficient type and have the least weight for any similar machine. They are adapted for chipping, scaling, etc. They are dependable machines.



Cleveland Chipping Hammers are made in 20 styles and sizes, for Chipping, Beading, Calking, Scaling, Bushing Concrete Surfaces, etc. They are speedy tools and are preferred by operators, as they have no oil.

Write for Bulletins



Ideal for Chipping Billets and Blooms in Steel Mills and for Ragging Rolls



Hunter "Duplex" SPEED

can be employed
very profitably on
shrapnel or any
other stock

The secret of *Hunter "Duplex" Saw Speed* is the method of holding the high speed teeth. The illustration shows a Hunter "Duplex" speeding through $3\frac{1}{2}$ " round 60 carbon, 70 manganese Shrapnel stock—it's a tough cut made easy and fast.

Let us demonstrate what a saving can be made by installing a Hunter "Duplex" inserted tooth blade.

Mail us a line for full particulars.

HUNTER SAW & MACHINE CO.
Pittsburg, Pa.

**Shrapnel and High Explosive Steel
Turnings or Cuttings.**

**Shrapnel and High Explosive Steel
Crop Ends and Defective Shells.**

*Will pay highest market cash
price for this material.*

Ohio Iron & Metal Company

1134 1st National Bank Bldg., Chicago

BETTER DO IT RIGHT AWAY

Consider them on your work.

BAKER DRILLS

They are POPULAR tools on Lyddite
and Shrapnel.

POPULAR because they produce
ACCURATE—DEPENDABLE work
at extremely low labor cost, low installa-
tion cost and small floor space.

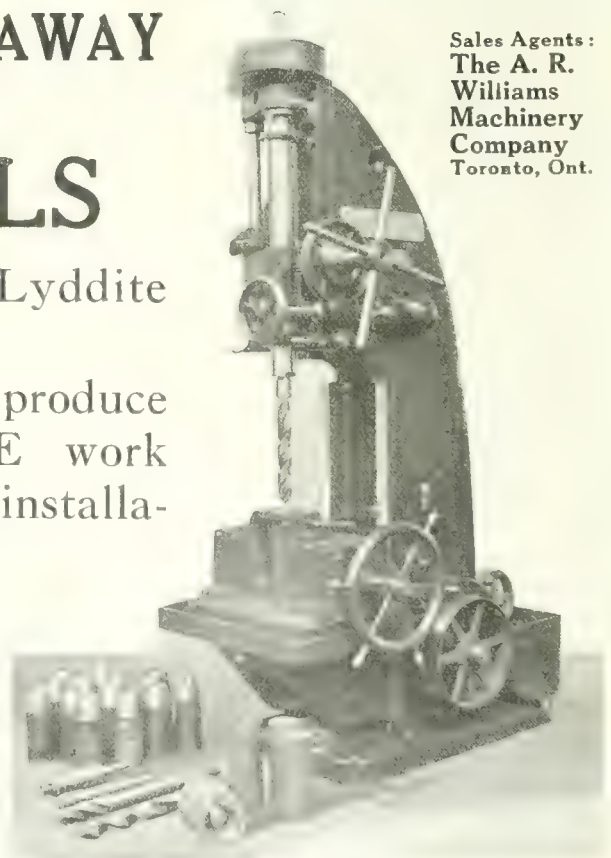
SHELL OPERATIONS

READILY PERFORMED BY BAKERS

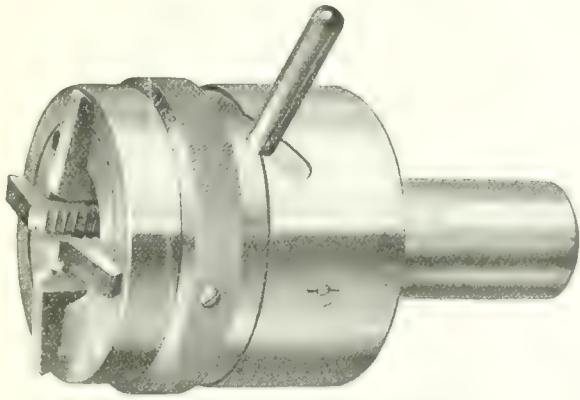
Drilling, Boring, Reaming, Counterboring,
Facing, Undercutting, Nosing, Tapping.

BAKER BROS., Toledo, O., U.S.A.

Sales Agents:
The A. R.
Williams
Machinery
Company
Toronto, Ont.



The advertiser would like to know where you saw his advertisement—tell him.



Wells Self-Opening Die—Model B.

The simplest and most efficient of all automatic opening die heads.

The principle of construction safeguards and insures perfect work. This die is now giving satisfaction in hundreds of shops.

Good Threads Cost Less Than Poor Ones

The advent of the W.S.O.D. in his shop, has opened the eyes of many a manufacturer producing screw threads to the fact that he can

Increase Production, Decrease Costs and Cut Perfect Threads

all at one and the same time.

Do you want us to prove it? We are ready,

We want to send you the booklet describing the different models. Are you willing to try the W.S.O.D. in your shop under your own conditions?

WELLS BROTHERS COMPANY OF CANADA, Limited
GALT · ONTARIO

Sales Agents:

The Canadian Fairbanks-Morse Company, Limited, Montreal, Toronto, Vancouver, Winnipeg, St. John, Calgary.

HYDRAULIC PRESSES

For Piercing and Drawing

SHELLS AND PROJECTILES

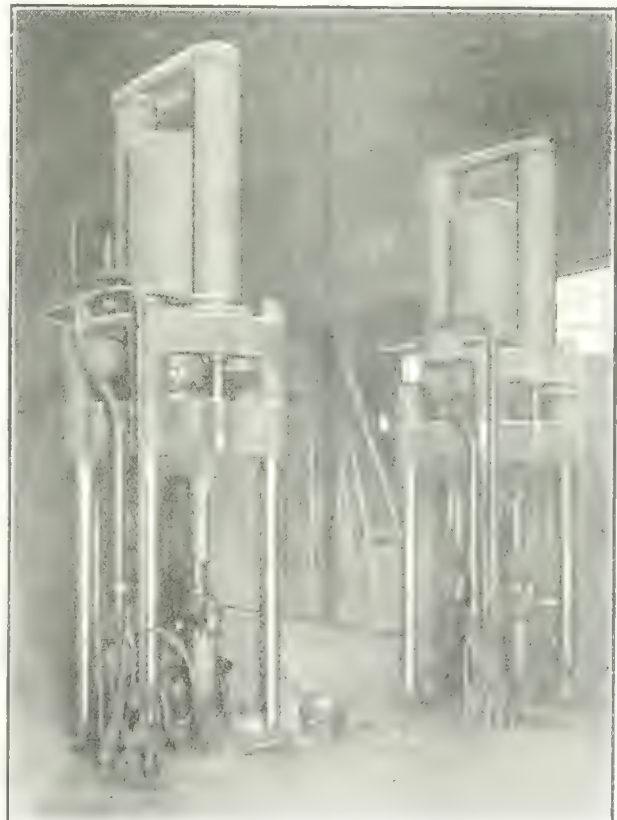
Our facilities for manufacturing Hydraulic Presses assure you a product of very high quality and efficiency at reasonable cost.

Write us now. We are in a position to give you PROMPT DELIVERY.

The William Cramp & Sons Ship and Engine Building Company

PHILADELPHIA, PA.

DRAWING PRESSES



If what you want is not advertised in this issue consult the Buyers' Directory at the back.



Government Engineers

designed these rolls to carry the emergency gates at Panama. The specifications called for tough alloy steel and a grinding limit of .002."



It proved to be a big grinding problem—but a Norton wheel the full width of the surface and formed to the right contour did the work satisfactorily.

This is an example of the many interesting problems the grinding machine and grinding wheel manufacturers are solving right along.

When a difficult grinding problem presents itself, a Norton Grinding Wheel—Alundum or Crystolon—combined with a rigid grinding machine and expert knowledge afford the best solution.

The Canadian Fairbanks-Morse Co., Limited

St. John, N. B.

Montreal
Edmonton

Ottawa
Calgary

Toronto
Vancouver

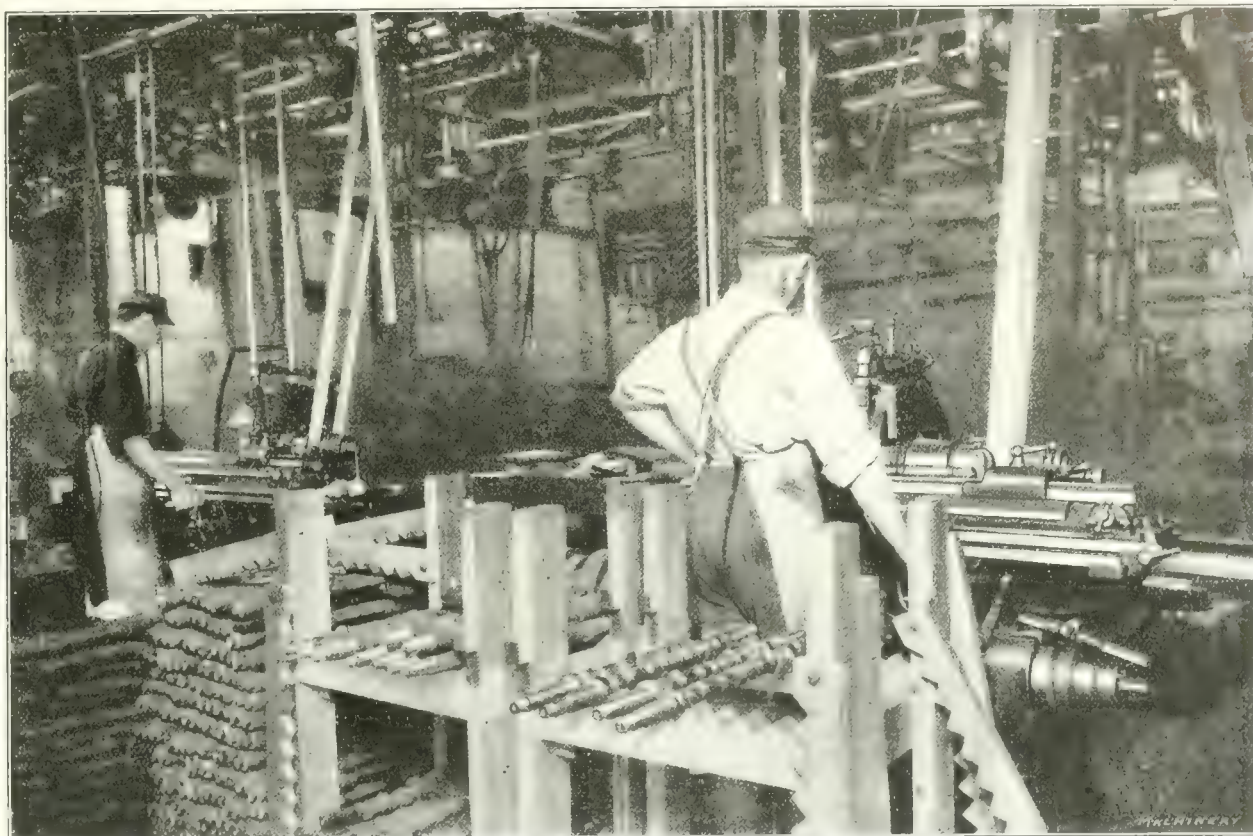
Winnipeg
Victoria.

Saskatoon

F. H. Andrews & Sons, Quebec, P. Q.

Canadian Agents for
NORTON COMPANY, Worcester, Mass., U. S. A.

753



GRIND 50 CAMSHAFTS PER DAY

A very good idea can be gotten of how automobile engine camshafts are being machined in Norton Grinding Machines, by considering what is being done on the job illustrated above. The two

NORTON

Grinding Machines shown are each handling 25 camshafts per day. They rough and finish three bearings, and grind two timing-gear seats.

Twenty-five thousandths is taken off, while a half thousandth is the limit of error allowed.

Pretty good day's work this. Nothing very unusual though. Norton Grinding Machines everywhere are doing such work—making good—satisfying their owners—cleaning up more profit.

Let us have a chance to show you where Norton Grinding can help you out.

The Canadian Fairbanks-Morse Co., Limited

St. John, N.B.

Montreal
Edmonton

Ottawa
Calgary

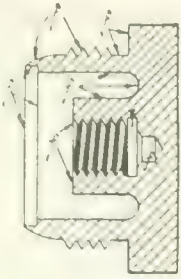
Toronto
Vancouver

Winnipeg
Victoria

Saskatoon

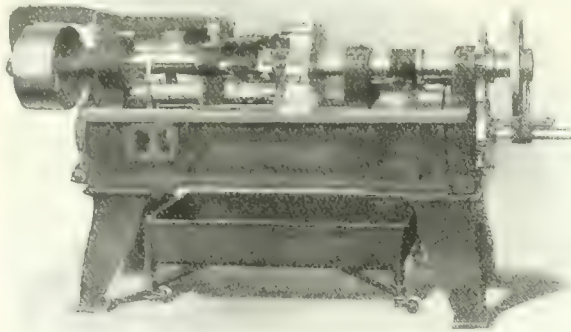
Canadian Agents for
NORTON GRINDING COMPANY, Worcester, Mass., U.S.A.

If what you want is not advertised in this issue consult the Buyers' Directory at the back.



Belgian Primer Bodies 180 Per Hour—Six for a cent!

EVERY TWENTY SECONDS a finished Primer Body is removed from this "New Britain" Automatic Multiple-Spindle Chucking Machine. ¶ Note the large number of operations—all progressing simultaneously. Outside faced, formed, turned, undercut, shoulder faced and threaded. Inside bored, counterbored, hub turned, faced, drilled, undercut and tapped. ¶ Both threads were cut at the same time by means of a combination tap and die holder. Likewise internal and external undercuts back of threads were formed at once by a special combination cross-cut tool. ¶ The production time for *all* operations combined is exactly the same as for the longest *single* operation—*twenty seconds*.

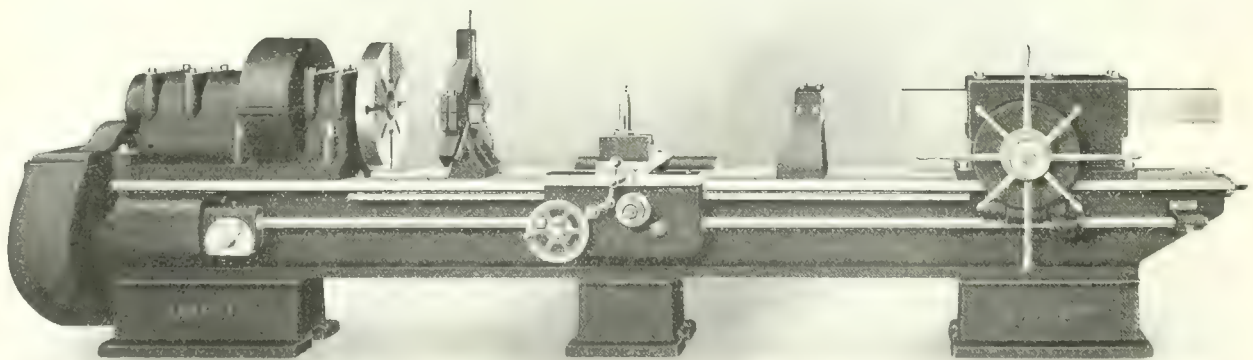


Every manufacturer having castings, forgings or second operation screw-machine work to chuck needs these machines. Made in both Single-Head and Double-Head types for machining pieces on one or both ends.

Let us show what it can do for *you*. Send samples or blue-prints.

The New Britain Machine Co.
New Britain, Conn., U.S.A.

Barrett 25" Heavy Duty Projectile Boring Lathe



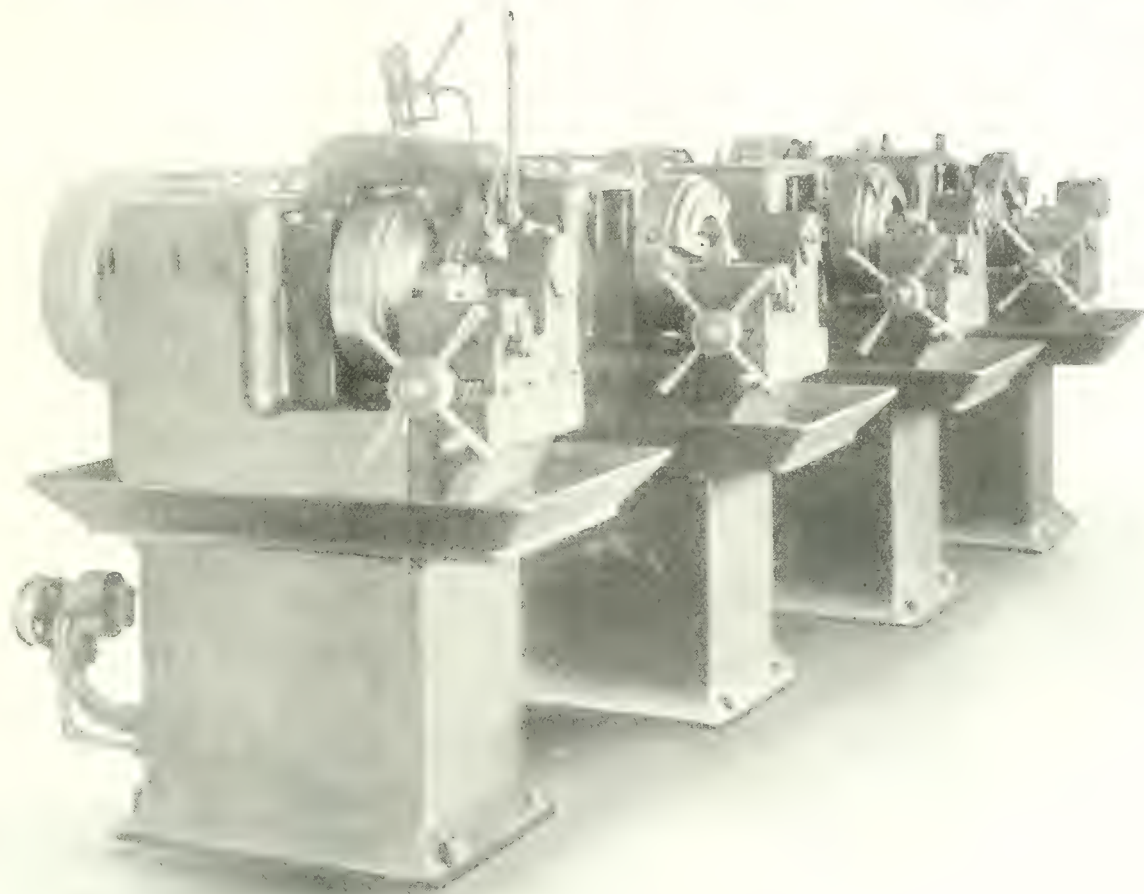
A thorough tried-out proposition for boring and facing projectiles and shells up to 12 inches.

LET US SEND YOU SPECIFICATIONS AND FULL PARTICULARS.

Barrett Machine Tool Co., Meadville, Pa., U.S.A.

The advertiser would like to know where you saw his advertisement—tell him.

Shell Manufacturers' SINGLE PURPOSE LATHES



This cut industry group of machines furnished one manufacturer for Band Grooving, Wave Thread and Undercutting in one operation.

These machines are designed for Trimming, Facing base, Finish turning body nose, Band Turning, Rough Turning body, Band Grooving, Wave Thread and Undercutting, etc., etc.

The object of the design included the following points which we believe have been successfully achieved:

- First—The use of unskilled labor.
- Second—Reduction of tooling expense by simplifying equipment.
- Third—Economy of floor and ceiling space.
- Fourth—Minimum installation cost, no countershaft to erect and belt.
- Fifth—The relief of expensive turret lathes from operations for which they were not particularly adapted and at the same time simplify their work, allowing the use of unskilled labor.

Machines can be equipped for any outside operation on shells.

Write for prices and details specifying operation for which machine is required.

The General Supply Company of Canada, Limited

356 Sparks St.,
OTTAWA, ONT.

125 Adelaide St. W.,
TORONTO, ONT.

408 McGill Building
MONTREAL, QUE.

85 Water St.,
WINNIPEG, MAN.

If what you want is not advertised in this issue consult the Buyers' Directory at the back.

Special Purpose Lathes

For Finishing Copper Driving Bands on Ammunition



This half-toned illustration shows one of our single purpose lathes in service in a munitions factory in Great Britain finishing the driving band on 60 pdr. High Explosive Shells. This factory is using five of our machines equipped with standard three-jaw chucks, compressed air being unobtainable.

Write nearest branch office for descriptive prints and deliveries.

The Jenckes Machine Co., Limited
SHERBROOKE, QUEBEC

Branches at Toronto, Ontario, 728 Traders Bank Bldg.; Montreal, Que., 305 E. T. Bank Building; St. Catharines, Ont.; Cobalt, Ont.; Vancouver, B.C.; Nelson, B.C.



Wolfram Cobalt High-Speed Steel, BEST FOR TURNING SHRAPNEL. Vulcan Hot Piercing Steel, FOR ALL KINDS OF HOT WORK. Vulcan Regal No. 2 Steel, FOR BRASS FINISHINGS. Vulcan Special "W" Steel, For Special Taps and Dies. Vulcan Non-Shrinkable Steel, For Intricate Dies. Vulcan Special Vanadium Steel Does Twice the Work of Regular Carbon Steels

VULCAN CRUCIBLE STEEL COMPANY
ALQUIPPA, PA.

M. E. C. COLLAPSIBLE TAPS



More Shells Better Shells

The convenience, rigidity and accuracy of M.E.C. Collapsible taps have resulted in their adoption by many of Canada's Leading Shell Makers.

M.E.C. Taps are the cheapest in the end.

No doubt you'd like to hear what users themselves have to say re M.E.C. Service. We'll gladly put you in touch with our Canadian customers.

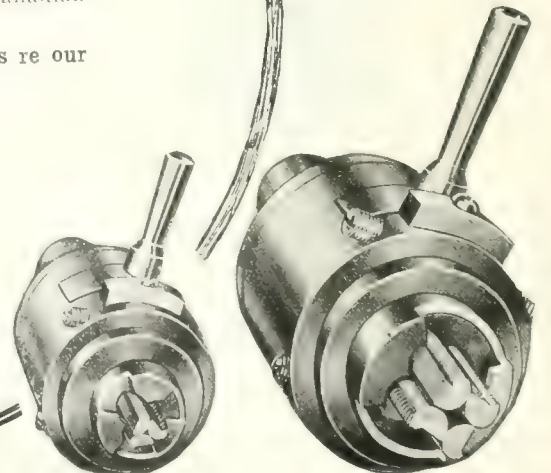
No better time than now. Get details re our liberal proposition.

FOREIGN AGENTS: C. W. Burton Griffiths & Co., Ludgate Square, Ludgate Hill, London; Louis Besse, Bureaux & Caisse, 39 Rue De Lappe, Paris, France.

**Once Known—
Always Used**

Manufacturers Equipment Company

175-179 North Jefferson Street, CHICAGO



"Wood" Hydraulic Presses

Used by practically every company making shrapnel in Canada, and their service on this work retains the reputation that their efficiency and reliability has built for them in the past.

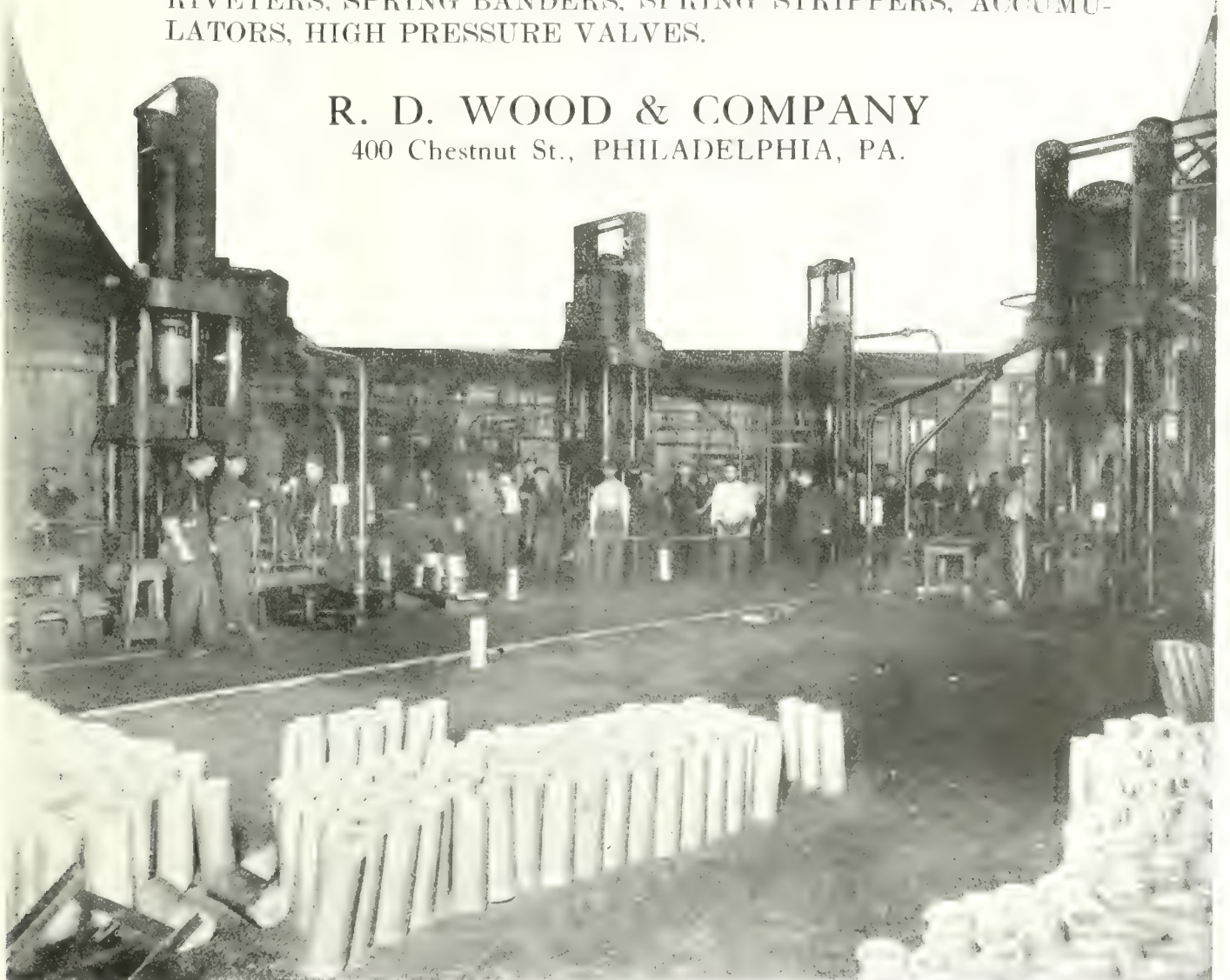
We manufacture

HYDRAULIC MACHINERY

FOR RAILROAD SHOPS, WHEEL PRESSES, FLANGING PRESSES, RIVETERS, SPRING BANDERS, SPRING STRIPPERS, ACCUMULATORS, HIGH PRESSURE VALVES.

R. D. WOOD & COMPANY

400 Chestnut St., PHILADELPHIA, PA.





ELMES HYDRAULIC PRESSES

Rapid-acting hydraulic drawing presses, piercing presses, pumps, and accumulators for making Shells, etc. High pressure fittings and valves, quick shipment.

Send for our illustrated catalog to-day

Charles F. Elmes Engineering Works

217 N. Morgan Street, Chicago, U.S.A.

Over 50 years' experience building hydraulic machinery.



We Equip Foundries Complete

Grey Iron, Brass, Car Wheel, Pipe, Steel
(OH. and Converter) and Malleable

from laying out the plant to starting it in operation. Our experts know the foundry and its problems from the ground up. Profit by our thirty years' experience.

Cranes
of all
Kinds



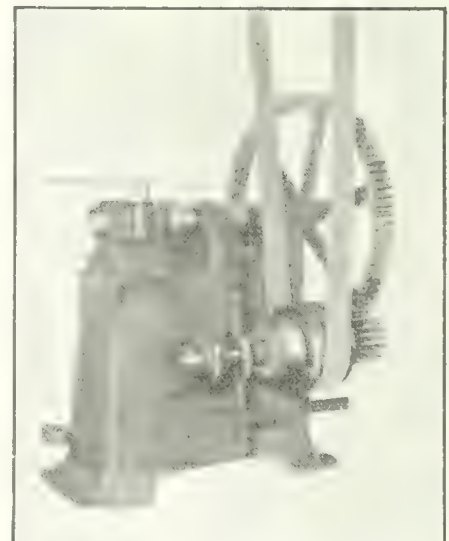
Catalogs
on
Request

Holden-Morgan Mechanical Plug Wrench

For Screwing the Base Plugs Into Shells

Output 120 per hour. One machine with an operator will do the work of four men. Friction device adjustable, and can be set for any required tension, and when set the pressure applied will not vary from the desired adjustment.

Direct driven, no countershaft needed. The plug is screwed in and tightened up entirely by mechanical action, and therefore eliminating the variations that result from hand work.



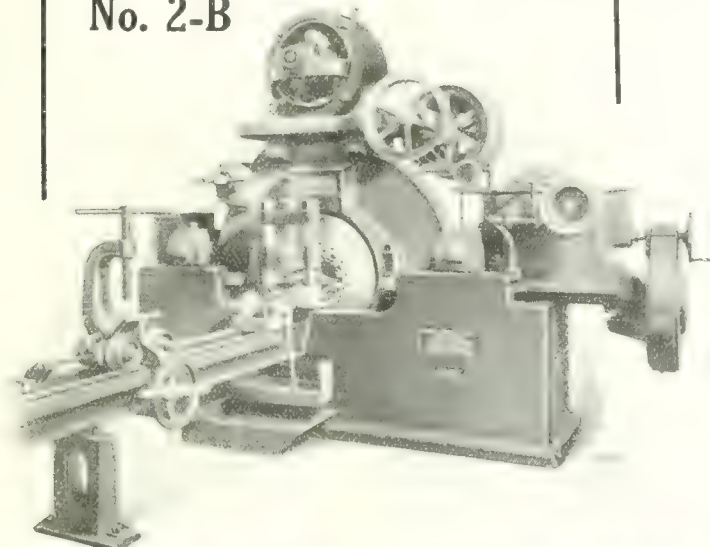
THE HOLDEN-MORGAN COMPANY, LIMITED

539 RICHMOND STREET WEST, TORONTO

The advertiser would like to know where you saw his advertisement—tell him.

Gorton Heavy Duty Cutting-Off Machine

No. 2-B



We can make prompt delivery of this machine, as shown. It is a type of machine which originated with this company, and has been very carefully developed for ten years past, and is used by all of the large steel works and by other manufacturers in the United States.

This is the only machine for shrapnel work. We have furnished twelve to one large firm and several to each of a number of other firms.

3 1/2" Round Shrapnel stock, when cutting bars singly, may be severed at the rate of 600 cuts per 12 hours. Arranged with special jaws to cut two bars at a time 800 to 1100 cuts can be made per 12 hours.

3 1/2" Square Shrapnel stock may be reduced down to 1" diameter by using our rotary attachment, at the rate of 600 cuts per ten hours.

6" ordinary round steel may be cut at the rate of over 300 cuts per ten hours.

George Gorton Machine Company

Manufacturers of Engraving Machines and Heavy Duty Cutting-off Machines

RACINE, WIS., U. S. A.

Cable Address: "Gorton, Racine." Use A. B. C. Code (4th edition) or Western Union Code (Universal edition)

FRONT VIEW GORTON NO. 2-B HEAVY DUTY CUTTING-OFF MACHINE. Capacity 600 cuts per 12 hours. Photo Shows Single End Equipment. 2 H.P. 2" V-Belt. S. W. M. Co. Ltd. 100 King St. W. Toronto, Ont. Canada. Mfg. Co. 100 King St. W. Toronto, Ont. Canada. Sole Western Agents: S. W. M. Co. Ltd. 100 King St. W. Toronto, Ont. Canada. Sole Eastern Agents: R. W. M. Co. Ltd. 100 King St. W. Toronto, Ont. Canada.



Where "Time Is The Essence Of The Contract"

you can't afford to let your men use inefficient tools.

Yet the probability is that they are wasting time trying to get the last bit of wear from their files.

And at a certain point in the lifetime of a file, the time lost in its use is money wasted.

By using a half-worn file your men may be slowing up a contract that means thousands of dollars to you.

They'll do better work with a new file—in less than half the time. And the saving goes into your pocket.

But, be sure the files used are of the following brands:

**KEARNEY & FOOT GREAT WESTERN
AMERICAN ARCADE GLOBE**

(Made in Canada)

The Files with our 50 years' experience at back of them. They last!

Write for our FREE copy of "File Philosophy."

NICHOLSON FILE COMPANY, - PORT HOPE

(Dealers Everywhere)

If what you want is not advertised in this issue consult the Buyer's Directory at the back.

especially
adopted
for
Grinding
SHELLS

"Modern" 12" x 24" Self-Contained Grinding Machine

This is a powerful, rigid and effective machine that will give you an extra measure of shell production.

Large diameter, wide face wheel with powerful drive.

Automatic feed, without traversing the table, where required.

Absolute central control of all levers and hand wheels.

Single constant speed drive.

Write for full details.

USED BY A LARGE NUMBER OF SHELL MAKERS IN CANADA.

It comes equipped for all classes of straight and taper cylindrical work.

Send for blueprints and estimates.



Modern Tool Company

Main Office and Works:

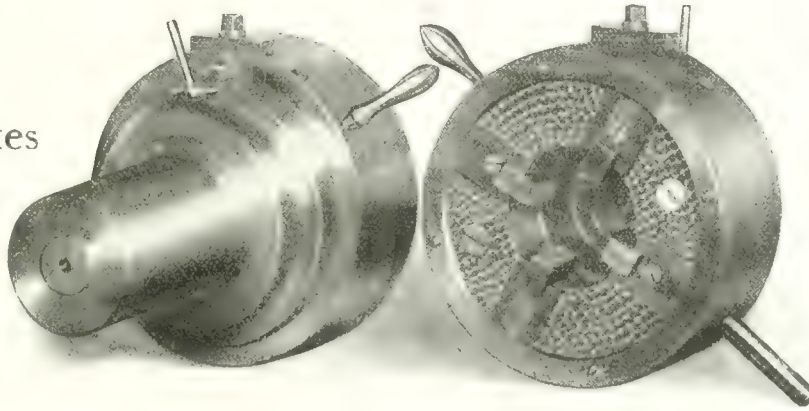
State and Peach Streets, Erie, Penn'a

Canadian Agents: Rudel-Belnap Machinery Co., Toronto and Montreal

The advertiser would like to know where you saw his advertisement - tell him.

The "Modern" Speed Die

Eliminates
Spoiled
Pieces



Self-Opening
and
Adjustable
Die Heads

—*SPEED that's invaluable to shell makers*

Supported to insure the cutting of a perfectly straight thread, of full size and accurate lead, and the heads will not clog with chips, necessitating frequent cleaning.

All "Modern" Heads now have our cleaning improvement, which permits cleaning without disassembling the head. The chaser clocks, in which the chasers are rigidly held, are firmly supported by a tool steel cam ring.

The "Modern" Die Head is made in a single style that will cut all threads, coarse or fine, of standard or special pitch and pipe threads, of any diameter or length within the capacity of the Die.

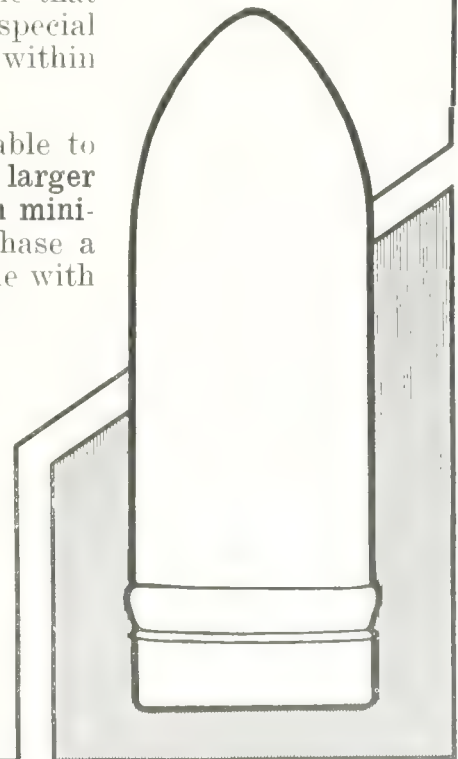
No other make of Self-Opening Dies has been able to attain these advantages, hence, if you desire a **larger output of precision work and a wider range, with minimum investment**, you will be compelled to purchase a "Modern" Die Head. So if you are having trouble with your present threading tools, you can eliminate this trouble by installing "Modern" Heads.

Information regarding the use of "Modern" Self-Opening Die Heads for threading time fuse parts and base plugs upon request.

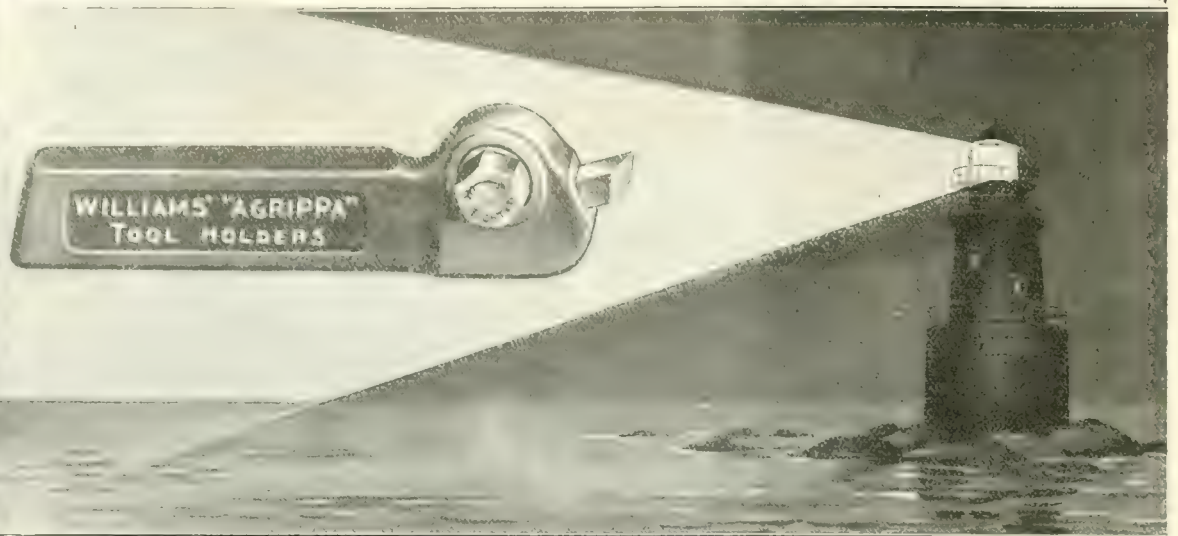
Modern Tool Company

Main Office and Works: State and Peach Sts., Erie, Pa.


Canadian Agents: Rudel-Belnap Machinery Co., Toronto and Montreal



Let a score of reasons emblazon their score



"THE HOLDERS THAT HOLD"

1. They were designed and produced **after** the demands of the High Speed Age upon lathe tools were fully established and understood.
2. They can be made to grip tighter than other tool holders without inviting their destruction.
3. Their protected fastenings make them immune from abuse.
4. Their fastenings provide reserve power—the greater the pressure the tighter the lock
5. They are made of selected stock, scientifically refined and treated by trained experts.
6. They prevent lost motion by obviating breakage of fastenings.
7. They are steady workers who never quit until the job is completed.
8. They never lose their heads.
9. Nothing upsets them.
10. The stripping of threads is impossible.
11. They are well balanced; each portion is designed for the strain it bears.
12. Their dependability is assured—the  secures it.
13. They are made and sold to secure full commission to the dealer, full profit to the owner and full pay to the workmen.
14. Their successful career has not turned their heads; we provide a **suitable** wrench for that purpose.
15. They permit a pound of steel to perform the work of many pounds of solid forged tools.
16. The cam fastenings permit quicker locking and releasing of tools in turning, threading, cutting-off and side holders.
17. The lockable spring head of the Threading tool permits the finest threading in finishing or heavy roughing cuts in preliminary operations.
18. The cutting-off tool is made as effective for **side** work by interchangeable blades.
19. Within its range the boring tool takes any commercial size or shape of bar without shims, and provides for varied adjustment of straight or angular cutters.
20. The planing tool with 36 angles of adjustment provides perfect seating of cutters with uniform locking pressure in all positions.

J. H. WILLIAMS & CO.

45 Richards Street BROOKLYN, N. Y. CITY

The Wrench People

Western Office and Warehouse:

40 SOUTH CLINTON STREET, CHICAGO, ILL.

CATALOGUE FOR
THE ASKING

OFFICIAL
AWARD
RIBBON



PANAMA PACIFIC
INTERNATIONAL
EXPOSITION
SAN FRANCISCO
1915

Williams
Presented
to
PROPERTY OF THE SOCIETY OF
MACHINERY ENGINEERS

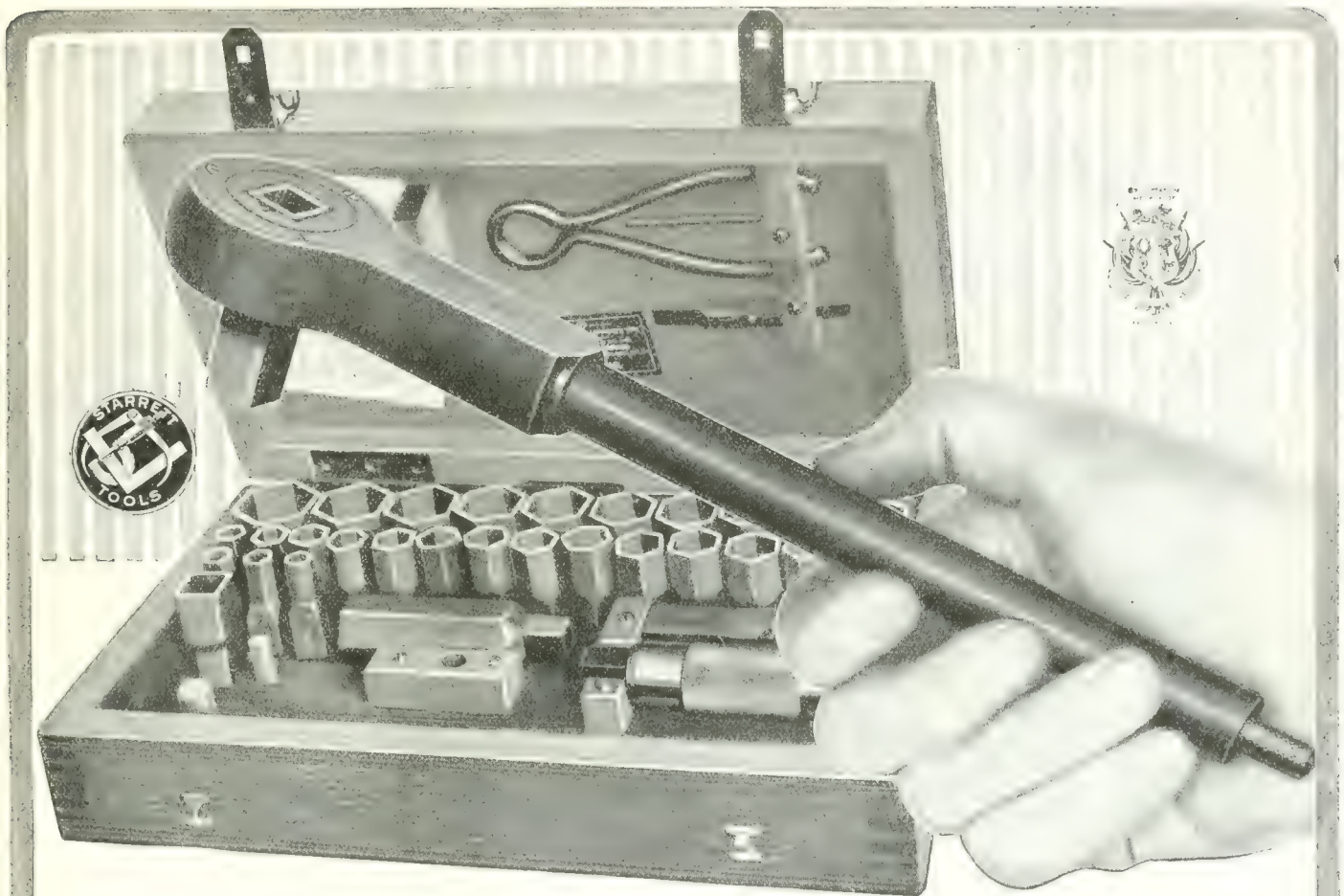
OFFICIAL AWARD
MEDAL
HONOR
DEPARTMENT OF
MACHINERY



Their Score

Factories:
BROOKLYN,
BUFFALO, N. Y.

The advertiser would like to know where you saw his advertisement—tell him.

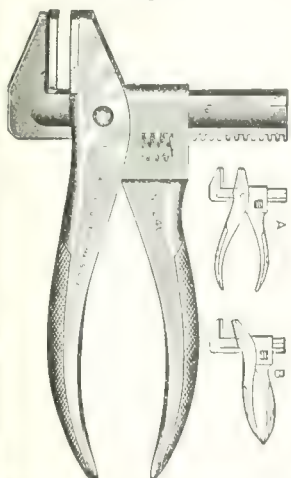


Starrett Tools for Motorists

Starrett Tools are known throughout the world as tools for fine mechanical work. Among these tools are several especially adapted for use on automobiles.

The Starrett Ratchet Wrench \$15

includes 28 sockets for all standard hex nuts—handle with ratchet and reversible pawl, universal joint, drilling attachment, spark plug socket, screwdriver.



Expansion Pliers \$2

Jaws are adjustable, will take any shape up to 1 1/4 inch. Handles are always just right to squeeze. Great leverage gives powerful grip. Quicker than a wrench for small adjustments.



Hack Saws and Frames

Flexible back blades for hand work prevent breakage. Adjustable hack saw frames take 8, 10 and 12 inch blades and permit turning the blades to saw in any position.

Starrett Tools and Instruments include 2100 styles and sizes of fine tools and hack saws.

We deal direct with retail dealers. Send for free catalog No. 20-MA, prices, etc.



THE L. S. STARRETT COMPANY

"The World's Greatest Tool Makers"

ATHOL

MASSACHUSETTS

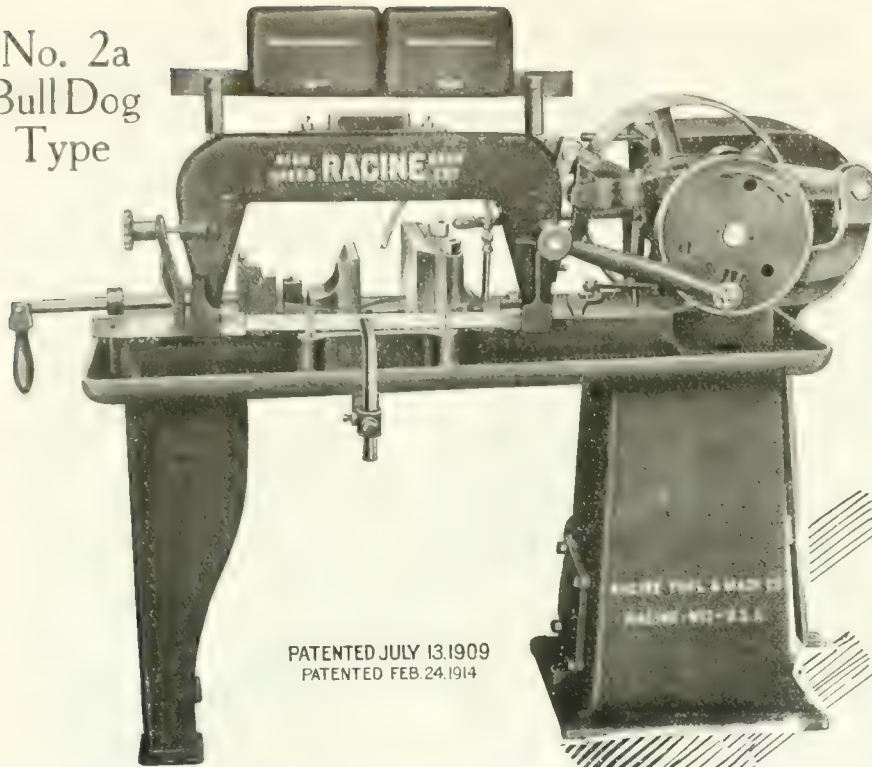
NEW YORK

LONDON

CHICAGO

If what you want is not advertised in this issue consult the Buyers' Directory at the back.

No. 2a
Bull Dog
Type



PATENTED JULY 13, 1909
PATENTED FEB. 24, 1914

The Racine Metal Cutter

Less Blades
and
Utmost

One
Canadian Steel
Company uses 120
Racine Metal Cutters

Racines are popular everywhere because they work fast and are easy on the blades — because springing is absolutely prevented by the mechanically correct design and construction.

The heavy, rigid saw frame guide of the Racine is made of the best grade of semi-steel and will hold the saw absolutely rigid and square with the work at all times, ensuring a straight cut with the least possible waste of material.

The Blade Tightener is operated without the use of a wrench and is a great time saver.

The **Three-Speed Transmission** gives unlimited range to machine illustrated herewith, adapting it to cutting all kinds of metal at proper speeds.

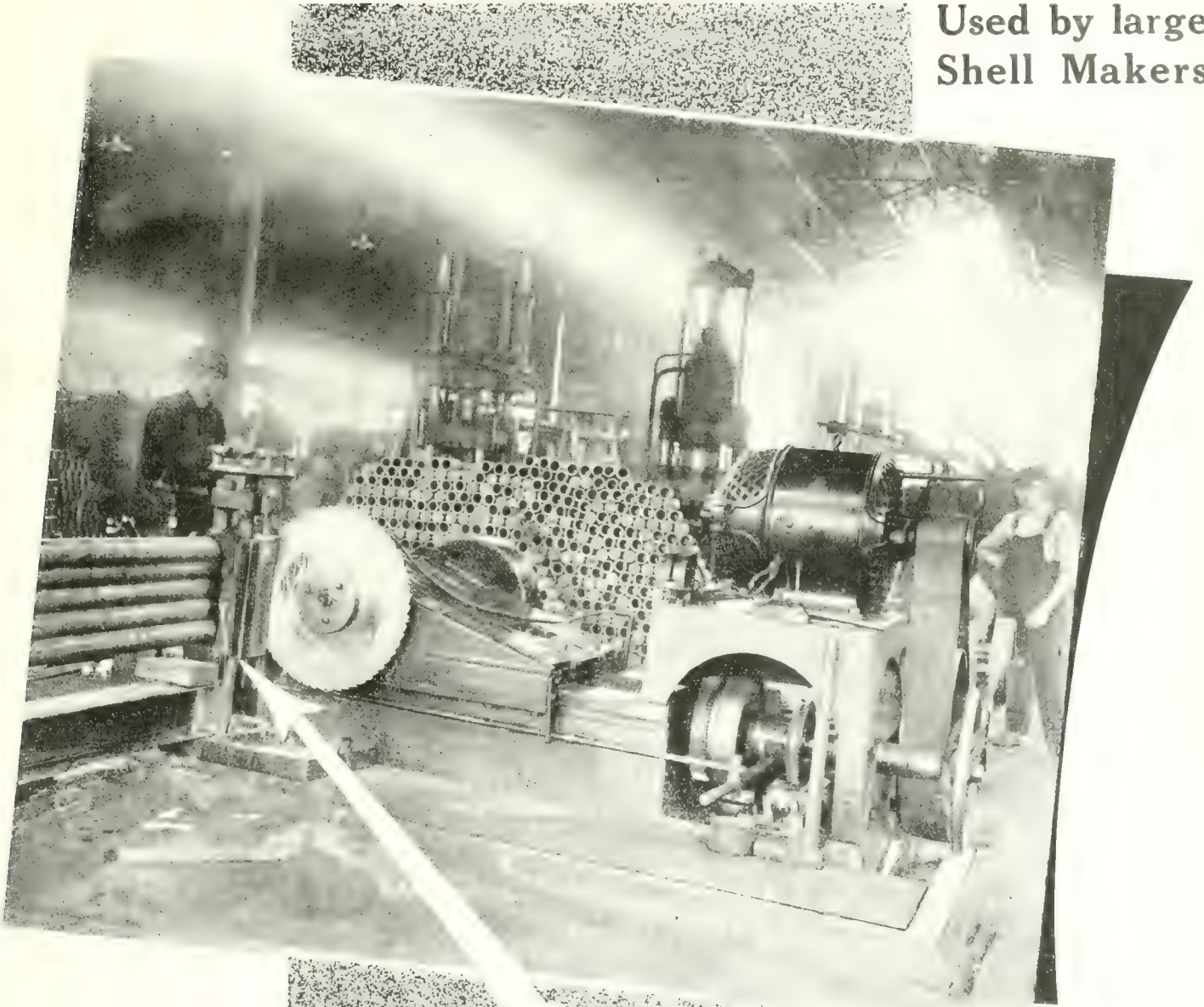
USED EXTENSIVELY IN CANADA

Write for full details and list of Canadian Customers.

Racine Tool & Machine Company

15 MELBOURNE AVE., RACINE, WIS., U.S.A.

**Used by large
Shell Makers**



*190 Types
and Sizes for
Sawing all
kinds of
Metal*

**Cutting off
5 Steel Bars
at a time**

*The fastest
Cold Sawing
Machine in
the World*

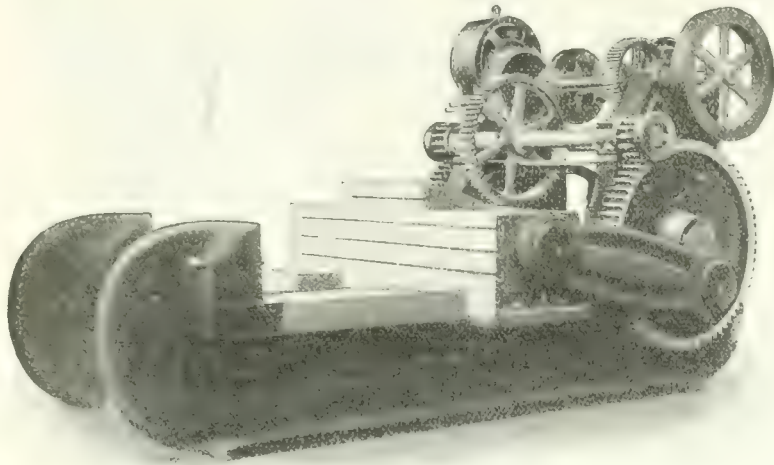
The Espen-Lucas Machine Works

Front and Girard Avenue, Philadelphia, Penna., U.S.A.

If what you want is not advertised in this issue consult the Buyers' Directory at the back.

SHRAPNEL and HIGH EXPLOSIVE SHELL

FORGING MACHINERY AND RIFLE
BARREL TAPERING AND DRAWING ROLLS



Drop Hammers,
Power Hammers,
Bulldozers, Rifle
Barrel Tapering
and Drawing Rolls,
and a complete line of
forging machinery.

Our machines are in use by some of the largest manufacturers of Rifles, Shrapnel and High Explosive Shells.

We are very glad to confer with manufacturers and give them the benefit of our engineering experience.

Full Details Furnished on Request.

Williams, White & Company, Moline, Ill.
U. S. A.

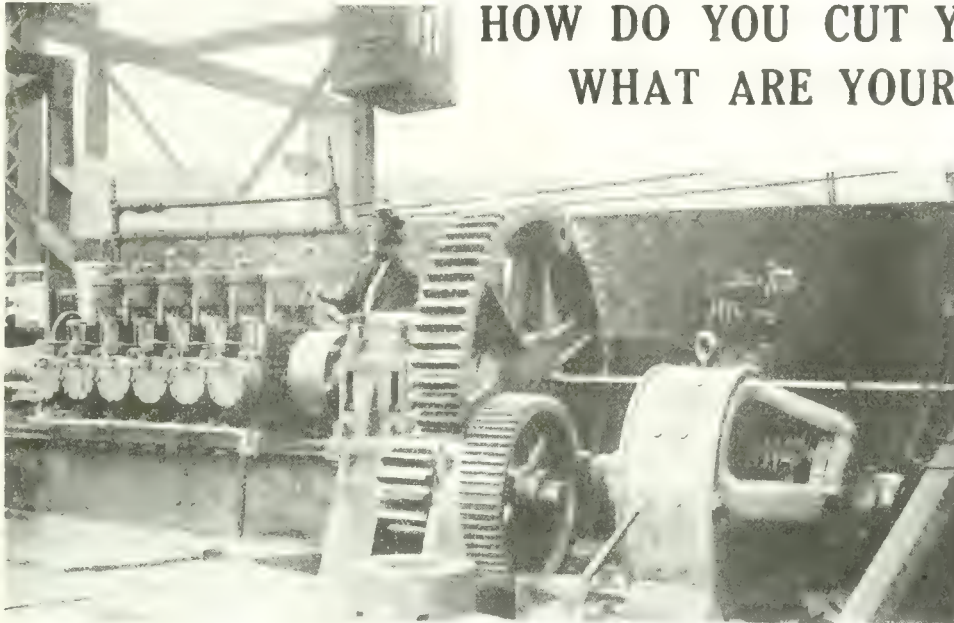
CHICAGO OFFICE: 933 Monadnock Blk.

PITTSBURGH OFFICE: 808 Home Building.

SOUTHWARK

CUTTING-OFF MACHINES

HOW DO YOU CUT YOUR SLUGS?
WHAT ARE YOUR COSTS?



Minimum
Operating
and
Maintenance
Costs

—
No Waste

—
Maximum
Production

Illustration shows a powerful Air Operated Machine, for cutting off Cold Metal, 1" to 6" diameter. This machine cuts six slugs from a 5 1/2" round in 65 seconds.

The McMeans Basler Cutting Off Machine may be operated by one man, and handles a wide range of work with speed, accuracy and economy.

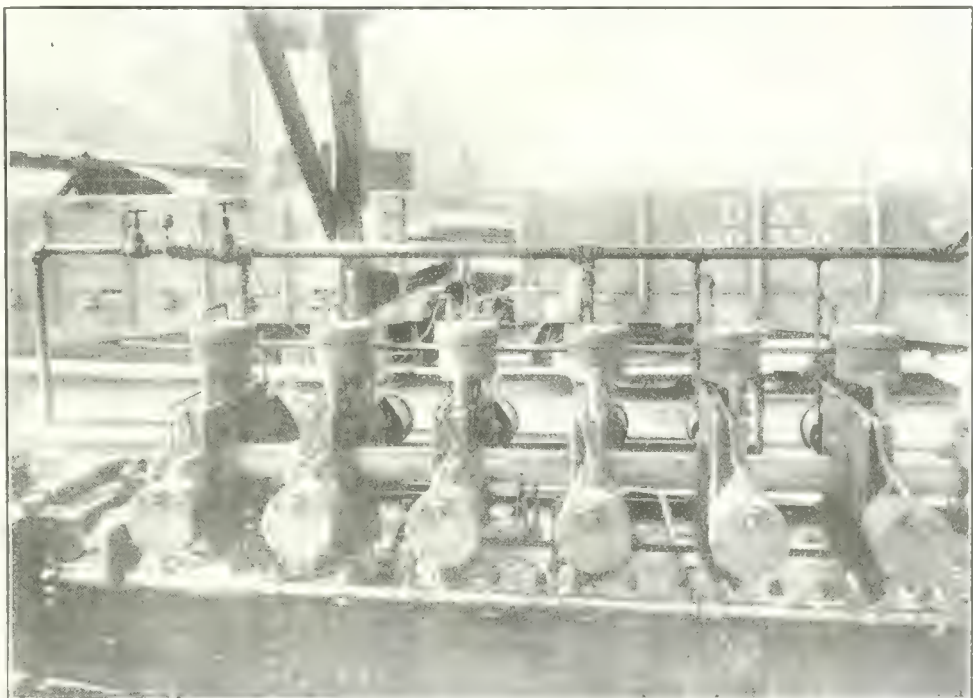
It costs LESS to Cut Stock on this machine. It will Cut your Cost as fast as it Cuts Steel.

It is built in single and multiple head types for cutting rounds from 1" to 13" in diameter. It can be equipped with handling device for disposing of the cuttings.

If you ROLL ROUNDS it is the ONLY way to keep ahead of your Mill. If you make SHEET BLANKS it is the ONLY way to keep ahead of your Presses.

It leaves a BREAKING SECTION at the middle as required by shell specifications.

Its Simplicity, Ease of Handling, Low Operating and Maintenance Costs, combined with its Great Speed and High Production, make it absolutely essential in plants of large output.



Same type of machine cutting rounds into slugs 19" long, 5 1/2" diameter

Southwark Foundry & Machine Company

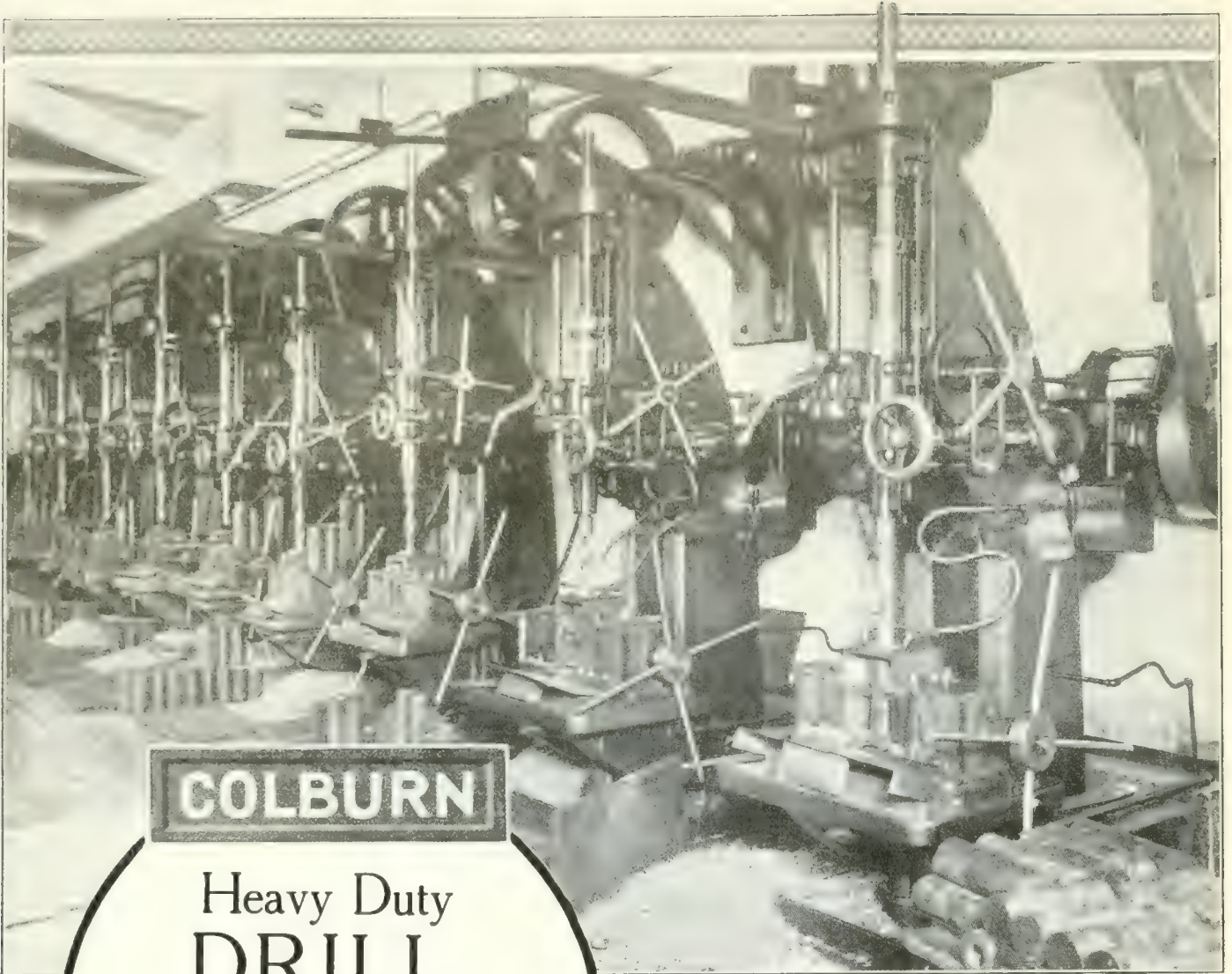
PHILADELPHIA

FOUNDED 1836

Old Colony Building, Chicago

Brown-Marx Building, Birmingham

If what you want is not advertised in this issue consult the Buyers' Directory at the back



COLBURN

Heavy Duty
**DRILL
 PRESSES**

Machines That Make
 Tough Jobs Look
 Small

Important Factors in Fast,
 Accurate and Profitable
 Shell Production.

Colburn Drill Presses stand up to and deliver the goods in the hard, tough work of drilling shrapnel and high

explosive shells, because they are built to take the toughest jobs and drive the best of high-speed twist drills to their full capacity.

Their power, stiffness and rigidity has won place for them in hundreds of munition manufacturing plants here and abroad. There is absolutely no spring, drill breakage is small and drills wear long between grinds.

COLBURN MACHINE TOOL CO., Franklin, Pa., U.S.A.

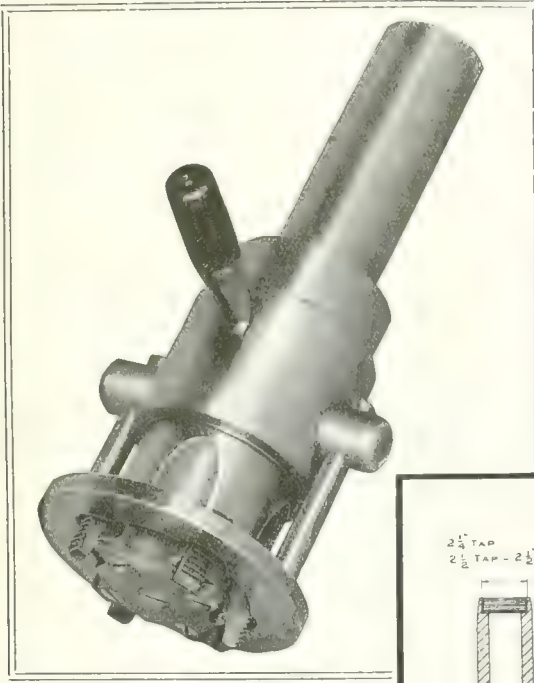
The advertiser would like to know where you saw his advertisement - tell him.

"Murchey" Tools

are threading successfully
all types and sizes of

High Explosive Shells

English, French, Italian,
United States and Russian.



LARGE SHELLS

of 9.2" and
12" diameter

are calling for improved
and larger types of
Tools to produce them.

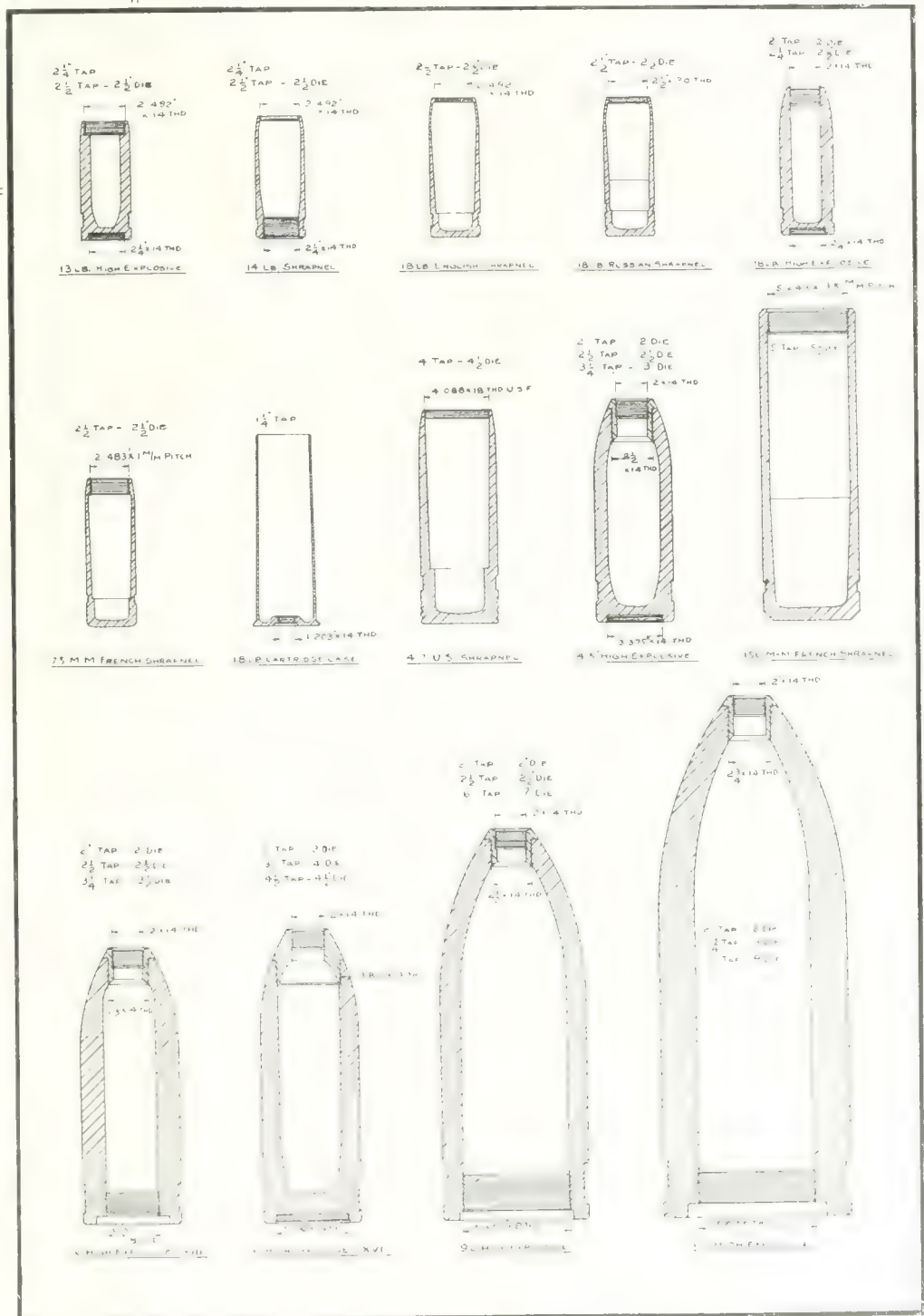
Murchey Service

which means Murchey
Collapsing Taps and
Self-opening Dies — is
doing this work NOW in
a number of the largest
munition plants with en-
tirely satisfactory re-
sults.

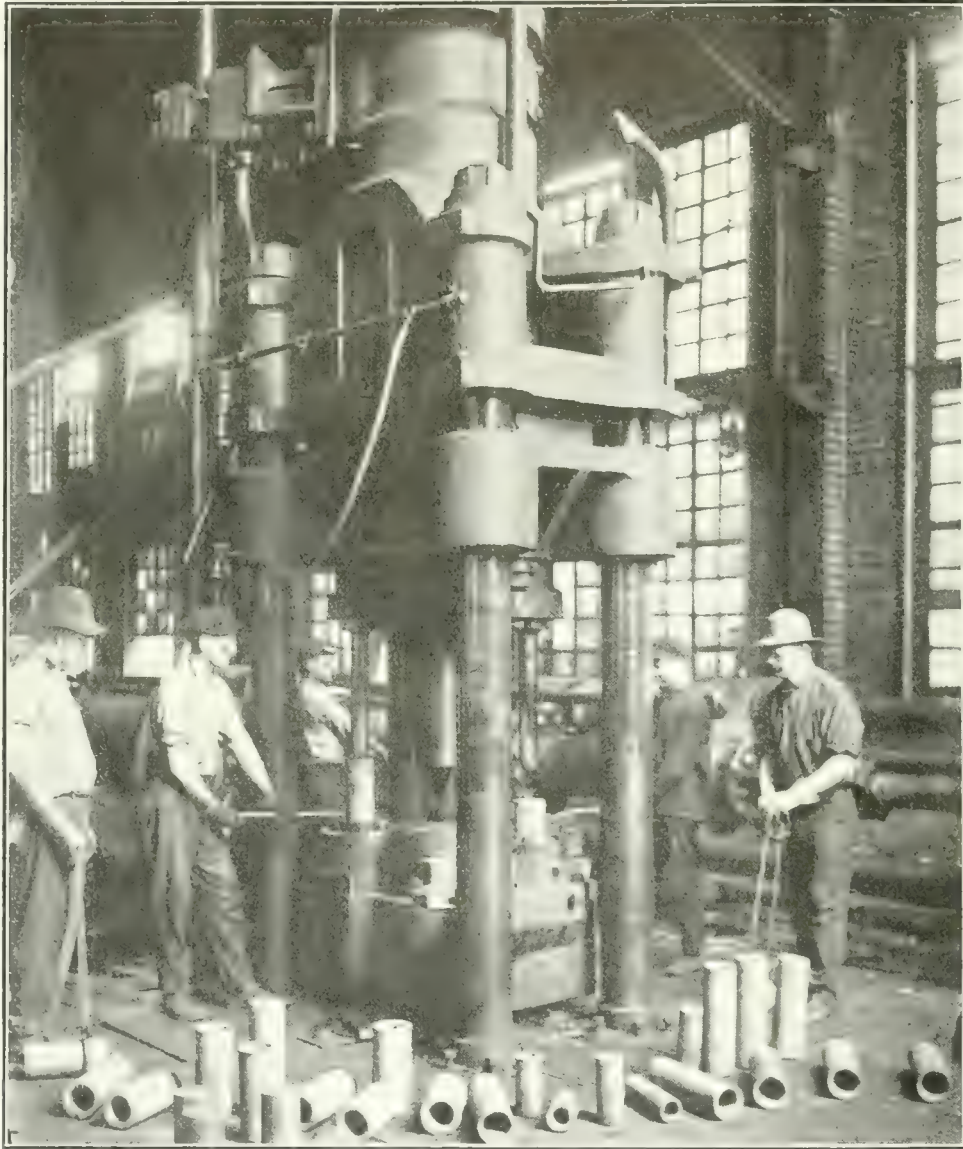
Send us B P of your re-
quirements and let us
quote you on the neces-
sary tools.

**Murchey Machine
& Tool Company**

75 Porter Street
DETROIT, - MICH.



PURELY HYDRAULIC
"Extra Rapid" Forging Presses

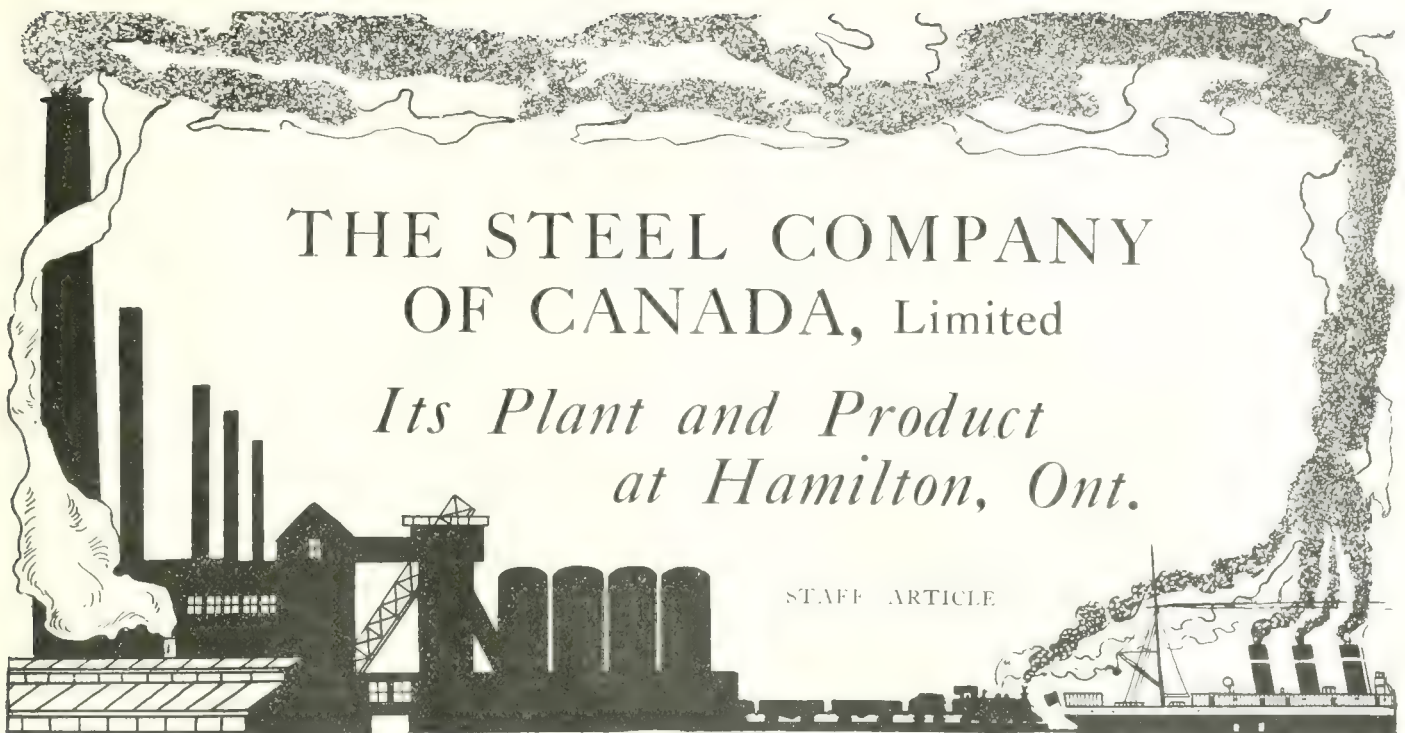


Purely Hydraulic Tod Presses for Piercing and Drawing of Shells and Projectiles
WE CAN SUPPLY FORGED SHELL BLANKS UP TO 8 in. DIAMETER

The William Tod Company

YOUNGSTOWN, OHIO

ENGINES—Mill, Reversing, Blowing, Gas, Pumping
ROLLING MILLS—CONDENSERS—HYDRAULIC FORG-
ING PRESSES, IRON AND BRASS CASTINGS



From the ore mines of Mesabi to the fighting front in France is a long way to go, but not long enough to prevent a steady flow of shells and other munitions of war. The help which Canada is giving to the Empire, grows in volume and variety as it progresses Eastward and the valued assistance being rendered by establishments such as the one described in this article is convincing evidence of Canada's present power and future potentiality.

THE entrance of Canada into the ranks of munitions producing nations was one of the unexpected events of a war, in which the unexpected has been more than once prominent. A year ago, when hostilities had been in progress for several months, there were few, if any, indeed, who foresaw the extent to which this country's resources would be relied upon for providing not only ammunition, but army stores of all descriptions in enormous quantities. Possessing an area of 3,817,000 square miles, equal to more than one-quarter of the land possessions of the Empire, with natural resources more varied and extensive than any other colony, and geographical location and political environment of the most favorable nature, Canada would have failed in her duty as a loyal colony had she exerted herself one whit less strenuously than she has done during the past year. Circumstances point to intensification and continuation of such efforts till the British Empire once more asserts itself as the chief factor in the world's peace, and in the attainment of such a state of affairs Canada will be looked to for increased help and support until the much desired consummation of events is attained.

The building of ordnance in the near future along with impending develop-

ments in munitions manufacture will tend more and more towards the consolidation of the Dominion as a self-contained and fully developed unit, and increase to a desirable extent the effective help so necessary in the terrible struggle for liberty and justice.

The Genesis of a Shell

While the successful production of guns will form the completion of Canada's military development, the demand for munitions has been most urgent, and so far the efforts of all parties have been so concentrated on actual production that few of us have realized that every step, every operation, every substance that enters into a finished shell, and last, but not least, the men and the guns to use them; in fact, each and every phase in the life of a shell from the ore mine to the battlefield is now in existence in this country.

The successful production of a modern artillery projectile is dependent on a degree of scientific knowledge, mechanical ability, and complexity of operations, of which the casual observer has only the faintest idea, and in devoting its efforts to the manufacture of munitions The Steel Company of Canada affords a splendid instance of that promptness, thoroughness and wholeheartedness which has been so characteristic of our manufacturers.

Immediately it became apparent that the company's services would be needed, preparations for new, and alterations to operating plant and equipment were begun and carried out with such promptness and alacrity that in a very short time, shells were being produced at a highly creditable rate, and during the months which the plant has been engaged on this work the company has earned a lasting reputation as a producer of material for this purpose of the very highest order. In considering this performance one must remember that the metal is made from the ore, the forging is made from the metal, and the finished shell produced from the forging all under the one management. The life story of a shell as observed at the company's various plants is fascinating, instructive and highly stimulative of that industrial patriotism which is so characteristic of Canada's present efforts.

Mining the Iron Ore

Situated in the Mesabi range of hills in the northern part of the State of Minnesota, close to the Canadian border, and 800 miles from Hamilton, Ont., as the crow flies, are vast deposits of iron ore. From this locality, known as the Lake Superior district, about 40,000,000 tons of hematite iron ore are shipped annually to blast fur-

ores which yield more than three quarters of the pig iron produced in the North American continent. This red or brown hematite is one of the richest forms of iron ore, containing in some cases as much as 68 per cent. of iron, and in appearance resembles soft brownish earth. The deposits of the Mesabi range of hills are near the surface, and are mined by means of immense steam shovels or excavators, such as are used for digging foundations, canals, railway cuttings, etc. These deposits are particularly adapted for handling by machinery, and the mining, transportation, and unloading of this material have resulted in the perfection of mechanical appliances of wonderful capacity and efficiency.

Lake Transportation

Ore boats carrying 10,000 or 12,000 tons of ore in one cargo, convey the ore to its destination. These boats are loaded from immense bins, into which the cars from the mines are emptied, the bins being elevated above the level of

the boats, so that by means of ore chutes leading into each hatchway, the ore is rapidly conveyed by gravity into the hold of the vessel. In a few hours the ship has received its cargo and is ready to start on its long journey down the chain of inland lakes to its destination, where

Canada is complete in every detail, and is considered by many authorities to be of most modern design and construction. Here, in an extent of several acres, and in the course of a few hours may be seen steel in every stage of production from iron ore, barely distinguish-

able from common earth to the shrapnel and high-explosive shell, wanting only the addition of the explosive charge and propellant to make it ready for actual use in battle.

A short explanation of the reasons for and nature of the various processes through which the metal passes, may render clearer a description of the plant.

The first step in the manufacture of steel from iron ore is to separate the iron from the various substances associated with it in that form. This is accomplished by smelting

the ore in a blast furnace with fuel and flux, whereby much of the impurities is removed, and a cast iron, commonly known as pig iron, is obtained. The pig iron thus produced is still an impure grade of



LOADING ORE BOATS AT MESABA ORE DOCK, DULUTH Gallagher, Duluth

unloading of the boats is accomplished almost as rapidly as the loading.

The Production of Pig Iron

The plant of The Steel Company of



MALLET COMPOUND LOCOMOTIVE HAULING TRAIN OF

iron, containing roughly 1.00 per cent silicon, 0.1 per cent sulphur, 1.50 per cent phosphorus, 1.50 per cent manganese, 3.50 per cent carbon. A steel suitable for projectile manufacture would have a composition approximately thus: .15 silicon, 0.03 per cent sulphur, 0.05 per cent phosphorus, 0.70 per cent manganese, 0.50 per cent carbon. In order to obtain metal of this composition it is necessary to remove nearly all of the various impurities from the pig iron, and then add the necessary proportions of such ingredients as are desired.

This constitutes steel-making proper, and may be accomplished by various processes, all of which are similar in general principles, though differing widely in certain features which have important bearing on the finished produce.

After the desired chemical composition has been obtained, the steel is subjected to various mechanical treatments terminating with its appearance in the shape of the now familiar shell forging.

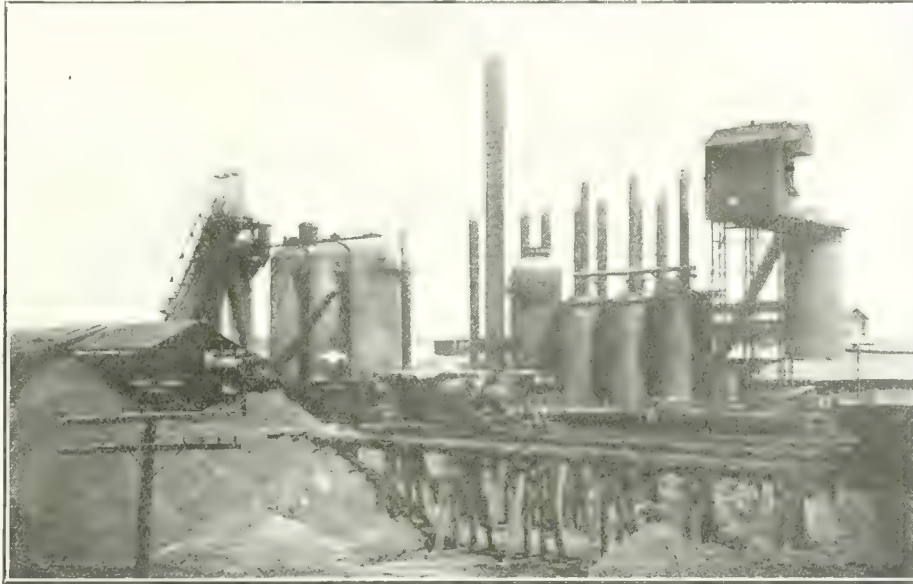
The Blast Furnace

Returning now to the blast furnace, the iron ore arrives in hopper bottom cars, which are run out on elevated tracks and dumped in large storage bins in close proximity to the blast furnace. Limestone and coke, which are necessary

above ground level, the discharge spouts being so arranged that the necessary amounts of ore, coke and limestone may be fed into a travelling dump car provided with scales, and running on a track below the bins. The car empties its load of material into the skip, two of which

are used, one ascending to be filled when the other ascends with the charge for the furnace. When the loaded skip nears the top of the hoist tracks, projections on the ends of the rear axle engage with suitable curved guide rails, and tip the skip over so that its contents are discharged into the hopper on top of the furnace. This hopper is of double construction, being fitted with two bells or cones A and B. Bell B is held against the bottom of the upper hopper by a counterweight, and

is opened by hydraulic gear, thus allowing the charge to fall into the main hopper I, which in turn is closed by bell A. When hopper I has been charged with the proper quantities of ore, limestone and coke, bell A is opened, while bell B is kept tightly



BLAST FURNACE PLANT OF THE STEEL COMPANY OF CANADA, LTD., HAMILTON, ONT.

materials in steel-making, are similarly stored.

A sectional view of the blast furnace with skip hoist and charging bins is shown on page 465.

The charging bins are situated well



LOADED CARS FROM ORE MINES TO LAKE SUPERIOR

closed. The contents are now precipitated into the furnace, while the gas is prevented from escaping by bell B and going to waste as formerly, thus giving rise to the long flame which some years ago was such a prominent feature of blast furnace plants.

protected by a water-cooled casting, and is closed by means of an iron plug. The purpose of this hole is to draw off the cinder and prevent it reaching the level of the tuyeres. On a level with the bottom of the crucible, on the front side of the furnace, is the iron tap-hole through

seen lying at the base of the furnace in photograph on page 466.

Blowing Engines

The air which is necessary to operate the furnace is supplied at a pressure of from 15 to 30 lb. per sq. in., according



STORAGE PILES OF IRON ORE AWAITING TREATMENT IN BLAST FURNACE.

Design

As will be observed from the drawing, a blast furnace consists of a vertical brick-lined shaft, the internal shape being of a special outline, which has assumed its present form and proportions as the result of experience and scientific investigation. The lining of the furnace consists of acid (silicious) fire-brick, into the outer surface of which are built numerous water pipes for cooling purposes. These are easily seen in the photograph on page 466.

Encircling the lower part of the furnace is the blast pipe L, which supplies air to the furnace through the tuyeres N. The tuyeres, 12 in number, extend through the lining, the openings or "notches" as well as the tuyeres being cooled by water circulating through special pipes and hollow shields.

The hearth is the lower portion of the furnace, about 8 ft. in height, with vertical sides. Above that for a distance of 12 ft. is a portion of gradually increasing diameter, known as the bosh. From the top of the bosh, which is the largest diameter of the furnace, the walls close in gradually, forming the stack, which extends upwards to the throat where the charging hopper is located.

About three feet below the level of the tuyeres a hole is provided, known as the "cinder notch" or "monkey." This is

which the liquid metal is drawn off from the furnace. This is simply a large hole in the brick work, which is stopped with clay balls. In tapping the furnace, these balls are broken up with a bar, and in order to stop the hole again a mud gun is employed, which shoots the balls of clay into the hole. This gun is

to furnace conditions. The blowing engines for supplying this air are of a type which is more or less peculiar to blast furnace plants, and one of these is shown in a photograph on page 465. They are what are known as disconnected compound, long cross-head blowing engines. The steam cylinders are 44 in. and 84 in. diameter by 60 in. stroke, and are placed above the blowing cylinders, which are located between the fly-wheels.

Before entering the furnaces the air is heated to a temperature of 900 to 1,250 deg. Fahr. by passing through the hot blast stoves. These stoves, of which there are three, are distinctive features in the appearance of blast furnace plants. They are upwards of 100 ft. high and 20 ft. in diameter.

The hot gas from the top of the blast furnace is conveyed through large pipes to the base of the stoves, where it is mixed with air and burned. The products of combustion pass upwards through the central passage and then downward through the surrounding space, which is constructed of suitably arranged fire-brick chambers, after which the gases escape through the chimney. After running for a certain period, the stove has absorbed a maximum amount of heat from the gases, and the process is then reversed. The air from the blowing engines is now re-



ELECTRICALLY DRIVEN CHARGING CAR WHICH WEIGHS THE ORE COKE, ETC. AS DELIVERED BY OVER-HEAD CHUTES FROM CHARGING BINS

ceived through a valve at the base of the chimney, and, passing upwards through the hot fire-brick, is raised to a high temperature before passing out at the bottom of the central passage and thence to the tuyeres. When this reversal takes place, the hot gases from the furnace are switched into that stove, which was previously heating the air. While one stove is heating the air, the remaining stoves are being warmed up by the hot gases. In order to maintain a fairly regular temperature in the blast furnace, the stoves are changed over about once an hour.

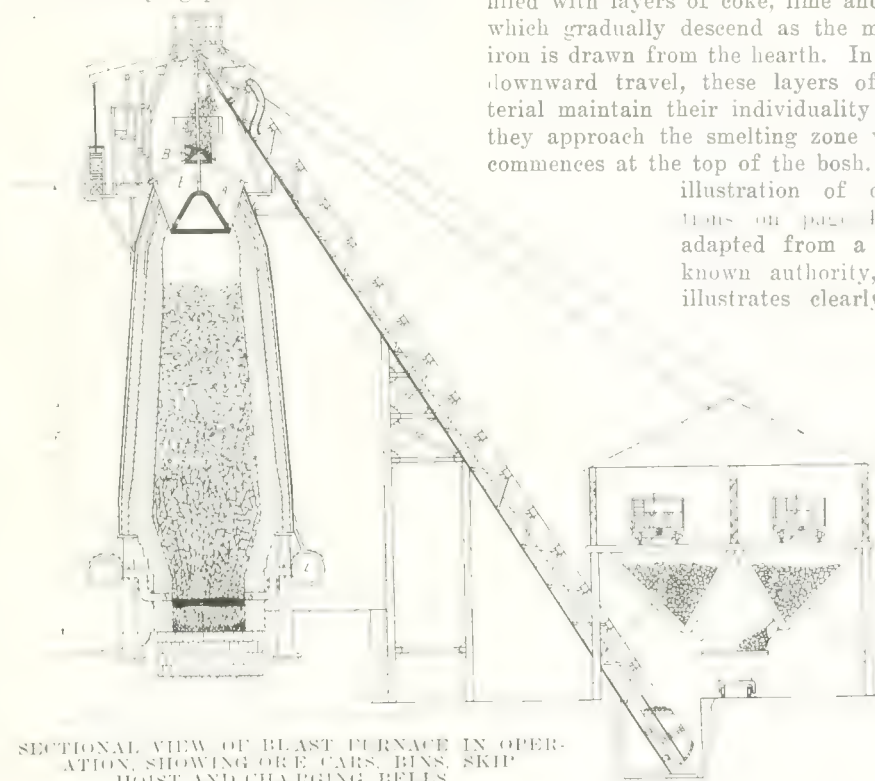
Utilizing the Waste Gases

Only one-third of the waste gases from the blast furnace is necessary to keep the stoves hot, and the remaining two-thirds are available for use in various ways. In the case of this plant, the gas is burned under a battery of boilers, producing the steam required to operate the blowing engines and refrigerating plant which is required for drying the air before entering the stoves.

Undried air, if blown directly into the furnace, would carry with it water vapor equivalent to from 1 1/3 to 8 gallons per minute, according to the humidity of the air, materially cooling the smelting zone of the furnace. The process of drying the air by refrigeration was originated by James Gayley, a prominent American steel maker, and the saving in fuel and increased regularity of working due to the absence of moisture

have resulted in its adoption by the leading plants in various countries.

The air-drying plant consists of three



SECTIONAL VIEW OF BLAST FURNACE IN OPERATION, SHOWING ORE CARS, BINS, SKIP HOIST AND CHARGING BELLS

150-ton compound steam-driven ammonia compressors, which supply the necessary refrigeration for cooling the brine which is circulated by three steam-driven flywheel type brine pumps.

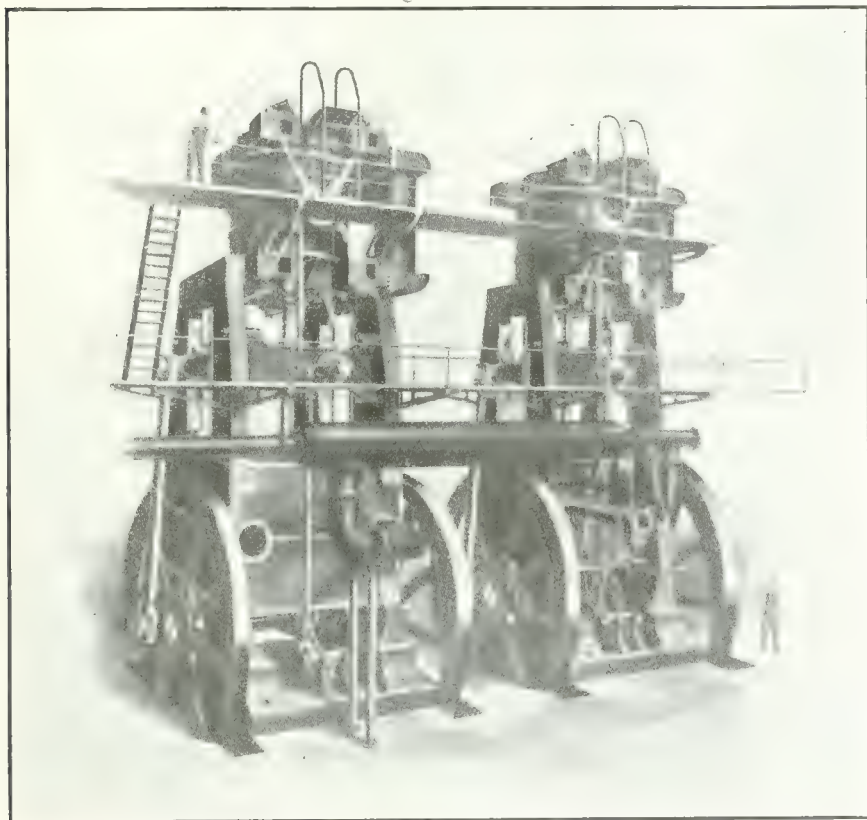
Operation of the Blast Furnace

When in operation, the furnace is filled with layers of coke, lime and ore, which gradually descend as the molten iron is drawn from the hearth. In their downward travel, these layers of material maintain their individuality until they approach the smelting zone which commences at the top of the bosh. The illustration of conditions on page 466 is adapted from a well-known authority, and illustrates clearly the

action of the various materials. The exact location of the smelting zone is dependent upon the volume and pressure of blast, size of furnace, character of slag made, etc., but will extend from the level of the tuyeres to a few feet above them, or about to the top of the bosh. It will require perhaps fifteen hours for the material to descend from the top of the furnace to the smelting zone. During this descent, it is upheld partly by the resistance of the uprushing column of hot gases, partly by its friction on the walls of the furnace, and partly by the loose column of coke which extends through the smelting zone and to the bottom of the furnace, and which alone resists melting in the intense heat of this zone. The oxygen of the air blast attacks all the coke in the smelting zone and as much of it below the level of the tuyeres as is not covered by accumulations of iron and slag in the hearth, producing a large volume of carbon monoxide gas (CO), and a temperature which may exceed 3,000 deg. Fahr. This CO along with the nitrogen of the blast passes up between the particles of solid material, which takes up the greater part of their heat. The CO also performs certain chemical reactions, and thus in both ways the rising column of gases prepares the charge for its final reduction in the smelting zone.

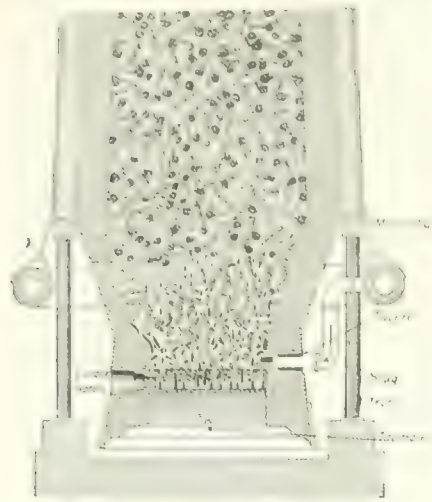
Smelting the Iron

When the charge has travelled about half-way down the furnace, the in-



DISCONNECTED COMPOUND LONG CROSSHEAD BLOWING ENGINE

crushed laterally breaks up the large stones, and fragments pass down to the smaller ones, the ore is gradually re-



Legend:— Lumps of Coke
Lumps of Iron Ore
Lumps of Lime
Drops of Slag
Drops of Iron
Layer of Molten Slag
Layer of Molten Iron

DIAGRAM SHOWING VARIOUS STAGES IN PROCESS OF SMELTING IRON ORE
From Howe, "Iron, Steel and other Alloys."

duced to metallic iron. This spongy iron is impregnated with deposited carbon, which is absorbed in a similar manner to the process known as carbonizing. This reduces the melting point of the iron, and causes it to become liquid at a higher point above the tuyeres than it otherwise would.

On reaching the smelting zone, the iron melts and trickles quickly down over the columns of coke, from which it completes its saturation with carbon. At a corresponding point the lime unites with the coke ash and impurities in the iron ore, forming a fusible slag, which also trickles down and collects on the hearth. It is during this transit that the different impurities are reduced by the carbon, and the extent of this reduction determines the characteristics of the pig iron, for in this operation as in all smelting, reduced elements are dissolved by the metal, while those in the oxidized form are dissolved by the slag.

The slag is drawn off through the cinder notch four or five times, be-

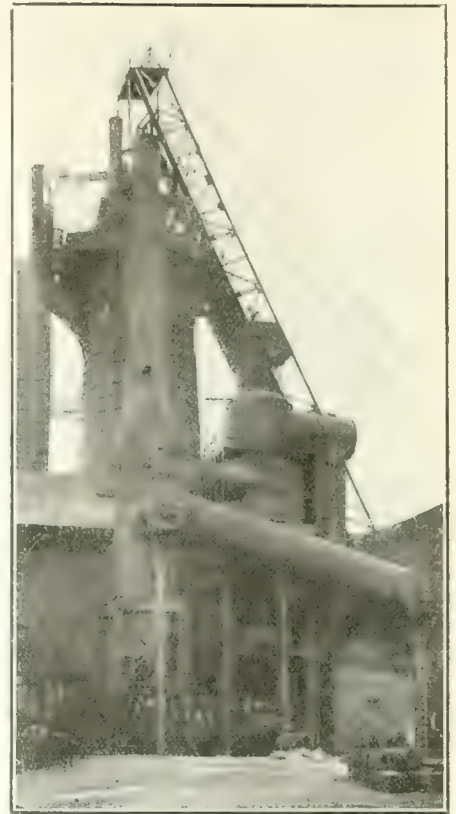
fore the next work takes place about every six hours. This is run through channels in the sand floor to ladle outs at the side of the cast house, whence it is taken to the water front and dumped into the bay, making an ideal foundation for the reclaimed land which is being gradually brought into existence on the company's lake front.

Tapping the Furnace

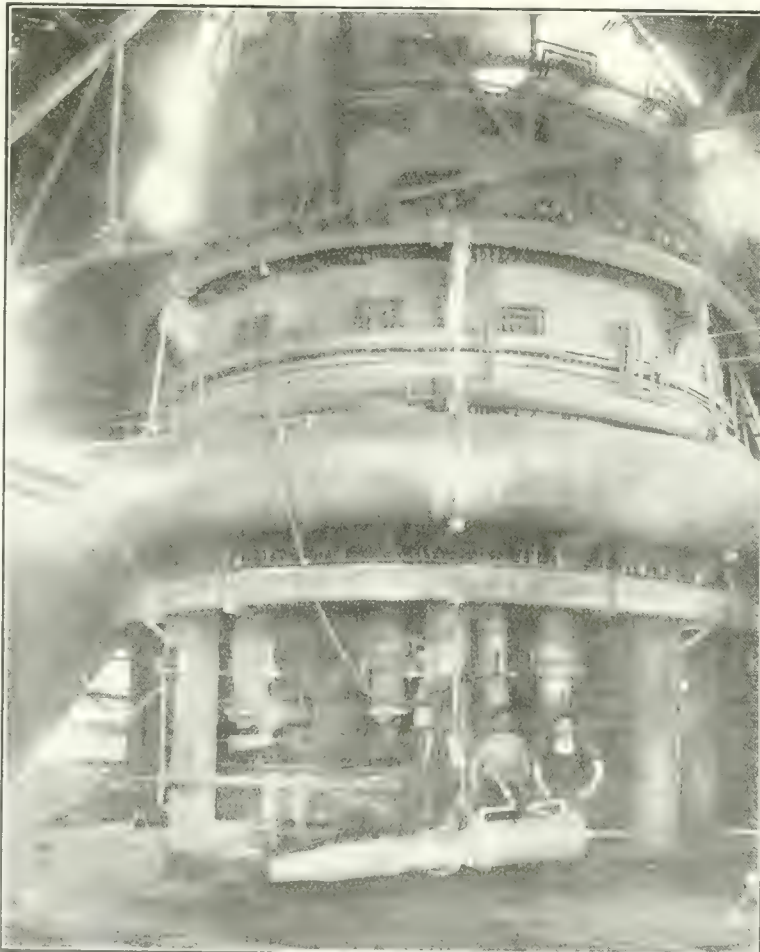
The scene in the cast house when the furnace is tapped is one which impresses even the most passive observers. The tap hole is opened by breaking up the clay balls which were forced into it, forming a solid plug. The molten iron flows underneath a skimmer, which deflects the floating slag into its own runner, while the iron flows into brick-lined ladles at the end of the cast house, which are immediately transferred to the open-hearth department and deposited in a large cylindrical vessel known as the mixer, where it is kept hot until it is time to charge it into the open-hearth furnace, where further changes in its composition are affected, which finally transform it into that indispensable metal—steel.

Manufacture of Steel

The physical properties possessed by



EXTERIOR VIEW OF BLAST FURNACE SHOWING PIPES FOR CONVEYING WASTE GASES TO STOVES, DUST SEPARATOR IN FOREGROUND.



BASE OF STACK SHOWING LARGE BLAST PIPE SUPPLYING AIR TO THE TUYERES. STEAM OPERATED MFD GEN IN FOREGROUND USED FOR PLAGGING TAP HOLE BEHIND THE MIZZLE.

iron as produced in the blast furnace are such as to render it unsuited for shells. The large proportion of carbon and other impurities present impart a brittleness and absence of ductility which are entirely absent when these substances are wholly or partially eliminated. This elimination or purification is performed by various processes, but the chemical action of oxidation is common to all.

The particular process of purification adopted by the Steel Company of Canada is that known as the basic open-hearth process, and differs sufficiently from other processes to demand a brief description. In all cases of purification, i.e., steel-making, the impurities are removed from the pig iron by means of oxidation—that is to say, the molten metal is subjected to the action of oxygen either in the form of air or iron oxide or both. The name of Bessemer naturally occurs to many people in connection with steel-making, and in the pro-

cess invented by the late Sir Henry Bessemer, air alone is used to remove the impurities from the molten iron.

Bessemer Process

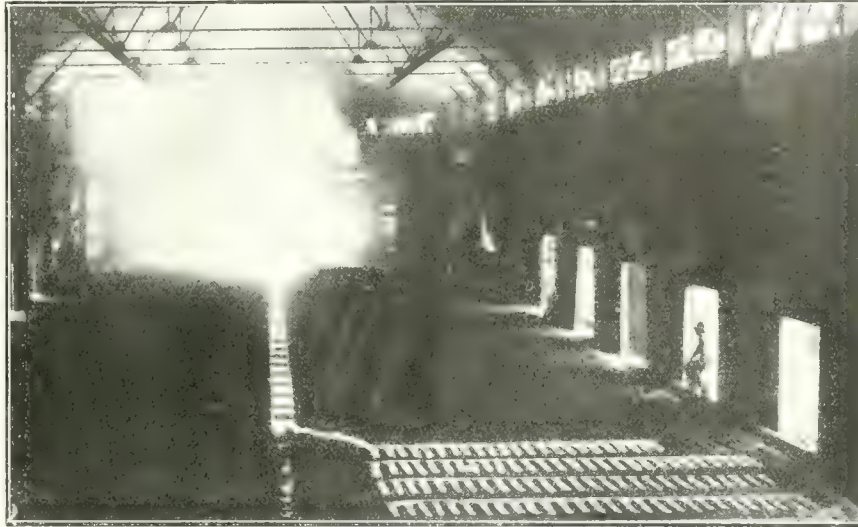
A large pear-shaped vessel known as a converter is lined with suitable protective material and provided with means whereby air can be forced upwards from the bottom with sufficient force to bubble through the molten metal. A converter, as the receptacle is termed, with a capacity of 15 tons, would require 30,000 cu. ft. of cold air per minute. The effect of such treatment on the iron impresses the lay mind chiefly by reason of its peculiar physical aspect, but no matter how wonderful its behaviour and appearance during this treatment, the resulting changes in the physical properties of the metal are little short of marvellous. A concise description of a "blow" or "heat" is given by Bradley Stoughton. "In about

four minutes the silicon and manganese are all oxidized by the oxygen of the air and have formed a slag. The carbon then begins to oxidize to carbon monoxide, CO, and this boils up through the metal and pours out of the mouth of the

has been the heat evolved by the oxidation of the impurities that the temperature is now higher than it was at the start, and we have a waste of liquid mass of relatively pure metal. To this is added a carefully calculated amount of carbon to produce the desired degree of strength or hardness, or both; also about 1.0 per cent. of manganese and 0.15 per cent. of silicon. The manganese is added to remove from the bath the oxygen with which it has become charged during the operation, and which would render the steel unfit for use. The silicon is added to get rid of the gases which are contained in the bath. After adding these materials, or 'recarburizing' as it is called, the metal is poured into ingots, which are allowed to solidify, and are then rolled, while hot, into the desired size and form."

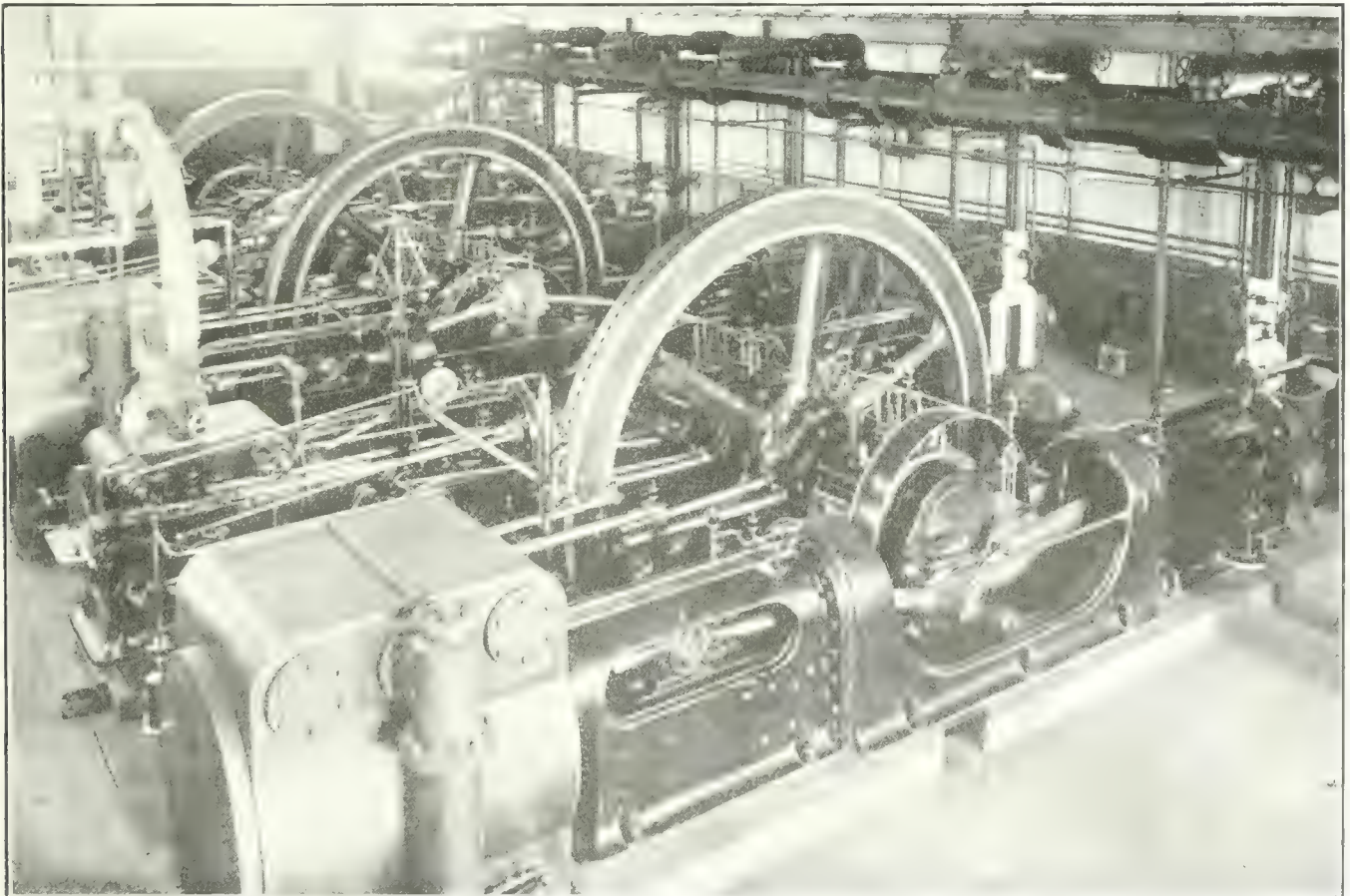
Basic Open-Hearth Process

The open-hearth process in operation at this plant differs considerably from



CAST HOUSE, SHOWING THE MOLTEN IRON BEING RUN INTO MOULDS OR PIGS

vessel in a long brilliant flame. After another six minutes the flame shortens or 'drops' the operator knows that the carbon has been eliminated to the lowest practicable limit (say 0.04 per cent.), and the operation is stopped. So great



THREE COMPOUND, 150-TON AMMONIA COMPRESSORS IN AIR DRYING PLANT

the Bessemer process, and its use in preference to the other is due to a complexity of circumstances, such as nature of ores available, quality of product desired, demands of customers, etc. The basic open-hearth differs from the acid open-hearth in the nature of the lining and the composition of the slag produced, the effect of which is to aid greatly in the removal of phosphorus and sulphur, thus permitting the use of high phosphorus ores as distinguished from low phosphorus ores, which are necessary for both Bessemer and acid open-hearth practice.

A sectional view of the furnace plant is given on page 469, while the accompanying views of the melting platform, charging machine, casting pit and ingot teeming give a good idea of the actual conditions under which the work of steel making is carried on.

Furnace Arrangement

The furnaces, which are in continuous operation, are of the stationary type, in which the metal is drawn off through a tap hole in the sides (see photo of casting pit). The melting plat-



RUNNING SLAG FROM THE BLAST FURNACE INTO LADLE-CARS.

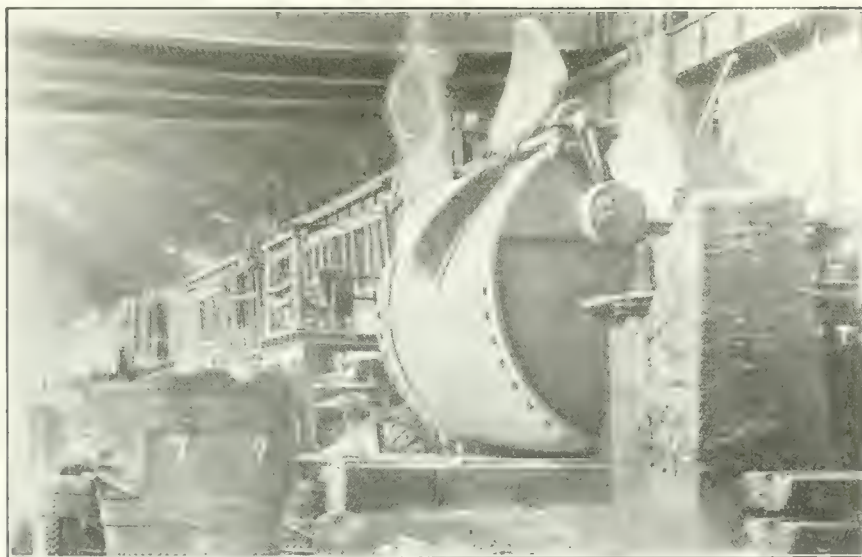
crators or preheating chambers are built beneath the charging floor, and perform a similar function to that of the hot

blast stoves in connection with the blast furnace.

Construction of Furnaces

A longitudinal section of one of the furnaces is given on page 469, from which the principle of construction can be understood. The hearth in which the metal lies is formed of a shallow dish-like depression, which in the case of a 50-ton furnace is about 24 inches deep. The bottom is composed of a magnesite brick shell on which is built up a special lining of calcined magnesite with a small proportion of anhydrous tar, which acts as a binder. This magnesite and tar is deposited on the surface, where the tar is immediately incinerated, forming a strong frame work, which holds the magnesite securely in place. By means of successive layers this protective coating is built up to a thickness of 18 inches.

The fuel and air enter the furnace through separate ports at the same end of the furnace. Ports are provided at



THE MIXER WHICH RECEIVES THE MOLTEN IRON TO PREPARE IT FOR TREATMENT IN OPEN-HEARTH FURNACE.

form or charging floor is on the other side of the furnaces and on the same level as the hearth. Two charging machines travel along this floor on rails, while directly in front of the furnaces is a standard gauge track on which trucks convey the scrap metal and limestone which are deposited in the furnaces through the various doors shown. Spanning the casting pit, which is situated on actual ground level, are two traveling cranes for handling the ladles in charging, teeming, etc. The mixer, which is at one end of the casting pit, is also served by these cranes.

Situated on the opposite side of the charging floor and at a lower level are the gas producers, which supply the necessary fuel for the furnaces. Regen-



STORAGE YARD OF SCRAP STEEL. THIS MATERIAL FORMS A CONSIDERABLE PROPORTION OF THE FURNACE CHARGE.

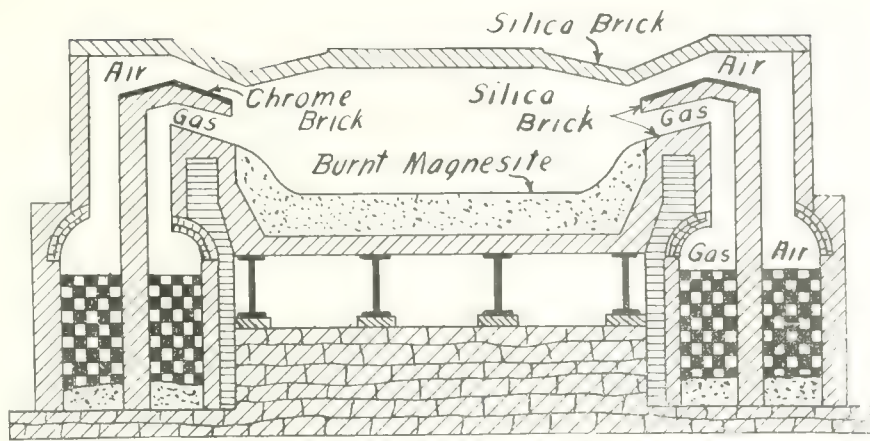
both ends, however, so that each pair of ports alternately acts as exit for the products of combination, which are conveyed through the regenerators to the chimney flue. After a suitable lapse of time the ports are reversed, so that the incoming gas and air is heated by the regenerators which were previously being heated by the waste gases, the ports which formerly supplied the fuel and air now acting as exits and allowing the regenerators in their flues to be heated again.

Charging the Furnace

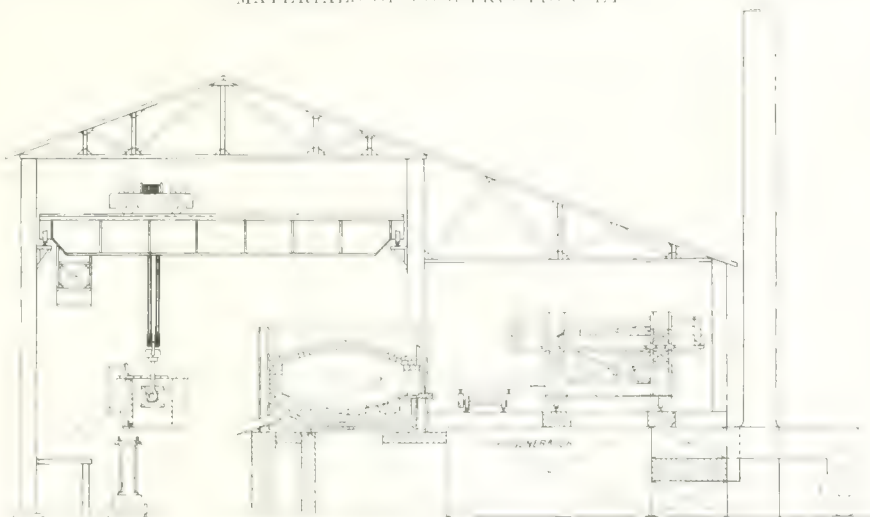
In charging the furnace, the charging machine is placed opposite the furnace door. Between the machine and the door is a truck with a number of long buckets containing lime stone. One end of each bucket is specially formed so that the arm of the machine is able to pick it up and carry it forward into the furnace and then revolve it, so that the contents are distributed equally over the bottom. Steel scrap and other cold metal is then added, and lastly, the molten iron from the blast furnace, which has been held over in the mixer till the furnace is ready to receive it. This molten iron is

charged through a special door on the casting pit side of the furnace. The object in charging this last is to avoid damage to the furnace lining, which would result from dropping solid lumps of stone and metal into the liquid iron. The charge melts down in about five hours or so. When this is complete, the melter takes a sample and continues to do so at stated intervals, until the labo-

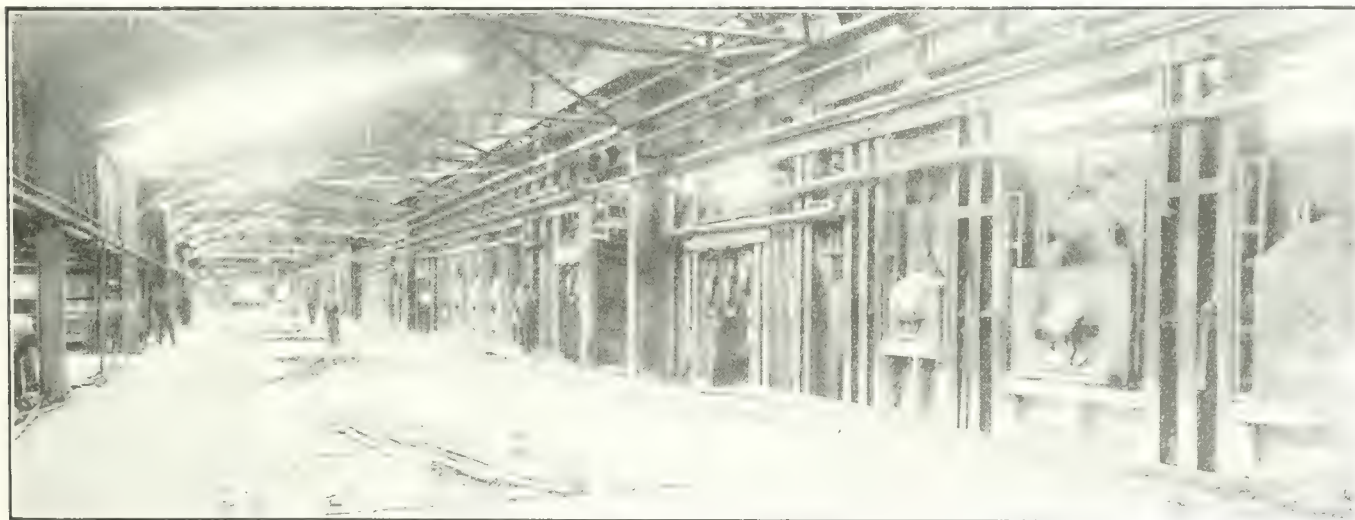
rary tests show the desired composition. The charge is now run off through the tap hole, which was securely closed by forcing material into it from the inside of the furnace. As will be observed in the illustration of the casting pit, a gallery extends round the furnace close to the tap hole, and the hole is pierced by a man from this position. The metal pours out in a state of great fluidity, its appearance being like white hot water. After 35 or 40 tons are in the huge ladle, the surface ripples and waves, due to the pouring, continue to travel back and forth across the surface, and indicate in a most impressive manner the wonderful nature of the operations incidental to the production of steel. The results of the various reactions which take place in the open-hearth furnace are these. The molten lime absorbs the silicon, manganese and phosphorus with a proportion of sulphur, after which it floats on the surface of the metal and protects it from being oxidized by the furnace gases. The carbon content is brought down by introducing iron ore at a suitable time, the



SECTIONAL VIEW OF OPEN HEARTH FURNACE SHOWING GAS AND AIR PASSAGES, MATERIALS OF CONSTRUCTION, ETC.



SECTION OF OPEN HEARTH FURNACE BUILDING



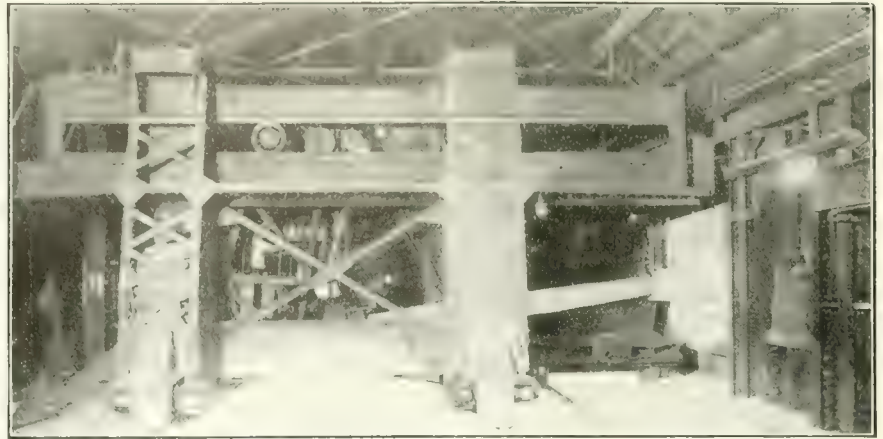
CHARGING FLOOR IN OPEN-HEARTH BUILDING. FURNACES ON RIGHT

oxy-acetylene torches with the carbon, rolling of and escaping gas.

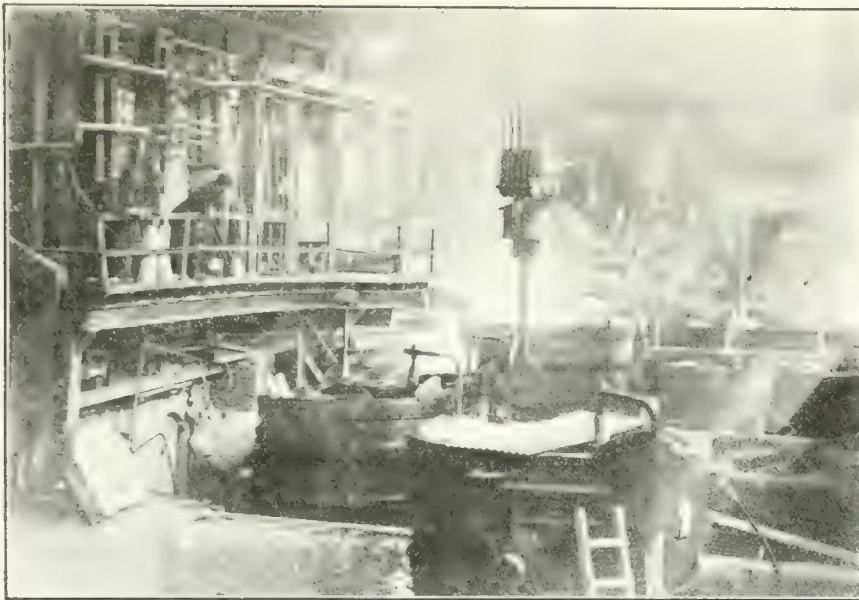
While the metal is running off into the teeming ladle it is recarburized by adding to it the necessary quantity of ferro-manganese and charcoal or coke. These materials are prepared in suitable size, and at a given time during the filling of the ladle, two large paper bags containing the mixture are thrown in from the gallery. About half of the carbon content of the materials is absorbed by the steel, and if all calculations and operations have been correctly made and carried out, the steel has now a composition roughly as follows: Silicon, 0.15 per cent.; sulphur, 0.03 per cent.; phosphorus, 0.05 per cent.; manganese, 0.70 per cent.; carbon, 0.50 per cent.

deposits it in a section of the soaking pit, where it is maintained in an upright position, at a steady temperature for

about one hour. This treatment is necessary to allow the ingot to attain an even temperature throughout, and also to



CHARGING MACHINE DEPOSITING MATERIAL IN FURNACE.



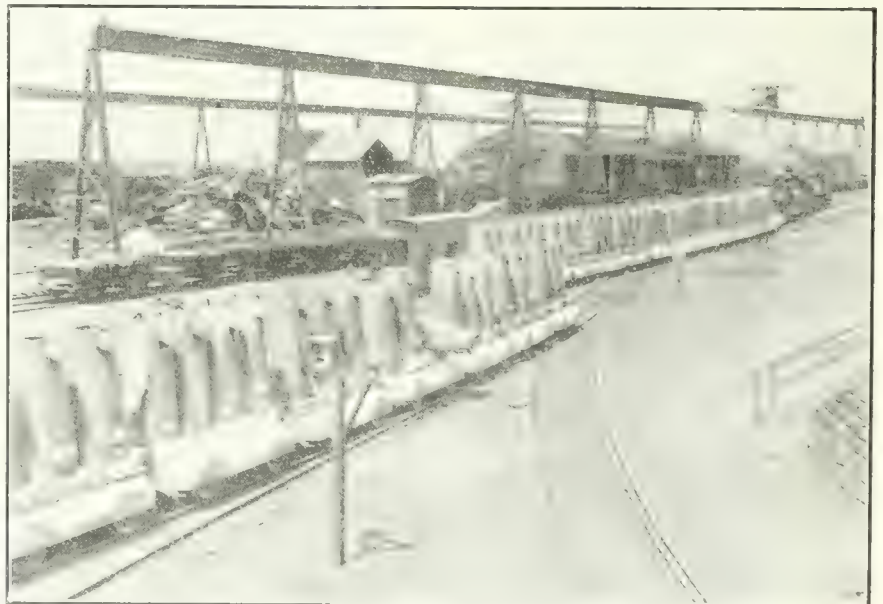
CASTING PIT. RUNNING CHARGE FROM FURNACE INTO TEEMING LADLE

Teeming

The pouring of the molten steel into moulds is known as teeming. The teeming ladle is made of heavy sheet steel lined with fire-brick and provided with a stopper or plug which fits into a hole in the bottom. The stopper is controlled by a handle which allows the operator to control the flow of metal into the ingot moulds, the ladle being moved over each mould by the overhead crane from which it is suspended. These moulds are of very massive cast iron construction and rest on stools carried by the cars. After the ingot moulds are filled, the train of cars is taken to the rolling mill, by which time the metal is sufficiently solidified to allow the mould to be drawn off or stripped, as shown in photograph. This is done by a 75-ton Alliance crane, which has a pair of links which grip the mould under the lugs and pull it up clear of the ingot. Another crane immediately grips the ingot and

confine the pipe or segregation core to the centre.

Each soaking pit furnace supplies heat to four holes, 5 ft. x 8 ft. 6 in., capable of holding eight ingots each, and served by a 10-ton soaking pit crane installed by the Morgan Engineering Co. These furnaces are fired by producer gas generated by four Morgan gas producers. They are provided with regenerating chambers similar to the open-hearth furnaces, suitable chambers and passages being provided for reversing the flow of the gases in order to utilize all of the heat. A photograph on page 471 gives a view of the top, showing the hydraulic cylinders which operate the doors. These doors are made of fire-brick tiles, supported in a suitable frame and run on wheels giving easy access to the various pits. The actual manufacture of the steel is now completed, as all subsequent operations are of a more



TRAIN OF INGOT MOULDS EN ROUTE TO ROLLING MILL

or less mechanical nature, and exercise no decisive influence on the chemical composition or quality of the steel.

The Mechanical Treatment of Steel

Steel which is cast, i.e., poured into moulds after being drawn from the furnace, is subject to certain defects, the prevention and removal of which can be accomplished by suitable means. Ingotism, piping and segregation are three of the defects liable to occur in steel. The former consists of the formation of excessively large crystals which form when molten steel is cooled too slowly, and also when it is not poured at the correct temperature. This crystalline structure when allowed to take place may persist throughout the entire ingot, whereas piping and segregation are more of a localized nature.

Piping, the term applied to the central porous core at the upper end of the ingot, is due to the shrinkage of the outer layers which induces an outward flow of the still liquid metal in the centre. This reduction in internal pressure also facilitates the evolution of contained gases which fill up the spaces left by the solidifying metal, resulting finally in the peculiar structure known as a "pipe."



"TEEMING" THE MOLTEN STEEL INTO INGOT MOLDS.

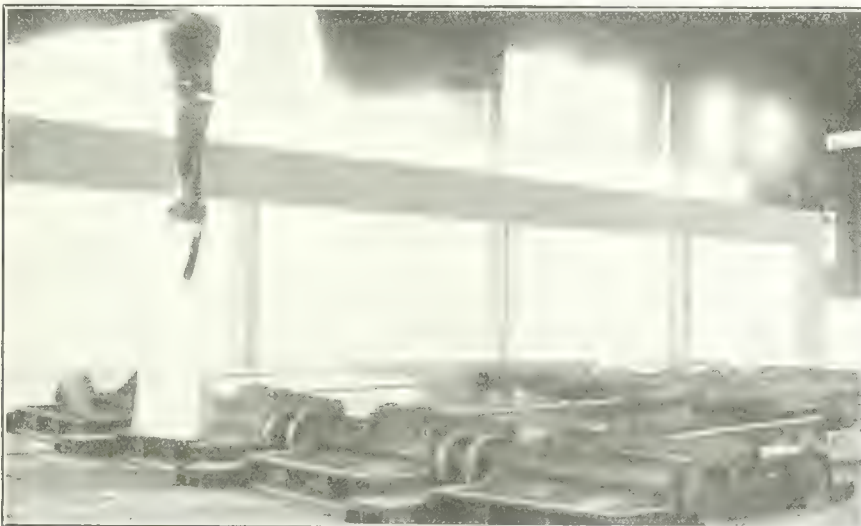
Segregation is a partial separation of the various ingredients from the iron during solidification, due to the difference in fusibility of the various impurities and the iron itself. As the presence of some of the impurities lowers the melting point of the iron without increasing their own solubility, the result is that when the lower layers of steel solidify, a small portion of the impurities is rejected and passes upward into the still molten metal. This action proceeds upward through the ingot until when the topmost metal reaches the

point of solidification, the percentage of impurities present is considerably greater than in the bulk of the ingot.

Segregation, which piping cannot be completely eliminated, but by suitable treatment and the use of deoxidizers, such as aluminum, etc., the trouble can be not only greatly reduced, but localized, so that the cropping of a comparatively small portion of the upper end of the ingot removes completely all possibility of harm from these causes. The progress made in this direction will be realized from the fact that although specifications for shell steel called for the discard of 40 per cent. of the ingot when operations were commenced, the thoroughness of manufacture and the resulting high quality of material have enabled this loss to be reduced below 15 per cent. with a large margin of safety.

Rolling the Steel

Having now been in the soaking pit



REMOVING HOT INGOT FROM SOAKING PIT TO BE ROLLED INTO BLOOMS IN THE BLOOMING MILL.

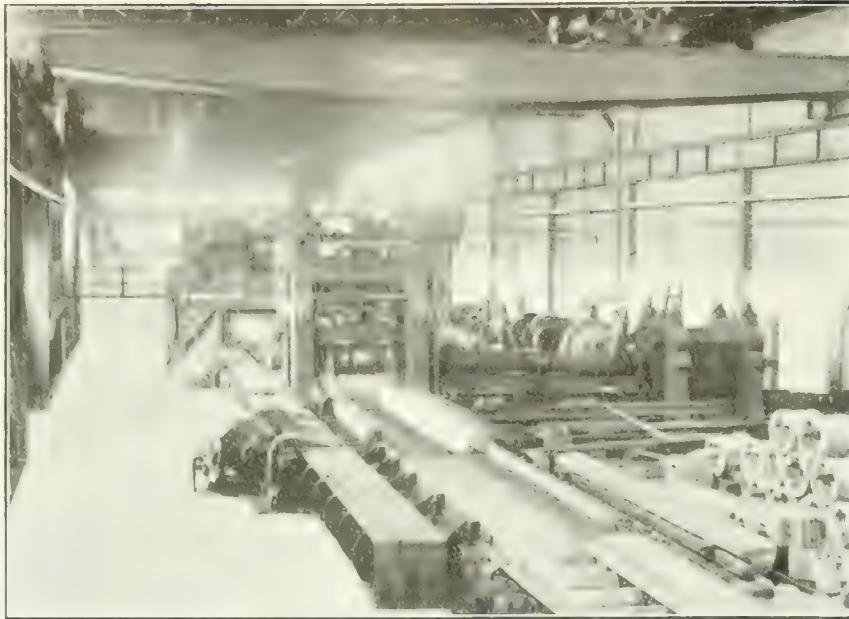


SLIPPING THE MOULD FROM THE HOT INGOT.

long enough to attain the necessary condition as regards solidification and temperature, the ingot is withdrawn from the pit by the crane and deposited on the approach table of the blooming mill. The ingot, which is 15 in. x 17 in. x 7 ft. long, is passed back and forth between massive steel rollers, which while reducing its cross-sectional area, increases its length until, when reduced to about 6 inches square, the bloom, as it is now termed, is 50 ft. in length.

A photograph on this page shows a semi-finished bloom entering between the rollers of this mill, which is very complete in design and construction and along with its power plant is one of the best examples of modern steel working machinery on this continent.

The installation consists of a two-high 34-inch reversing motor-driven blooming mill designed by the Morgan Construction Company and built at the Lloyd-Booth plant of the United Engineering and Foundry Co., Pittsburgh, and is served by a Shaw 20-ton crane. The approach table in the immediate foreground is operated by a 30 horse-power direct-current motor, while the tables on either side of the mill are driven by 100-



ELECTRICALLY DRIVEN REVERSING BLOOMING MILL.

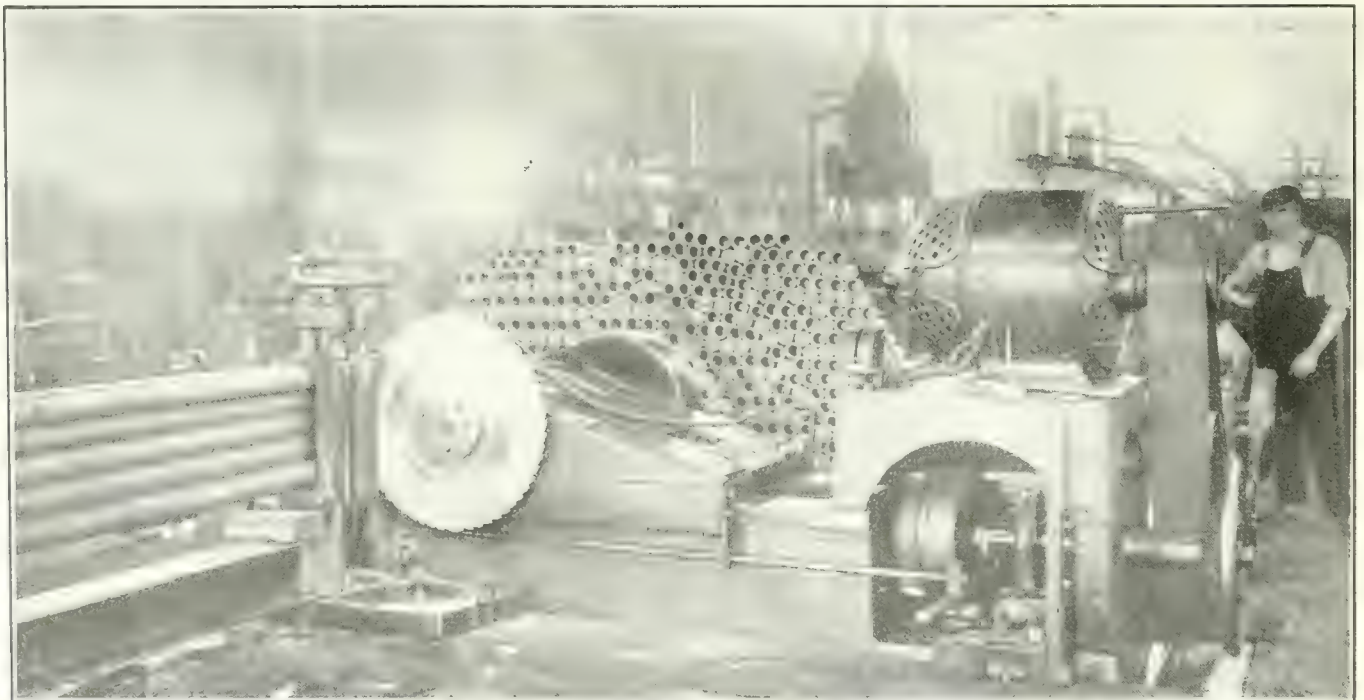
horse-power motors. The side guards for handling the bloom from one part of the rolls to another, are operated by hydraulic gear to the right of the tables. Here are also located the pinion housings. The lower pinion is directly coupled to the motor shaft, which passes through the wall into the power house; the other end of the pinion shaft is coupled to the lower roll of the mill.

The spindle or shaft which connects the upper pinion with the upper roll is provided at either end with a flexible coupling or wobbler, so that the spindle may assume an inclined position as the upper roller is raised or lowered to suit the thickness of metal passing between

the rolls. The traveling crane is provided with special tackle to facilitate changing rolls and replacing pinions, etc., in case of accident. The entire operation of the mill is controlled from a platform or pulpit located above the table, affording a clear view of the rolls and the work.

After being reduced to the desired size, which is accomplished in 15 to 18 passes, the bloom is cut to suitable lengths in a 10 x 10-inch vertical bloom shear, which then go to the finishing mill, which reduces them still further to a round section of suitable diameter according to the size of shell to be made.

The blooming mill is driven by a 3,000 horse-power normal rating twin armature reversing motor, constructed by the Canadian Westinghouse Co., Hamilton, Ont., operated by electric power purchased from the Dominion Power & Transmission Co., which operates a 42,000 h.p. hydro-electric plant near St. Catharines, Ont., about 40 miles distant. The current, which is received at 44,000 volts, 66 2/3 cycles, is stepped down to 2,200 volts three-phase for the large motors and to 220 volts, two-phase, for several smaller motors and for lighting



ELECTRICALLY DRIVEN SAW CUTTING FIVE BARS OF SHELL STEEL AT ONCE

and all other purposes throughout the plant.

When breaking down ingots into blooms for the billet mill, the steel is given 18 passes through the rolls, but when breaking down for 6 x 6-inch blooms, the number of passes is reduced to 15. It is apparent, therefore, that the loads on the motor-generator set which supplies power to the reversing motor will vary rapidly over a wide range, the rate of change at times aggregating 4,000 to 5,000 horse-power per second during acceleration and approximately the same when braking. A load of this kind from the standpoint of power supply would be exceedingly undesirable and the cost of the current necessarily would be excessive. The twin armature reversing motor, while rated at 3,000 horse-power is, therefore, designed to carry a momentary peak load of 8,000 horse-power, receiving the necessary electrical energy through the medium of a motor-generator flywheel set consisting of one 1,800 horse-power alternating current, 2,200-volt, three-phase motor mounted on a common shaft

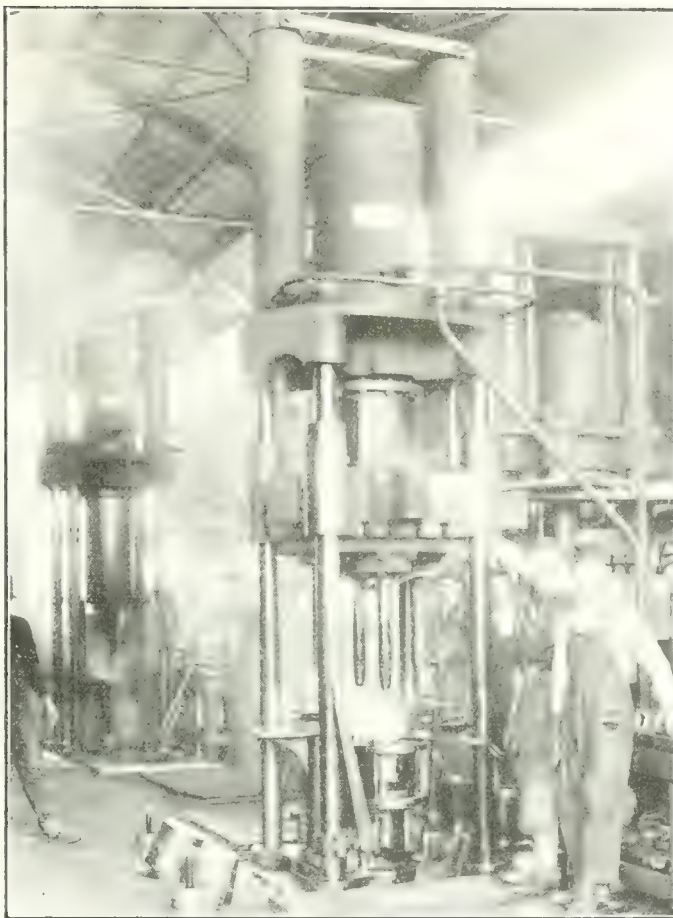
with a 50-ton flywheel and two 1,200 kilowatt generators. This set is located in a power house on the other side of the wall from the blooming mill. Under light loads the fly-wheel has a speed of 500 r.p.m., while under the heaviest loads

its speed does not fall below 400 revolutions per minute. The flywheel stores up energy during the period of light load and attains its maximum speed. When the heavy momentary loads comes on, the speed of the flywheel is allowed to

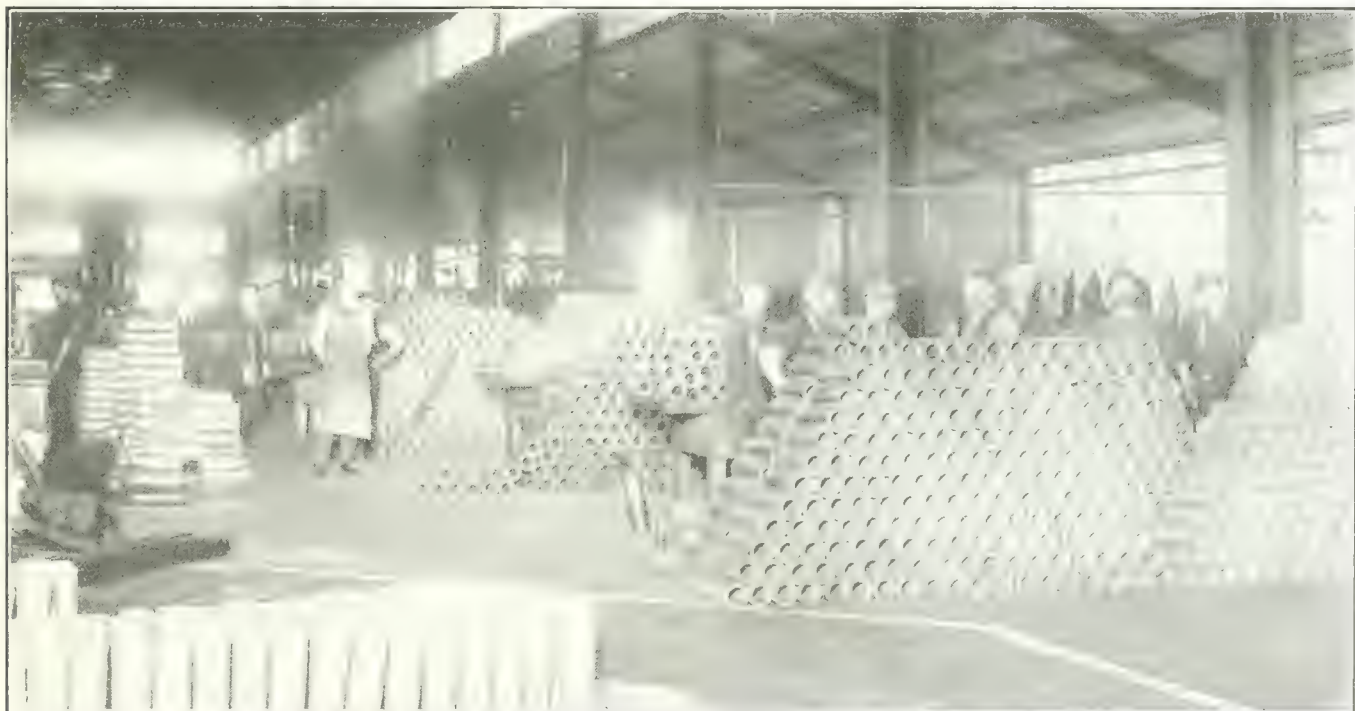
drop, thus enabling it to deliver some of its stored-up energy in order to help the generators supply sufficient power to the reversing motor without making excessive demands on the external supply of electrical power.

To enable the flywheel to assist the 1,800 horse-power motor to drive the two 1,200 kilowatt generators, during maximum demand periods, an automatic slip regulator has been installed, which introduces resistance in the rotor circuit as the output to the set increases, the speed thereby being reduced and a portion of the flywheel energy utilized for driving the two generators. Reducing the load on the generators automatically cuts out the resistance, and as the speed increases, energy is again stored in the flywheel.

The speed and direction of the rotation of the 3,000 horse-power motor are controlled by changing the polarity of the generators and varying their field strength, thereby varying the voltage applied to the armatures of the mill motor. This eliminates rheostatic losses except in the field circuit and permits any desired speed to be obtained independent of the load. As a result of this arrangement, no peak loads are taken off the line and the current input to the motor-generator set is maintained practically constant. The blooming



VIEW OF SHRAPNEL FORGING PRESS SHOWING PUNCHES FOR PIERCING THE SHELL BLANKS



INSPECTION DEPARTMENT FOR SHELL FORGINGS

will rotate complete wheels 129,000 pounds and the rotating part, which rotates at a maximum speed of 100 revolutions per minute, weighs 164,000 pounds. This motor is provided with a thrust bearing on its shaft and a braking coupling is installed between the casing and the portion rotating. The flywheel set weighs 367,130 pounds, and the rotating part weighs 240,000 pounds.

Ventilation is provided by a Sirocco fan installed by the American Blower Co., Detroit, which has a capacity of 21,000 cubic feet of free air per minute.

Forging the Shell

The round bars, from which the shell forgings are made, are of considerable length and must be cut to an exact size so that excess material or waste is reduced to a minimum. The bars or "rounds" as they are termed by the trade are cut off by electrically driven cold saws as illustrated on page 472. This photograph shows one of several machines which are engaged continuously in this work. The forgings are supported in a frame or rest which holds them in a curved position corresponding to the curve of the circular saw so that all five bars are cut through simultaneously, and no time is lost waiting for the last bar to be finished by itself as happens in some cases.

All forgings for shrapnel and 4.5-inch shells are produced by hydraulic presses, the two-operation method being adopted as the most satisfactory. In order to handle the immense volume of work involved, an entirely new forging shop with complete equipment was installed and has already produced innumerable forgings for both shrapnel and 4.5-inch high explosive shells.



FORGING SHOP ERECTED FOR PRODUCING

From the cold-sawing machines, the billets, as the pieces are called, now proceed to the heating furnaces where they are carefully brought up to the necessary temperature. The shrapnel billet is 61½ inches in length by 3.5 to 4 inches diameter and is forged at a temperature between 1,900 to 2,100 degs. F.

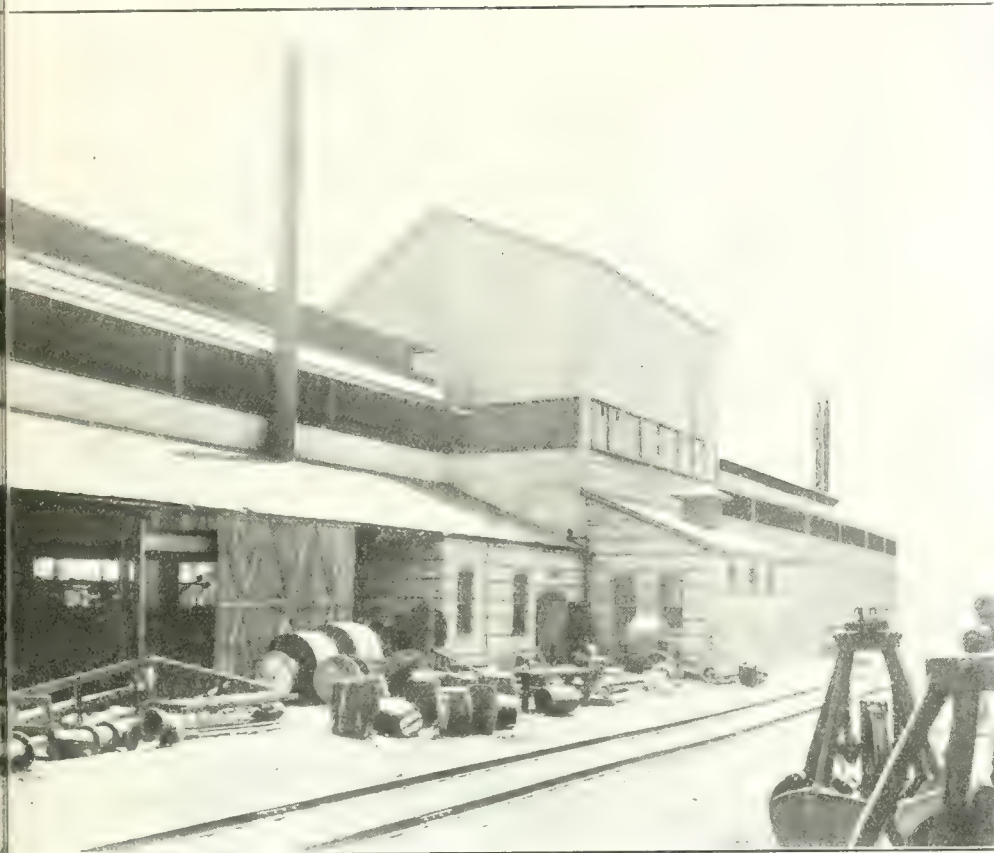
The process of forging as performed here consists of two operations, viz.,

piercing the solid billet, and then drawing the pierced billet out to length, this second operation including cupping or forming the pocket for powder cup. The north portion of the building is devoted to shrapnel forgings exclusively while the south end houses the 4.5 department. Each installation is complete with numerous hydraulic presses, heating furnaces, etc., the hydraulic power being supplied from a central station on one side of the building at the centre. Views of these departments are shown on this page, also the stock of finished forgings undergoing inspection by government officials. When piercing, the hot billet is placed in a cup-shaped die, and a round nose punch is forced into it causing it to fill out and extrude upwards around the punch. Suitable stripping gear removes the pierced billet from the die, and it is immediately transferred to an adjoining press for cupping and drawing.

In order to form the interior to the desired shape, the point of the drawing punch is made to the proper outline and the press is moved downward forcing the punch into the bottom of the billet which rests in a cupping die placed in position temporarily. Solid stops are arranged to arrest the travel of the punch at the required point after which the punch with the forging on it is raised slightly to allow the cupping die



VIEW IN SHRAPNEL FORGING DEPARTMENT.



FORGINGS FOR 3.3 IN. AND 4.5 IN. SHELLS.

to be removed. The punch is now forced down through the drawing dies which draw the hot metal up around the punch giving the proper outside diameter to the forging which now has the form of a tube with one end closed.

The finished forgings are now deposited on end in large groups on a cind-

er floor which retards the cooling sufficiently to avoid any trouble due to air hardening, etc. As each forging leaves the drawing press, it is stamped with a number indicating the heat or melt of metal from which it is made, and is gauged for depth of bore and thickness of wall. After cooling it is finally in-

spected and marked after which it is transferred to the machine shop for completion, or forms one of the great number of forgings supplied by the company to numerous machine shops throughout the Dominion, engaged in machining and assembling shells and components.

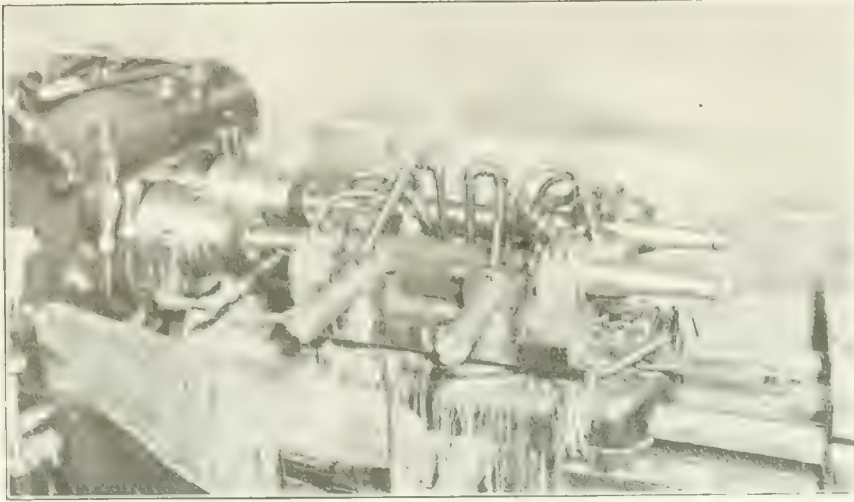
Finishing and Loading the Shell

The machining of the shell forging is done in fully-equipped machine shops, where the various operations, with which so many of our workers are familiar, are performed with all possible haste. Cutting off the rough forging to length, turning, boring, waving form the preparatory work followed by heat treating and nosing, after which threading, fitting base plugs, finishing to exact shapes and weights are all necessary before the shell is delivered from the machine to the assembly bench. Here may be seen the bullets being packed and the resin poured in to form a solid mass, which will behave in the desired manner while traveling through air from the muzzle of the gun. Varnishing the interior of high explosive shells is an operation that has to be thoroughly carried out in view of the deleterious action of the explosive on bare metal.

The assembling of the copper bands by hydraulic presses is one of the most interesting of the many operations which conclude with the painting and boxing of the projectiles, which then await shipment to the fixing plant to receive the charge of propellant contained in the brass cases which ultimately strew



4.5 IN. SHELL FORGING DEPARTMENT.



FORING EQUIPMENT ON DOUBLE SPINDLE L AND L FLAT TURRET LATHE

the battle field in the region of artillery engagements.

The Spirit of the Plant

The vicarities of fate are well illustrated by the fact that while "doing their bit" in producing the much-needed material required by the Empire, the company, adhering to the most modern business policy, is an admirable exponent of the humane principles of "safety first." The mutual consideration for each other's interests which exists between the company and its army of employees is well evidenced by the environment of harmony which permeates the atmosphere of the entire organization.

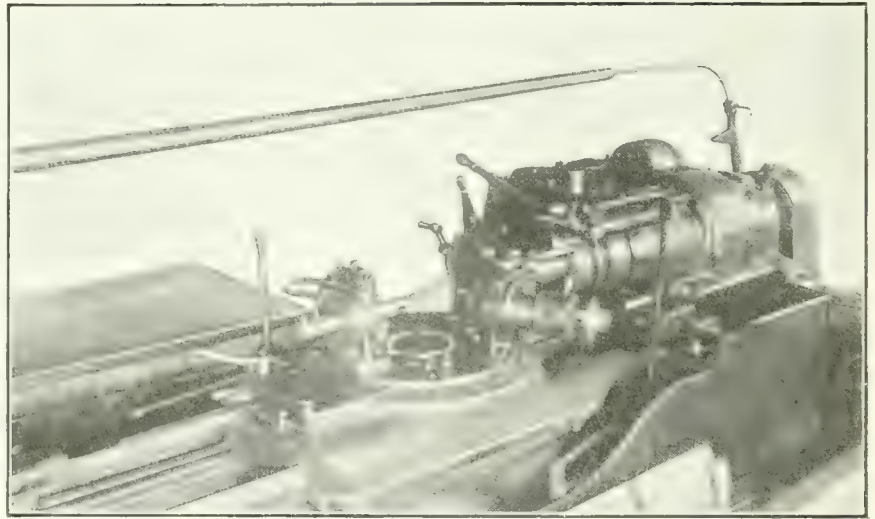
In the midst of industry and activity, heat, smoke, grime, and other inseparable features of steel manufacture, the company has not failed to realize its moral duty to those whose toil and effort, both of brain and muscle, have helped to establish and maintain the

position of the company in the foremost ranks of Canadian industry.

Firm believers in that old adage, "a sound mind in a sound body," the com-

pany's sentiments received concrete expression in the form of an athletic field, which is the home ground of a ball club of no small ability. Situated in front of the main offices, club room and library buildings, this expanse of green contrasts pleasantly with, and forms a welcome oasis in the midst of furnaces, mills, forges, machine shops, and railroad tracks.

The creature needs and comforts of all members of the staff are most carefully attended to in the staff building. A club restaurant, library, rest room, accident ward and hospital for sick and injured, are a few of many evidences of the reciprocal spirit of the plant, and in maintaining the surroundings in a high state of artistic excellence—well-kept grounds, vine-clad buildings, expert



MACHINING AND THREADING NOSE OF 8-PDR. SHRAPNEL SHELL.

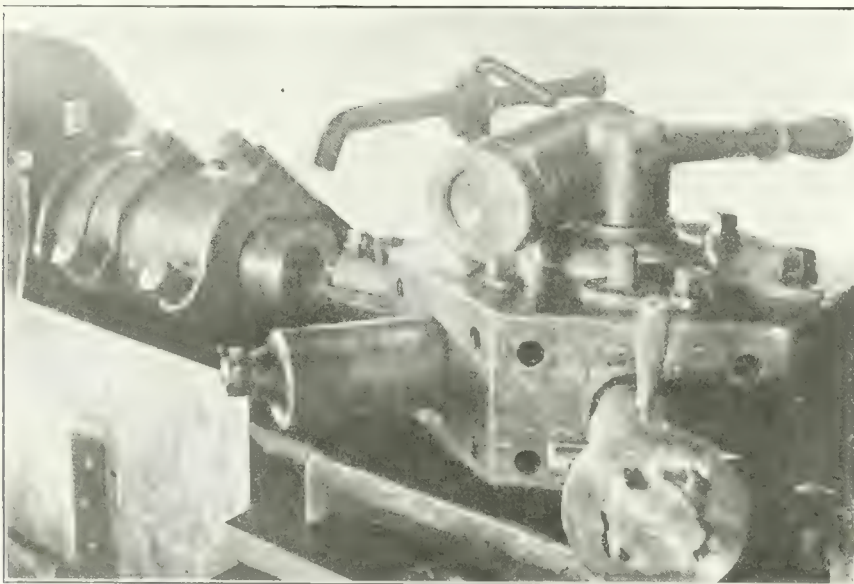
landscape gardening, etc.—the company betrays that attention and consideration for every detail, which has been an all-important factor in placing it in the enviable position which it now occupies as one of Canada's leading industrial establishments.



SPECIAL WELDING METAL FOR IRON AND MILD STEELS

THE necessity for using welding metals specially made for the oxy-acetylene welding process should be recognized by all users of the process, says the Acetylene and Welding Journal.

Until recently no special welding metal for work on iron and mild steels existed, and it is well known that until the advent of such a metal, wires or rods of Swedish iron should be used in preference to all other welding metals. The French Welding Union have been carrying out a series of experiments with the object of obtaining a welding metal for iron and steel which would deoxidize the welds, increase their strength and more important still, increase their ductility.



FORMING BASE RECESS IN SHRAPNEL SHELLS

Such an investigation is naturally a slow process because each rod made to a new or corrected formula must be followed by a series of practical and mechanical tests. These important researches were nearing completion and were to have been published in due course when the war intervened and the labors of the Union were turned in other directions.

It is well to emphasize that, apart from the welding rod, there are other conditions which must be rigidly followed if good welds on iron and steels are desired. It is safe to say that in the majority of workshops using the process these conditions are unfulfilled and advice on, say, the preparation of the edges, the power of the blowpipe and its position, the regulation of the flame and the execution of the weld itself could be given. Thus defective welds would, in many cases, be obtained with a perfect welding metal.

The use of ordinary iron or mild steel wire or rods is not to be recommended where sound strong welds are required. The use of Swedish iron gives a distinct improvement, but the welds obtained are still imperfect. The presence of impurities in these metals exerts a bad influence on the welds. The chief impurities being sulphur and phosphorus. A special welding metal for the welding of iron and mild steels has recently been placed on the British market under the name of Ferrox, and this product is manufactured entirely in England by a British firm's patented process. The metal is obtained by subjecting ordinary iron, steel, or cast iron to a process whereby the metal becomes impregnated with extremely finely divided nickel, and also holds in a state of occlusion or chemical combination a considerable quantity of hydrogen gas. It is claimed, after considerable research, that the welding rods obtained by this process effectively eliminate and counteract the disadvantages of the welding process. An example of the method of carrying out the invention is as follows:—

Hydrogen gas is passed over powdered nickel, or nickel oxide so that nickel chemically combines with the gas. The gas, thus charged with nickel is passed into a closed vessel in which the material to be treated is contained. The temperature and time of treatment play an important part. The gas is continuously passed over the metal or rods under a pressure slightly above atmospheric pressure. The time of treatment and the temperature employed will necessarily vary with the degree of impregnation required, with the thickness of the iron treated and its quality. When the treatment has been effected the product is cooled down in an atmosphere of hydrogen, or other inert gas.

Among the principal results obtained by applying this patented process are:—

(a)—The elimination of all oxides from the original material from which the welding wire is manufactured.

(b)—The expulsion from the original material of occluded gases.

The increased cost of this scientifically manufactured product over ordinary welding wire is small, and it is claimed that in spite of its increased cost, its use is attended with real economy. Apart from the relative merits it is cheaper than Swedish iron. In fact, the welding rod forms a very small percentage of the total cost of a weld.

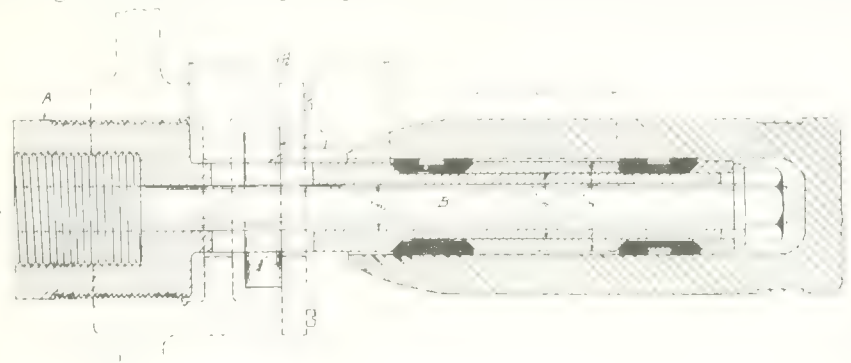


EXPANDING MANDREL

By E. T. Spidy

AS many of your readers are aware, the manufacture of munitions has called for much originality in designing tools and fixtures, partly because of the necessity of converting regular lines of machines which were adapted for work of a different nature, and partly because of the hurry in which they have had to be put into service.

One of the most called for pieces of mechanism at the present time is the expanding mandrel and every shop has



EXPANDING MANDREL FOR PARALLEL BORE SHELLS

its own variety to meet its particular requirements. It is a well-known fact that long holes are often not perfectly straight, particularly after the drill becomes worn. This may be accounted for in that a drill may strike a hard spot in the material and thereby glance a few thousandths of an inch to one side.

The mandrel illustrated was designed to average up the hole so that a "mean" along the total length would be obtained. It consists of a body A, which is threaded to suit the machine spindle. The body is bored out parallel and a spindle B, is fitted closely to its bore. At the lathe spindle end a cotter C is fitted through this spindle and corresponding slots D are milled in the body to allow for the travel of the cotter to tighten or slacken off the mandrel. On the outside of the body on the end inserted in the job, two steel sleeves are fitted and then split into three pieces. These three sections are held together by a retaining spring placed

in groove shown for that purpose. Between these split sleeves a solid sleeve is placed which acts as a spacing block and also transmits the power applied by the centre spindle, through the nut and end bushing. It can be seen that when the spindle is moved towards the lathe spindle all the taper faces act in unison but do not tighten up until both split sleeves are engaged in the hole. Thus a hole tapered in either direction, or a hole out of line in any direction is held rigidly and at an average trueness. Any user of mandrels will appreciate this advantage because the style of mandrel in common use presses out the dogs in such a way that only a parallel hole is held along its total length solidly in such a manner that will produce accurate work.

The manner of tightening the mandrel into the job must be adopted according to the work requirements and the machine. For centring purposes it is sufficient to attach a hand lever to directly engage the cotter, while for heavy turning in a lathe with a hollow spindle it is necessary to extend the spindle through the headstock and to attach a handwheel and a screw on the end of the lathe headstock and to attach a handwheel and a screw on the end of the lathe headstock.

When the lathe has no hollow spindle and heavy duty is required, the body of the mandrel may be threaded on the outside over the part screwed on to the lathe spindle and a handwheel threaded to fit this thread. The boss on the other side of the handwheel is extended to reach the cotter and a plate fitted over same so that the cotter is free to travel up the mandrel with the motion of the wheel in the recess so formed. This latter method is the most simple to apply and is entirely successful in operation.



Expansion joints should be located in all approximately straight pipe lines at such intervals that the extreme change in the length of pipe will not exceed the safe travel or range of the expansion element and that the force or strain exerted in moving the length of pipe may not be excessive and start leakage.

Large Shells: Production Problems and Possibilities--I.

By C. T. D.

In preparing to undertake the production of large shells up to 9.2 in. dia., manufacturers will encounter problems of a nature altogether different from those connected with 18 pdr. shells. Automatic machinery will not be so applicable to the larger sizes, and productive ability will centre largely on such points as sequence of operations, tooling methods, etc.

In undertaking the production of large shells up to 9.2 in. diameter, Canadian manufacturers will find considerable opportunity for utilizing all the experience obtained in making the smaller sizes, while at the same time many important differences, both in design and size, will be found which will require just as careful planning and carrying out as any of the initial problems encountered in shrapnel manufacture.

In producing shrapnel, difficulties were met which were peculiar to that type of shell, due to certain features of design and physical requirements. Buckling of the nose and walls, variations in heat treatment for different brands of steel, excessive wear on taps and tools due to irregularities in physical properties of the metal and so forth are some of the more familiar troubles which have been experienced by almost all producers of shrapnel.

The advent of high explosive 18 pdr. and 4.5 shells removed most of those previous troubles, to be succeeded by those incident to the insertion of the base plug, though the choice between a plain plug with a joined joint, and a threaded plug offers an alternative which has certain desirable features.

A study of the drawings of forgings and finished shells, which we reproduce, shows certain variations which will determine to a considerable degree the procedure adopted by different makers.

The various sizes of shells may be divided into two main groups, viz., solid

base, and open base. The 60 pdr. and the 6 in. shell belong to the first group, while 8 in. and larger form the second.

Considering the solid base designs, the inserted disc in the base is common to

In order to ensure contact over the entire surface of the disc, it is made slightly convex so that when tightened up, the contact commences in the centre and spreads over the surface as the thread tightens.

The special machines now available insure the production of perfect threads and a satisfactory job with ordinary care.

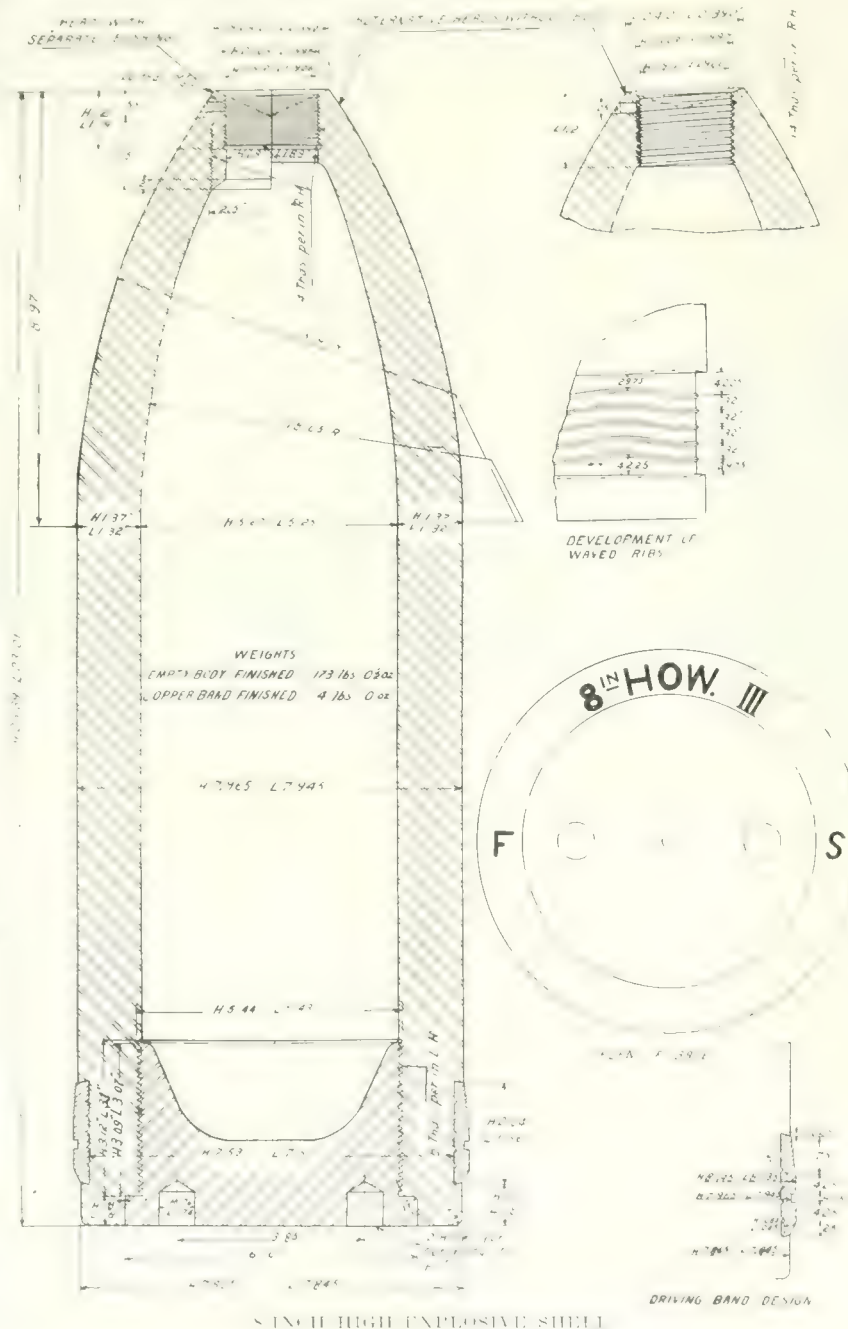
In the case of plain discs, these are made a fairly close fit, allowing for escape of imprisoned air. The outer edge is bevelled slightly and a ridge or bead left on the mouth of the hole is riveted over. The riveting gradually draws the plate down flat after which a finishing cut removes all traces of the operation.

The bore of the 60-pounder shell closes in at the mouth, necessitating nosing in, while the 6-inch shell is made with a parallel bore, the lower face of the socket being well hollowed out to form an approximately hemispherical upper end of the interior. In the event of a shortage of steel bushings, makers might be called upon to supply 60 pdr. shells with solid bushings, as has been done in some cases with 4.5 shells. The reduced size of boring bar and increased overhang of cutting tool are serious handicaps when finishing internal profile in this case.

The principal remaining difference is in the design of driving band. In addition to being more complicated in

profile, the 6 in. band is featured with an undercut which calls for increased care in production and also in handling.

The principle of construction adopted in these shells is radically different from



both the 60-pounder and the 6-inch. The use of threaded discs or plugs although more costly than the plain system, is preferred by many manufacturers because of the smaller possibility of rejections.

that of the 6 in. size and under.

8-in. and 9.2-in. Shells

In place of being made with a solid base and open-mouth necessitating a nosing operation, etc., these shells are forged with the nose closed or solid, and the base open. A solid forged steel plug with ample length of thread renders it possible to make a perfectly sound gas-tight joint, capable of withstanding the intense heat and pressure of the exploded gases.

The first question which presents itself to the practical mind is that of machining the bore of the shell. Machines for performing this operation have been in use in the regular arsenals and munition factories right along, but the private firms undertaking this work for the first time will in most cases develop their own ideas, as in the case of the smaller shells. Methods of machining open base shells will develop round the manner of boring. In one case the shell will revolve and boring bars and cutters will be fed into it in the conventional manner. In the other case, the shell will be held rigidly in a cradle and fed on to a revolving cutter bar.

In either case the best way to start is to work from the inside of the shell outward. It may not appear so to all, and it may not be compatible with certain methods and systems of machining, but those makers who are not yet committed to a definite method should bear in mind the fact that just as these shells are bigger than 18 pounders, so will their variations in the rough state be greater. A much quicker approach to the required degree of accuracy can be obtained by locating all operations from the inner surface of the shell as inequalities in the thickness of metal can be anticipated and removed more conveniently and effectively with a turning tool on the

outside, than with a more or less yielding boring bar working out of sight.

The question of whether to make a separate or solid base is a matter for individual judgment on the part of the maker. If sufficient strength is obtained

threading. A further consideration would be the possibility of delay through the non-delivery of shells from firms engaged in their manufacture.

It is perhaps desirable that the plugs be made in the same shop as the shells. The making of these in separate establishments is quite in accordance with modern machine practice, provided gauges of close enough limits are used and care is taken to avoid damage to threads and surfaces in shipment and handling. The allowable limits on the thread diameters are generous and while supplied plugs must be just within limits in one direction, the shell might be 1/16" as close to the limits in the other direction, consequently trouble would arise in one case getting the plug into the shell, and in the other, getting the shell past the inspector.

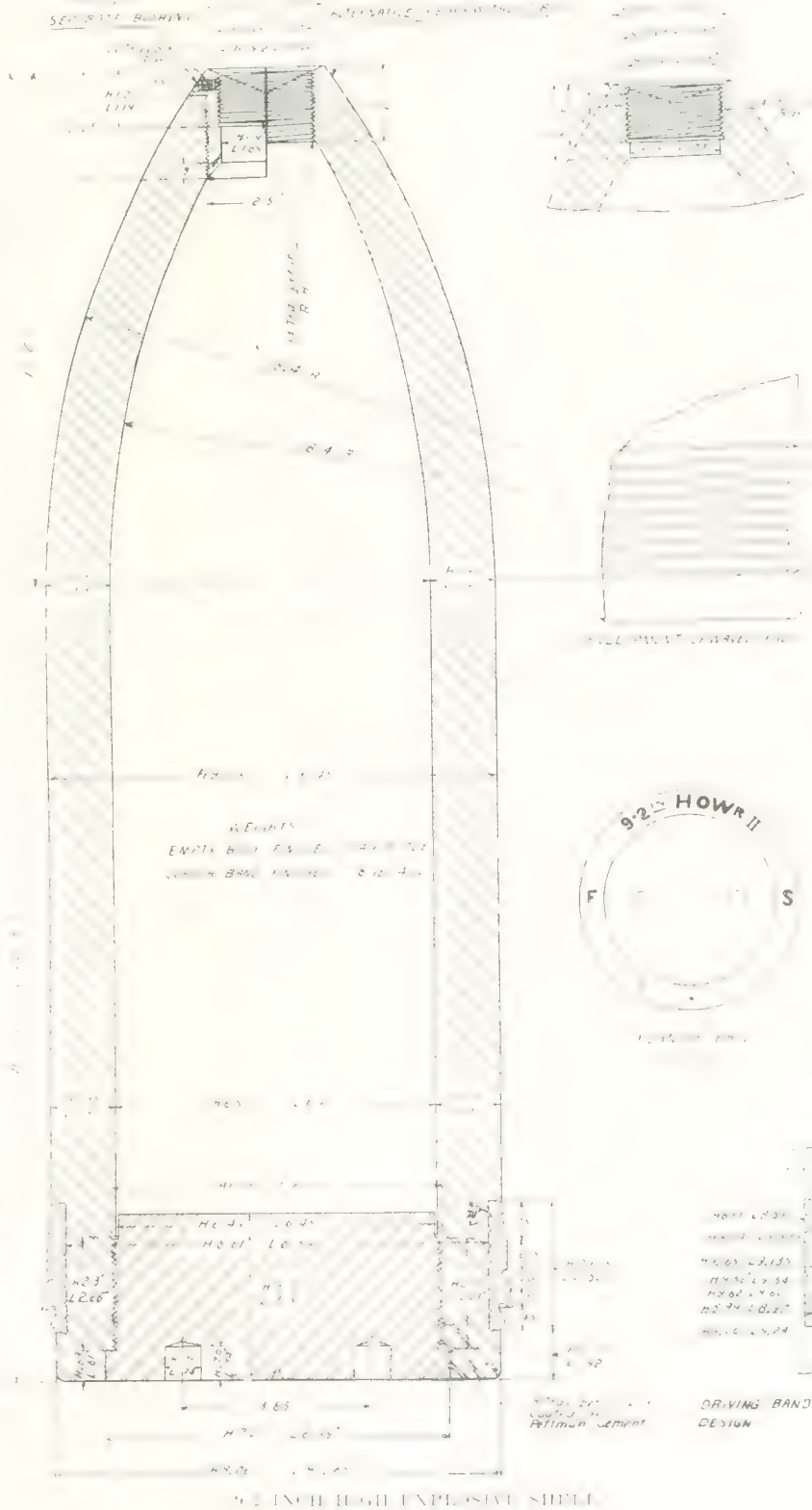
By producing the plugs in the same shop as the shell, more satisfactory work can be accomplished, as once having determined on a no-limit size for the plug, all available limits can be taken advantage of in tapping the end of the shell.

Driving Bands

A considerable difference in profile between 8 in. and 9.2 in. bands exists, and in the absence of any obvious reason or official explanation, the requirements have simply to be fulfilled. As in the 6 in. shell, the 9.2 in. band is shown having an undercut which does not simplify matters. The numerous vee grooves call for particular care not only in machining but in securing properly annealed copper so

as to produce perfect outlines. Banding presses of greatly increased power are necessary in view of the increased dimensions of the band.

The assembling of the plugs offers op-



without the use of a drill, saving a tap expense and time of machining is possible, coupled with the reserve possibility of enlarging the hole and using a bush should the first hole be solid in

possibilities for the development of plug driving machines for tightening plugs by power assuring efficient and uniform results.

Not the least important of equipment developments lies in the necessity for power handling apparatus.

Prospective makers of these large shells will be well advised to approach the driving band feature with all possible deliberation and care. The great increase in size, as well as the intricacy of outline, makes it an entirely different proposition from 15-in. shells. The band profile of the smaller shells is comparatively simple, and the circumference about one-third that of the big bands, both of which facts conduce to a large output in numbers from a single set of forming tools.

Whether the present methods of band turning will be entirely satisfactory on these large bands is a point that can best be decided from actual experience. The possibility of developing a special profile miller seems not altogether remote, and from a theoretical standpoint offers certain advantages. Revolving a heavy forging at a high rate of speed in order to remove a small quantity of metal from a minor component is bad practice, not only from a power saving point of view, but from quality of production as well. Constant attention would be necessary to prevent heating up the steady rest, and any seizing of the shell with consequent scoring might easily cause enough damage to result in rejection. This fact alone would justify consideration being given to the use of a milling machine in which the heavy shell body would be revolved slowly while a formed milling cutter produces the profile of the band.

Several developments of design suggest themselves such as a multiple spindle milling device in which a roughing cutter fed into the work in front would remove the surplus stock and a sizing cutter behind would be elevated on a vertical slide till it was level with

the centre of shell. If cutting compound had to be used to prevent the finer portions of profile from tearing, a copious stream would prevent heating of the band from spreading much beyond the parts being operated on.

The provision of a suitable tool with angular feed to undercut the band would seem necessary although it is more than probable that the fresh angle of attack, from which many of our manufacturers will approach these problems, will result in not a few ingenious and original

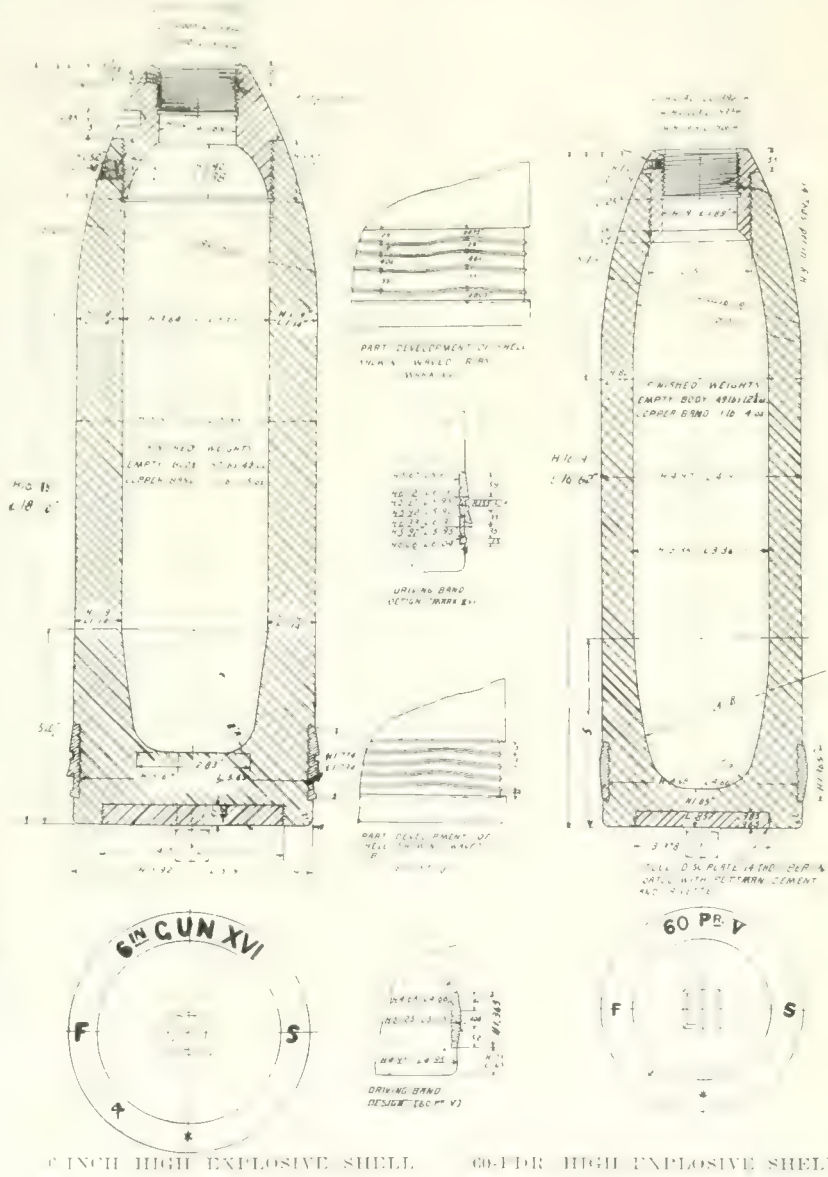
From the time a forging commences to undergo the first operation until it is completed, or until a break in its progress is advisable, say at the banding press or enamelling oven, all its steps should be strictly in rotation so as to avoid any doubling on its tracks.

Where it is possible to do so, an overhead track, with travelling chain blocks or hoists, either air, electrical, or otherwise, will prove the most popular and efficient method.

Circumstances peculiar to certain shops may render preferable the adoption of small revolving jib cranes on each machine which would require the use of suitable transfer trucks for moving between operations. A well thought out arrangement of this nature might be much less costly and when properly used, just about as quick as an overhead track. Any doubling back that might be necessary on occasion would certainly cause little if any confusion with this system as compared with a track which would not allow movement in either direction when a job was being set up in a machine.

The production of forgings up to the 8-in. size is now an accomplished fact in this country, although some few weeks must elapse before 9.2-in. forgings are also in course of production. Reproductions of forging drawings which give a good idea of the probable amount of work which will be required and the detailing of different methods, with illustrations and descriptions of the machines and tools for use therewith will form the subject of future articles in these columns.

Bombs Made in Canada.—Bombs have been added to the munitions products which Canada is now producing for the British War Office. An order for 5,000 of these projectiles has been received by the commission, and is being placed for speedy delivery. The bombs are to be used in trench warfare, and are to be fired from what are known as mine or trench guns.



6 INCH HIGH EXPLOSIVE SHELL. 60-PDR HIGH EXPLOSIVE SHELL.

The MacLean Publishing Company

LIMITED

(ESTABLISHED 1888)

JOHN BAYNE MACLEAN - - - - - President
H. T. HUNTER - - - - - General Manager
H. V. TYRRELL - - - - - Asst. General Manager

PUBLISHERS OF

CANADIAN MACHINERY AND MANUFACTURING NEWS

A weekly newspaper devoted to the machinery and manufacturing interests.

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GREAT BRITAIN—

London—The MacLean Company of Great Britain, Limited,
88 Fleet Street, E.C. E. J. Dodd, Director. Telephone Central
12960. Address: Atabek, London, England.

SUBSCRIPTION RATES:

Canada, \$2.00; United States, \$2.50; Great Britain, Australia and other Colonies, 8s. 6d. per year; other countries, \$3.00. Advertising rates on request.

Subscribers who are not receiving their paper regularly will confer a favor by letting us know. We should be notified at once of any change in address, giving both old and new.

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ANTICIPATING RESUMPTION OF PEACE-TIME BUSINESS

APPARENTLY of equal moment and importance to the manufacture of war munitions—perhaps even transcending the latter, is the manufacture of industrial stock values. From week to week these continue to advance, not seldom by leaps and bounds, and the question is naturally being asked: what is going to happen them when the end of the war becomes imminent?

Undoubtedly our steel and metal-working industries are finding munitions production worth while, but we hesitate to believe that the margin between contract prices and production costs is anything like so great as to justify the high level attained by the stocks. The impression has got

abroad that our manufacturers are making huge profits on war orders, and that the war is being made the medium whereby a multiplicity of individual and corporate enrichment may be brought about. In any case, "It's an ill wind that blows nobody any good." Therefore, in spite of the devastating influences of and distress caused by this war of wars, a considerable number of people, here and elsewhere, will no doubt realize a bountiful harvest of hard cash by devious means and channels. Combat their doing so how we may, such a consummation will be inevitable.

It is generally conceded, and at first sight reasonably so, that, after the necessarily long period of neglect, much construction leeway will have to be made up. The expectation then is that a burst of prosperity such as we have probably never known, will so efface the transition from war to peace that neither stock prices nor productive activities will be affected.

A boom is predicted in merchant shipbuilding to make good the losses by sinking, and to compensate for the almost total extinction of vessel construction in Britain. A similar boom is predicted in the sphere of railroad betterment, to compensate again for the long period during which maintenance has been neglected and earnings conserved. Development work of every description, private, municipal and Governmental, is, we are told, to be no exception; thus, on paper, the end of the war seems to be desirable for a variety of reasons.

In all calculations or prophesies of the nature of the foregoing, no cognizance, however, is taken of the price we are having and will have to pay for the war. We forget that in addition to war stocks reaching giddy heights, material and labor, and all else have pyramided. Stock market prices have a knack of crashing down en masse when the opportune moment arrives; not so these others.

Steel, wages, food and clothing are largely interdependent and have a comprehensive application. They are usually super-sensitive to the upward turn, and during the past year have proved so on many occasions. Individually or collectively they are less sensitive to the downward tendency, be the latter of simple desire or judiciously applied force or pressure. The downward movement is not only hard to start, but is so slow and gradual as to be almost imperceptible of measurement.

With the end of the war in sight, attention will, as already indicated, be turned to the peace-time pursuits of shipbuilding, railroading, etc. It will be found, however, that shipowners, railroad executives, etc., continue to sit tight so far as the distribution of orders is concerned, the cost of raw and finished material for the purposes of their requirements being totally prohibitive from the standpoint of the then or immediately prospective earnings. War-time prices for equipment and supplies will match ill with peace-time revenue. A period of readjustment must needs be ushered in, during which business of every description will incline to languish, war stocks will disappear and plain industrials will take their place. Prices of raw and finished material will have to be marked down, however slowly and reluctantly those involved contribute to the process.

Only by producers and their help getting together now, without waiting for the end of the war to become more imminent, and planning the necessary and inevitable procedure when the time is ripe, will the transition period be shortened and perchance eliminated, and a prolonged and wholly unnecessary business depression be avoided. Capital and labor are equally interested in the matter and both will be called upon to make big concessions sooner or later. The general welfare of our people demands that they take time by the forelock and arrange the details now.

SELECTED MARKET QUOTATIONS

Being a record of prices current on raw and finished material entering into the manufacture of mechanical and general engineering products.

PIG IRON.

Grey forge, Pittsburgh	\$15 40	
Lake Superior, charcoal, Chicago	16 75	
Ferry packed pig iron		25 00
	Montreal.	Toronto
Middlesboro, No. 3	\$24 00	
Carron, special	25 00	
Carron, soft	25 00	
Cleveland, No. 3	24 00	
Clarence, No. 3	24 50	
Glenarnock	28 00	
Summerlee, No. 1	30 00	
Summerlee, No. 3	29 00	
Michigan charcoal iron	28 00	
Victoria, No. 1	24 00	21 00
Victoria, No. 2X	23 00	21 00
Victoria, No. 2 plain	23 00	21 00
Hamilton, No. 1	23 00	21 00
Hamilton, No. 2	23 00	21 00

FINISHED IRON AND STEEL.

Per Pound to Large Buyers.		Cents.
Common bar iron, f.o.b., Toronto		2.50
Steel bars, f.o.b., Toronto		2.50
Common bar iron, f.o.b., Montreal		2.50
Steel bars, f.o.b., Montreal		2.50
Twisted reinforcing bars		2.55
Bessemer rails, heavy, at mill		1.25
Steel bars, Pittsburgh		1.60
Tank plates, Pittsburgh		1.60
Beams and angles, Pittsburgh		1.60
Steel hoops, Pittsburgh		1.75
F.O.B., Toronto Warehouse.		Cents.
Steel bars		2.50
Small shapes		2.75
Warehouse, Freight and Duty to Pay.		Cents.
Steel bars		2.20
Structural shapes		2.20
Plates		2.20
Freight, Pittsburgh to Toronto.		
18.9 cents carload; 22.1 cents less carload.		

BOILER PLATES.

	Montreal	Toronto
Plates, 1/4 to 1/2 in., 100 lb.	\$2 35	\$2 35
Heads, per 100 lb.	2 60	2 60
Tank plates, 3-16 in.	2 70	2 70

OLD MATERIAL.

Dealers' Buying Prices.		Montreal.	Toronto.
Copper, crucible		\$12 75	\$12 75
Copper, crucible		15 25	15 00
Copper, unch-bleed, heavy		14 75	14 50
Copper, wire, unch-bleed		14 75	14 50
No. 1 machine composition		11 75	11 75
No. 1 compos'n turnings		10 25	10 00
No. 1 wrought iron		10 00	8 50
Heavy machine steel		9 00	9 00
No. 1 machin'y cast iron		13 50	12 50
New brass clippings		11 00	11 00
No. 1 brass turnings		9 00	9 00
Lead		5 00	5 00

Tea lead	\$ 4 00	\$ 4 00
Scrap zinc	12 50	11 00

W. I. PIPE DISCOUNTS.

Following are Toronto jobbers' discounts on pipe in effect Nov. 5, 1915:

	Buttweld	Lapweld
	Black	Black
	Standard	Gal.
1 1/2, 3/8 in.	62	38 1/2
1 1/2 in.	67	47 1/2
3/4 to 1 1/2 in.	72	52 1/4
2 in.	72	52 1/2
2 1/2 to 4 in.	72	52 1/2
4 1/2, 5, 6 in.		69
7, 8, 10 in.		66
	N Strong	P. E.
1 1/2, 3/8 in.	55	38 1/2
1 1/2 in.	62	45 1/2
3/4 to 1 1/2 in.	66	49 1/2
2, 2 1/2, 3 in.	67	50 1/2
2 in.		62
2 1/2 to 4 in.		65
4 1/2, 5, 6 in.		65
7, 8 in.		58
	NX Strong	P. E.
1 1/2 to 2 in.	43	26 1/2
2 1/2 to 6 in.		42
7 to 8 in.		39
	Genuine Wrot Iron.	
3/8 in.	56	32 1/2
1/2 in.	61	41 1/2
3/4 to 1 1/2 in.	66	46 1/2
2 in.	66	46 1/2
2 1/2, 3 in.	66	46 1/2
3 1/2, 4 in.		65
4 1/2, 5, 6 in.		62
7, 8 in.		59
	Wrought Nipples.	
4 in. and under		77 1/2 cts
4 1/2 in. and larger		72 cts
4 in. and under, running thread.		57 1/2 cts
	Standard Couplings.	
4 in. and under		60 cts
4 1/2 in. and larger		40 cts

MILLED PRODUCTS.

Sq. & Hex Head Cap Screws 65 & 50				
Sq. Head Set Screws	70 & 50			
Rd. & Fil. Head Cap Screws	45 cts			
Flat & But. Head Cap Screws	40 cts			
Finished Nuts up to 1 in.	70 cts			
Finished Nuts over 1 in.	70 cts			
Semi-Fin. Nuts up to 1 in.	70 cts			
Semi-Fin. Nuts over 1 in.	72 cts			
Studs	65 cts			

METALS.

	Montreal.	Toronto.
Lake copper, carload	\$20 00	\$20 50
Electrolytic copper	20 00	20 25
Castings, copper	19 25	20 00
Tin	45 00	48 00
Spelter	19 00	19 00
Lead	6 50	7 00
Antimony	40 00	40 00
Aluminum	62 00	65 00

Prices per 100 lbs.

BILLETS.

	Per Gross Ton
Bessemer, billets, Pittsburgh	\$26 00
Open-hearth billets, Pittsburgh	28 00
Forging billets, Pittsburgh	45 00
Wire rods, Pittsburgh	35 00

NAILS AND SPIKES.

Standard steel wire nails, base	\$2 60	\$2 55
Cut nails	2 50	2 70
Miscellaneous wire nails	75 per cent.	
Pressed spikes, 5/8 diam., 100 lbs.	2 85	

BOLTS, NUTS AND SCREWS.

	Per Cent.
Coach and lag screws	70
Stove bolts	80
Plate washers	40
Machine bolts, 3/8 and less	65
Machine bolts, 7-16 and over	50-71 1/2
Blank bolts	50-71 1/2
Bolt ends	50-71 1/2
Machine screws, iron, brass	35
Nuts, equare, all sizes	3 3/4 c per lb off
Nuts, hexagon, all sizes	4 1/4 c per lb. off
Iron rivets	72 1/2
Boiler rivets, base, 3/4-in. and larger	\$3.75
Structural rivets, as above	3.75
Wood screws, flathead, bright	.85, 10, 7 1/2, 10 p.c. off
Wood screws, flathead, brass	.75 p.c. off
Wood screws, flathead, bronze	.70 p.c. off

LIST PRICES OF W. I. PIPE.

	Standard.	Extra Strong.	D. Ex. Strong.
	Nom. Price.	Size Price	Size Price
	Diam. per ft.	Ins. per ft.	Ins. per ft.
1/8 in.	\$.05 1/2	1/8 in \$.12	1/2 \$.32
1/4 in	.06	1/4 in .07 1/2	3/4 .35
3/8 in	.06	3/8 in .07 1/2	1 .37
1/2 in.	.08 1/2	1/2 in .11	1 1/4 .52 1/2
3/4 in.	.11 1/2	3/4 in .15	1 1/2 .65
1 in	.17 1/2	1 in .22	2 .91
1 1/4 in	.23 1/2	1 1/4 in .30	2 1/2 1.37
1 1/2 in	.27 1/2	1 1/2 in .36 1/2	3 1.86
2 in	.37	2 in .50 1/2	3 1/2 2.30
2 1/2 in.	.58 1/2	2 1/2 in .77	4 2.76
3 in	.76 1/2	3 in 1.03	4 1/2 3.26
3 1/2 in	.92	3 1/2 in 1.25	5 3.86
4 in	1.09	4 in 1.50	6 5.32
4 1/2 in	1.27	4 1/2 in 1.80	7 6.35
5 in	1.48	5 in 2.08	8 7.25
6 in	1.92	6 in 2.86	
7 in	2.38	7 in 3.81	
8 in	2.50	8 in 4.34	
8 in	2.88	9 in 4.90	
9 in	3.45	10 in 5.48	
10 in.	3.20		
10 in.	3.50		
10 in.	4.12		

The General Market Conditions and Tendencies

This section sets forth the views and observations of men qualified to judge the outlook and with whom we are in close touch through provincial correspondents.

Montreal, Que., Nov. 15, 1915.—Favorable industrial conditions continue throughout the Dominion. In the iron and steel trades, the activity is quite unparalleled, and the possibilities are that the immediate future may see even greater developments.

The manufacture of steel promises to crowd the capacity of every mill both in Canada and the United States. In this connection it is interesting to note that one hundred years ago the United States were producing about 50,000 tons of pig iron a year, while the average daily output for October last was over 100,000 tons, or an increase of 600 to 1.

The pressure being felt by the steel mills is largely due to the demand for war supplies, not only in shell bars and billets, but in many other lines, such as steel rails, structural steel for cars, locomotives, automobiles and the countless necessities used, directly, or indirectly, for the maintenance of large armies in the field.

Previous to the breaking out of hostilities, Canada as well as other countries countries, was purchasing large quantities of chemicals from Germany. Brought face to face with the problem of supplying their own needs, or paying prohibitive prices for what little could be obtained, the Canadian chemists have not only succeeded in accomplishing remarkable results in the production of these much-needed chemicals for their own use, but are able to export to Britain.

Enlarged opportunities have been opened for Canadian manufacturers, not only for supplies relative to war munitions, but in all classes of trade, formerly monopolized by European nations.

Steel.

The steel trade continues at quite high pressure, every available mill working to the limit, in the endeavor to supply the abnormal demand for bars and billets, as well as to keep up with the gradually increasing commercial requirements. The stress placed upon the steel-producing plants on this continent is shown by the past week's reports, in which it is stated that the United States Steel Corporation have withdrawn all prices on steel products except tubes and pipes. They are practically out of the market on all other lines of steel. Delivery under nine months is almost impossible, and many plants are closing down on future orders, until they can state definitely their exact position.

The requirements of the finishing

mills are beyond the output of crude steel, and one of the necessities of the moment is to bring the production of the basic material up to the output of the rolling mills.

Canadian furnaces are only producing about one-half of the steel being used by our manufacturers, and any restriction placed upon importation would have a serious effect meantime.

Construction of large additions to the plant of the Nova Scotia Steel Co. are now being undertaken, and within three months new furnaces are expected to be in operation, producing 200 tons a day in addition to their present output. New equipment for the production of the larger shells is also to be delivered at New Glasgow in about six weeks. The mines in connection with this company will continue operations at high pressure throughout the winter months.

CANADIAN GOVERNMENT PURCHASING COMMISSION

The following gentlemen constitute the Commission appointed to make all purchases under the Dominion \$100,000,000 war appropriation:—George F. Galt, Winnipeg; Hormidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

Machine Tools and Supplies.

Activity in machine tools has received a new impetus because of the expectation that many firms will receive orders for the heavy type of explosive shell, as well as additional orders for the present shells of 3.3. and 4.5-inch type. Many inquiries have come in for machines suitable for the production of 6-in., 8-in. and 9.2-in. shells, and in a short time definite information may be received as to the successful firms receiving contracts for additional munitions.

The demand for supplies is as heavy as ever. The munition factories are working night and day, and small tools and other supplies are a constant requirement.

Metals.

The present situation in the metal market is little changed from that of the preceding week. However, the reported closing of the Suez Canal has created some excitement among buyers of spot tin with the result that the persistent buying to cover requirements has

advanced the price from 38c to 45c a lb.

Copper is showing some signs of improvement, but last week's quotations prevail. Spelter is a shade stronger, and is quoted at 19c, and antimony shows an advance of five dollars per 100 lbs. A slight increase is noted in aluminum, a price of 62c being now quoted.

Copper.—The optimistic outlook for future copper is keeping the market firm. Although foreign quotations show advances, prices locally remain steady.

Tin.—Conditions in the Far East have apparently clouded the tin situation for the present, with the result that heavy advances have been made on prices for spot tin. Any losses of spot tin now in process of transportation might easily cause a further advance. This week's quotation shows an increase of \$7 per 100 lbs. over that of last week.

Spelter.—Foreign advances in the price of spelter have not affected the local market very much. However, an advance of one cent per lb. is shown in this week's prices. . .

Lead.—This continues firm at 61½c per lb.

Antimony.—The apparent scarcity developing in antimony and the demand has made the price stronger, the present quotation being \$40 per 100 lbs.

Old Materials.

Business in scrap metals of all kinds has been fairly brisk during the past week, and a general advance is noted in many lines. Copper has advanced about \$10 a ton, considerable quantities being handled.

Business in heavy melting steel has increased the price ½c per pound.

Heavy melting lead has risen to \$5 per 100 lbs., and tea lead shows an increase of ¼c per pound. Scrap zinc is selling at 12½ cents.

Toronto, Ont., Nov. 16.—The recent action of the United States Steel Corporation with regard to the Canadian market shows conclusively the far-reaching effect which the war is having on the steel trade here and elsewhere. The situation has been caused entirely by the enormous demand for munitions which will increase now that the orders for the large calibre shells are being placed. No official list of successful tenderers will be given out, nor the size of the orders named, notwithstanding reports to the contrary. This is the wish of the British War Office, which has notified the shell Committee to that effect. It is understood that some orders for 6-in. shells have already been placed and that the contracts for the larger shells, although not actually signed up, are practically assured to certain firms.

The general industrial situation is gradually improving and a more confident spirit prevails as a result. A large

number of factories are engaged in the production of war equipment and the engineering trade is active on shell orders. Prices of all lines have a higher tendency, particularly iron and steel products, which continue to advance. The metal market is very active and a general advance in prices has to be noted.

Steel Market

The recent announcement issued by the United States Steel Corporation is of considerable importance to Canadian steel plants. The Corporation in addition to withdrawing prices to the Canadian trade, have decided not to solicit business in this market until conditions have become normal. This order will affect principally bars and billets, etc., for which there is such a heavy demand; structural shapes will also be affected. This action of the Corporation does not mean that they will refuse business, providing delivery is no object, or that orders already booked will not be filled. It is simply a question of delivery. The demand is so far ahead of production that the output of the mills is booked up for several months in advance. Under these conditions and with unfilled tonnage increasing each month, prices cannot be fixed so far ahead and no promise can be made to consumers when they are likely to get delivery. The situation thus revealed is unprecedented and while not particularly serious at present may become so as the demand for steel for munitions continues to increase and present contracts run out. The market is naturally upset and the outlook is uncertain.

Canadian steel companies, although operating on capacity, are falling behind in meeting the demand, and higher prices for steel products are inevitable. The prosperity of the steel industry is assured for some time to come and plants will have to be extended to take care of the demand. It is announced that the Nova Scotia Steel Co. will build an open-hearth furnace having a capacity of 200 tons per day. The same concern will install new presses for forging 8-in., 9.2-in. and 12-in. shells, also the necessary machining equipment.

Prices continue in an upward direction. Canadian mills are now quoting bars at 2.50c base, and reinforcing bars 2.35c base Toronto, plus extra for twisting. Steel bars are 2.50c and small shapes 2.75c f.o.b. Toronto warehouse. Pittsburgh bars, plates and shapes for Canadian consumption are quoted at 1.60c, but this figure is practically nominal, as no orders are being booked. Seamless boiler tubes have advanced again, but lapwelded are unchanged for the present. Higher prices on tubes are expected. Boiler plates are very firm and an advance in price may be made early next month. Some lines of bolts

and nuts have advanced, the new discounts being as follows: Coach and lag screws, 70 p.c.; machine bolts, $\frac{3}{8}$ in. and less, 65 p.c.; machine bolts, 7-16 in. and over, 50 p.c.; blank bolts and bolt ends, 50 and $7\frac{1}{2}$ p.c.; square nuts, $3\frac{3}{4}$ c per lb. off, and hex. nuts $4\frac{1}{2}$ c per lb. off. Another advance in wrought iron pipe has been made and is now in effect. The new schedule affects black pipe only, galvanized remaining unchanged.

Prices of high-speed tool steel continue to advance and the situation shows no improvement. The scarcity of tungsten has assumed serious proportions and the supplies, although increasing, are not sufficient to meet the demand. As this alloy to a large extent determines the price, quality and quantity of high-speed steel, it is apparent that while tungsten keeps at the present high level, high-speed tool steel will also be correspondingly high. The situation is further

ALLIES PURCHASING AGENTS

The Trade and Commerce Department, Ottawa, has published the following list of purchasing agents for military purposes for the allied Governments:

International Purchasing Commission, India House, Kingsway, London, Eng.

French.—Hudson Bay Co., 56 McGill Street, Montreal; Captain Lafoulloux, Hotel Brevort, New York; Direction de l'Intendance Ministere de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

Russian.—Messrs. S. Ruperti and Alexsief, care Military Attache, Russian Embassy, Washington, D.C.

aggravated by the exceptionally heavy demand, which is at least five times that of normal.

Prices of all descriptions of steel sheets are very firm, and higher prices are expected. In galvanized sheets, the differentials between the gauges continue upset by the abnormal spelter situation, and while the consumer may secure heavy gauges at comparatively low prices, he must pay higher price for light gauges. Acid is becoming scarce and is high in price, and this, together with spelter and black sheets becoming more costly, will not doubt cause galvanized sheets to advance. Bessemer black sheets are quoted at 2.15c to 2.25c and open hearth 2.25c to 2.30c Pittsburgh.

In the States prices continue to advance, but this has had no effect in curbing the demand, which is heavier

than at any stage in this present movement. The unfilled tonnage of the United States Steel Corporation for October shows an increase of 847,000 tons over September. This record shows the development which is taking place in the market. The heavy demand for billets continues and prices are very firm. Wire rods are higher at \$35 f.o.b. Pittsburgh.

Pig Iron

The heavy demand for steel making pig iron continues but foundry grades are quieter. Prices are firm but unchanged.

Old Material

The market is considerably firmer and quotations higher for some metals. Copper is very strong and prices have advanced throughout the list. No. 1 machine composition and No. 1 composition turnings have advanced about 25c per 100 lbs., while No. 1 wrought iron and heavy melting steel are also higher. Prices of scrap lead are higher and scrap zinc is also advanced. Complete prices are given in the selected market quotations. Business is improving, but the higher prices are due more to the general buoyancy in the market and improved tone.

Machine Tools

The placing of the orders for the larger caliber shells is resulting in increased activity in the machine tool market. Quite a number of orders for tools, principally lathes, have already been placed and others are pending. Deliveries are better on the larger size lathes than on the smaller tools. Second-hand tools suitable for shell work are getting scarce and are not so easy to get hold of. Prices on all tools have advanced considerably. A feature of the present situation has been the development of the single-purpose lathe for which there is a big demand. Special tools for making shells have also been put on the market with exceptionally satisfactory results.

Supplies

A number of price changes have to be noted again this week. Solder, half-and-half, is higher at 25c, due to strength in the tin market. Prices of gasoline and benzine have been readjusted to bring gasoline $1\frac{1}{2}$ c higher than benzine. Gasoline is now being quoted at $23\frac{1}{2}$ c and benzine at 23c per gallon, in barrels. A sharp advance has been made in turpentine, which is now quoted at 85c per gallon. Linseed oil is higher and is quoted at 85c for raw and 88c for boiled oil. Business continues brisk.

Metals

The market has revived and is more active. Prices of practically all metals have advanced, tin showing the greatest strength. The sharp advance of tin is

owning to a belief that the Suez Canal is closed and also on account of submarine activity in the Mediterranean. It is expected that shipments of tin will be affected and with this account, Copper has advanced, and there is a better feeling in the market. Spelter, lead and antimony are all higher and the market is strong, while aluminum is higher and quotations nominal.

Tin.—The London and New York markets are excited, buyers being anxious to cover their requirements, due to the report that the Suez Canal has been closed. If such is the case there will be a delay in getting supplies, while there is also a chance of shipments being lost in the Mediterranean on account of submarines. This scare, together with a spot scarcity, has unsettled the market. Tin has advanced 8c locally and is now quoted at 48c per pound.

Copper.—There is a better feeling growing in the market and the London

market is strong. There is no special improvement noted in the demand from consumers, but producers are confident that the latter must become heavy buyers soon. Copper has advanced 1c and is quoted at 20 1/2c per pound.

Spelter.—The market is firm and high. A corner in spot spelter has developed in London and quotations have advanced. Spelter has advanced 1c locally, and is quoted at 19c per pound.

Lead.—There is a shortage of supplies of spot and early delivery in London, and the market has advanced. The market is strong in New York and the "Trust" price is slightly higher at 5.15c which may be advanced. Locally, lead has advanced 1c and is quoted at 7c per pound.

Antimony. The market is firm and there are indications of a scarcity in spot antimony developing if the demand for prompt metal continues as good as it has been during the week.

Antimony has advanced 5c and is quoted at 40c per pound.

Aluminum. The situation does not improve, and supplies are very difficult to obtain. Quotations have advanced 5c and are nominal at 65c per pound.



Moose Mountain Iron Mines at Sellwood, Ont., have closed down indefinitely after a series of disappointing experiments of the past several years to commercialize the immense bodies of ore which they control. The most recent experiments were with the Grondal system of concentrating and briquetting the ore for shipment to the blast furnaces, raising it from a 35 per cent. ore in the rock to a 60 per cent. in the concentrates, which was not a commercial success. It is estimated that over a million dollars has been expended by the Gates interests of New York and the Mackenzie and Mann interests of Toronto in this endeavor.

CANADIAN COMMERCIAL INTELLIGENCE SERVICE

The Department of Trade and Commerce invites correspondence from Canadian exporters or importers upon all trade matters. Canadian Trade Commissioners and Commercial Agents should be kept supplied with catalogues, price lists discount rates, etc., and the names and addresses of trade representatives by Canadian exporters. Catalogues should state whether prices are at factory point, f.o.b. at port of shipment, or, which is preferable, c.i.f. at foreign port.

CANADIAN TRADE COMMISSIONERS.

Argentine Republic.

H. R. Poussette, 278 Balcarce, Buenos Aires. Cable Address, Canadian.

Australasia.

D. H. Ross, Stock Exchange Building, Melbourne, Cable address, Canadian.

British West Indies.

E. H. S. Flood, Bridgetown, Barbadoes, agent also for the Bermudas and British Guiana. Cable address, Canadian.

China.

J. W. Ross, 6 Klukiang Road, Shanghai. Cable Address Cancoma.

Cuba.

Acting Trade Commissioner, Lonja del Comercio, Apartado 1290, Havana. Cable address, Cantracom.

France.

Phillipe Roy, Commissioner General, 17 and 19 Boulevard des Capucines, Paris. Cable address, Stadacona

Japan.

G. B. Johnson, P.O. Box 109, Yokohama. Cable Address, Canadian.

Holland.

J. T. Lithgow, Zuidblaak, 26, Rotterdam. Cable address, Watermill.

Newfoundland.

W. B. Nicholson, Bank of Montreal Building, Water Street, St. John's. Cable address, Canadian.

New Zealand.

W. A. Beddoe, Union Buildings, Customs Street, Auckland. Cable address, Canadian.

South Africa.

W. J. Egan, Norwich Union Buildings, Cape Town. Cable address, Cantracom.

United Kingdom.

E. de B. Arnaud, Sun Building, Clare Street, Bristol. Cable address, Canadian.

J. E. Ray, Central House, Birmingham. Cable address, Canadian.

Acting Trade Commissioner, North British Building East Parade, Leeds. Cable address, Canadian.

F. A. C. Bickerdike, Canada Chambers, 36 Spring Gardens, Manchester. Cable address, Cantracom.

Fred. Dane, 87 Union Street, Glasgow, Scotland. Cable address, Cantracom.

Harrison Watson, 73 Basinghall Street, London, E.C., England. Cable address, Sleighing, London.

CANADIAN COMMERCIAL AGENTS.

British West Indies.

Edgar Tripp, Port of Spain, Trinidad. Cable address, Canadian.

R. H. Curry, Nassau, Bahamas.

Colombia.

A. E. Beckwith, c/o Tracey Hnos, Medellin, Colombia. Cables to Marmato, Colombia. Cable address, Canadian.

Norway and Denmark.

C. E. Sontum, Grubbeget No. 4, Christiania, Norway. Cable address, Sontums

South Africa.

D. M. McKibbin, Parker, Wood & Co., Buildings, P.O. Box 559, Johannesburg.

E. J. Wilkinson, Durban, 41 St. Andrew's Buildings, Durban, Natal

CANADIAN HIGH COMMISSIONER'S OFFICE.

United Kingdom.

W. L. Griffith, Secretary, 17 Victoria Street, London, S.W., England.

INDUSTRIAL AND CONSTRUCTION NEWS

Establishment or Enlargement of Factories, Mills, Power Plants, Etc.; Construction of Railways, Bridges, Etc.; Municipal Undertakings; Mining News.

Engineering

Toronto, Ont.—The Canadian Hanson & Van Winkle Co. are building a brass foundry at a cost of \$5,000.

Galt, Ont.—The Perfect Machinery Co. will build a machine shop to cost \$4,000. S. L. Clark is general manager.

Chatham, Ont.—Park Brothers of this city have closed a contract with the Dominion Sugar Co. for \$14,300 worth of machinery for the new plant.

Berlin, Ont.—Louis F. Dietrich has purchased a property which will be converted into a garage. An elevator and other equipment will be repaired.

Hamilton, Ont.—The Canadian Chadwick Metal Co. are having the old Gompf brewery building altered and machinery installed for making munitions.

Waneta, B.C.—The Waneta Development Co. will immediately start construction of a hydro-electric power plant to be erected at the confluence of the Columbia and Pend O'Reille rivers, which will have a capacity of 80,000 h.p.

Toronto, Ont.—It is officially announced that the Ontario Hydro-electric Commission has completed the survey for a Government powerhouse to be erected between Queenston Heights and Niagara Falls, Ont. Plans are being prepared. It is planned to use the surplus waters of the Welland Canal to develop 300,000 h.p.

Electrical

Hespeler, Ont.—The Hydro Commission will install a new transformer and also a number of 100 c.p. nitrogen filled lamps.

Port Lambton, Ont.—A petition has been drawn up asking for the hydro-electric system to be extended to this town.

Agincourt, Ont.—This village is planning to secure connection with the Hydro-electric at Duncan, on the C. N. R., and it is understood the preliminary arrangements are all completed.

London, Ont.—By a vote of 65 to 8, the ratepayers of the village of Granton, fifteen miles north of here, on Nov. 9 carried a by-law authorizing the village council to enter into a contract with the

Hydro-electric Power Commission for a supply of power.

Stratford, Ont.—The council and representatives of adjoining municipalities met Engineer Gaby and officers of the Provincial hydro-radial union and approved of the general plans of the main Toronto to London hydro-radial line as it affects Stratford and district. A resolution was adopted that steps be taken to have necessary by-laws submitted to the electors in January.

Municipal

Hespeler, Ont.—The town council will call for tenders for a power station.

Guelph, Ont.—The installation of fire alarm system is being considered by the City Council.

Hamilton, Ont.—Fire Chief Ten Eyck has asked for a new fire alarm system to be installed.

Chatham, Ont.—Hydro power will probably be installed in the pumping station this year.

London, Ont.—The City Council contemplate further extensions to the water-works distribution system.

Tecumseh, Ont.—A new water distribution system is contemplated for this town. The cost is estimated at \$25,000.

Owen Sound, Ont.—The town council have decided to submit a by-law to the ratepayers to authorize a loan of \$12,000 to W. A. Wilson, of London, who will start a shoe factory here.

Regina, Sask.—The City Commissioners have decided to install a new pumping unit driven by electrical power at Boggy Creek. The new pump will have a capacity of about two and a half million gallons. The cost is estimated at \$12,000.

Toronto, Ont.—The Board of Control have received a dozen tenders for the construction of the new Don incinerator building exclusive of the new chimney. The prices ranged from \$84,500 to \$95,000, several being \$86,000. The Controllers awarded the tender to George Welof, whose price was lowest at \$84,500, subject to the approval of that Street Commissioner. The chimney will cost about \$9,000.

General Industrial

Hespeler, Ont.—The Porcelain Kitchen Furniture Co. will establish a factory here shortly.

Petrolia, Ont.—Fred Howlett has purchased a site and intends to erect a brick and tile manufacturing plant.

Preston, Ont.—The Solid Leather Shoe Co. contemplate the erection of an addition to their factory. Manager, J. Parker.

Thorold, Ont.—The Ontario Paper Mill here was damaged to the extent of \$2,000 by fire on November 9. The fire originated in the large bin which supplies the coal for the boilers. The loss is covered by insurance.

Tenders

Grand'Mere, Que.—Tenders are being received for the supply of one 500 h.p. turbine and dynamo. Engineer, L. S. Pariseau, Montreal.

Toronto, Ont.—Tenders will be received up to Tuesday, November 23rd, 1915, for the construction and erection of smoke breeching at main pumping station. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Halifax, N.S.—Tenders will be received by the Governor of the Province of Macao, up till January 8, 1916, for the supply of a steel, self-propelling dredges for the use of the Macao Harbor Works. Full particulars may be obtained at the office of Fred. H. Oxley, Consul for Portugal, Keith Bldg., Halifax, N.S.

Toronto, Ont.—Tenders will be received, addressed to the Chairman, Board of Control, City Hall, up to Tuesday, November 23rd, 1915, for the following: Asphalt, refined; brass and bronze castings; brass work for house services; bearing pedestals; castings; pipe; castings, special; castings, man-holes, etc.; general supplies; house numbers; hydrants; iron and steel; lead pipe; mineral dust; oils; rubber valves, etc.; stop valves. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Personal

Frank Chappell, town engineer of Oshawa, Ont., has resigned his appointment to accept a position with the McLaughlin Motor Co., Oshawa.

Wm. Weir, of Montreal, president of the Canada Foundries and Forgings, paid a visit recently to the Welland plants, Canada Forge and Billings & Spencer.

William Bissett Smith, general manager of the Dominion Transport Co., died in Montreal on November 8, in his 87th year. He was born in Huntley, Aberdeenshire, and came to Canada in 1855.

Frank W. Hinsdale, who, after spending a year and a half in helping to organize the work of the Ontario Workmen's Compensation Board, has completed his duties, and has left Toronto for New York.

W. P. Hinton, assistant passenger traffic manager of the G. T. R. and G. T. P., has been appointed traffic manager in charge of passenger and freight of the G. T. P. R., with headquarters at Winnipeg, also Western traffic manager of the Canadian Government Railways.

C. H. Cahan, Jun., of the Canadian Car and Foundry Co., was in Pittsburgh recently with three members of the Imperial Russian Commission. They visited a number of important industrial plants with a view, it was stated, of ascertaining just how soon certain orders they desire to place could be filled.

Refrigeration

Chatham, Ont.—A proposal to establish a municipal dairy is under consideration by the council.

Ottawa, Ont.—The Ottawa Dairy Co. has let the contract for the erection of an ice-making plant to cost \$15,000.

Toronto, Ont.—The Board of Control has sanctioned an expenditure of \$9,500 for additional cold storage rooms at the Municipal Abattoir.

Rigaud, Que.—Curtis & Harvey have had their storage rooms equipped with two 15-ton refrigerating machines, furnished by the Frick Co., Waynesboro, Pa.

Wood-Working

Berlin, Ont.—George Guentzler will build an addition to his woodworking plant.

London, Ont.—The George H. Beton Lumber Co. is planning to add electrical equipment to operate woodworking machinery.

Nelson, N.B.—Fraser, Ltd., Fredericton, N.B., intend to erect a large saw-mill at this place. Approximate cost, \$100,000.

Rimouski, Que.—Work is about to start on the erection of a shingle mill for Price Brothers & Co., Quebec. Estimated cost, \$15,000.

St. John, N.B.—A site has been purchased at Washademoak, N.B., by Daley & Carvell, of this city, on which they will build an axe-handle and woodworking plant.

Marine

A. A. Larocque has been appointed vice-president of the Sincenes-McNaughton Line, Ltd., Montreal, in succession to the late Major A. V. Roy, who met his death recently while fighting with the Canadian forces in France. Mr. Y. Dupre was elected to fill the vacancy on the directorate.

St. Johns, Nfld.—The steamships "Adventure" and "Bellaventure" have been sold to the Russian government and will be used to keep Russian ports clear of ice in the winter. The "Bellaventure" has recently returned from Hudson Bay. Before leaving for Europe a trial trip will be run with Russian officials on board.

Windsor, Ont.—President Pressano of the Great Lakes Engineering Works, announces that he has booked contracts for the construction of four additional steel freighters, three for coast service and one for the Great Lakes trade. The steamer for lakes service will be a ship of about 9,000 tons, of 450 feet keel length, and about 56 feet beam. The three coast freighters will be of Welland Canal size.

Building Notes

Toronto, Ont.—B. C. Whitney and O. B. Sheppard have decided to rebuild the Princess Theatre.

Toronto, Ont.—The New Method Laundry will make an extension to their building to cost about \$4,200.

Toronto, Ont.—The Toronto Hydro-Electric Commission propose erecting a large office building to cost \$450,000.

Montreal, Que.—The city of Westmount will erect a municipal building to

cost about \$150,000. Kenneth G. Rea is the architect.

St. John, N.B.—The Rhodes Curry Co., contractors, engaged on two new warehouses on the dock, have been instructed to build a third. The latter warehouse will be 80 ft. x 350 ft.

Contracts Awarded

Galt, Ont.—The R. McDougall Co. have been awarded a contract by the city for five hydrants at \$32.50 each.

Wingham, Ont.—The Canada Furniture Co. has received a large order for shell boxes, and are now making preparations to start work in the Union Factory.

Toronto, Ont.—The Board of Control have let the contract for the supply of stop valves and other apparatus for the main pumping station to Drummond McCall & Company, Toronto, at \$8,530.

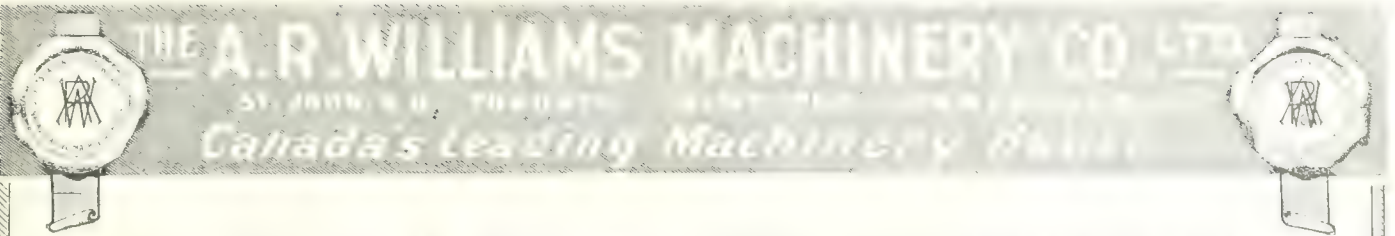
The Roxton Falls Manufacturing Co. has been incorporated at Ottawa with a capital of \$100,000 to manufacture articles in lead, copper, iron, malleable iron and wood at Roxton Falls, Que. Incorporators: Joseph Oscar Fauteux and Joseph Adolphe Desmarteau, of Montreal.

Chatham, Ont.—The Water Commissioners have awarded contracts for equipment for the pumping station. The contract for the pumps was let to the Canadian Allis-Chalmers Co., and the contract for the motors was given to the Canadian General Electric Co., Toronto. The pumps will have capacities of two million gallons and three million gallons respectively.

Moncton, N.B.—The contract for the steel superstructure of the new bridge over the Petiteodiac River, at this place, has been awarded by the Provincial Government to the Dominion Bridge Company of Montreal. Announcement to that effect has been made by the Provincial Board of Works, and it was said that the contract price would reach about \$125,000. The sub-structure will cost approximately \$200,000, making the total cost of the bridge about \$325,000.

Railways—Bridges

Victoria, B.C.—The C. N. P. R. is to resume construction work on the Vancouver Island sections of the system, not only in respect to the line to Patricia Bay and that to the West Coast, but also in the matter of the de-



BUYING AND SELLING SERVICE EITHER FOR PRESENT OR FUTURE REQUIREMENTS

Problems are confronting you every day simply because conditions and requirements are changing with the rapidity of thought.

Our constant experience and habit for nearly half a century has been to anticipate these changes and place them at the request of our clients.

Labor-saving devices, new machines for special or ordinary operations, or re-manufactured tools are the problems facilitated by our Service Department.

SHELL MAKING MACHINERY is our special service at the moment and perhaps your special need. We can meet it. Our experts have been studying the manufacture of the larger type shells—6", 8" and 9 1/2", and we are prepared to give you the benefit of their advice gladly and without obligation on your part.

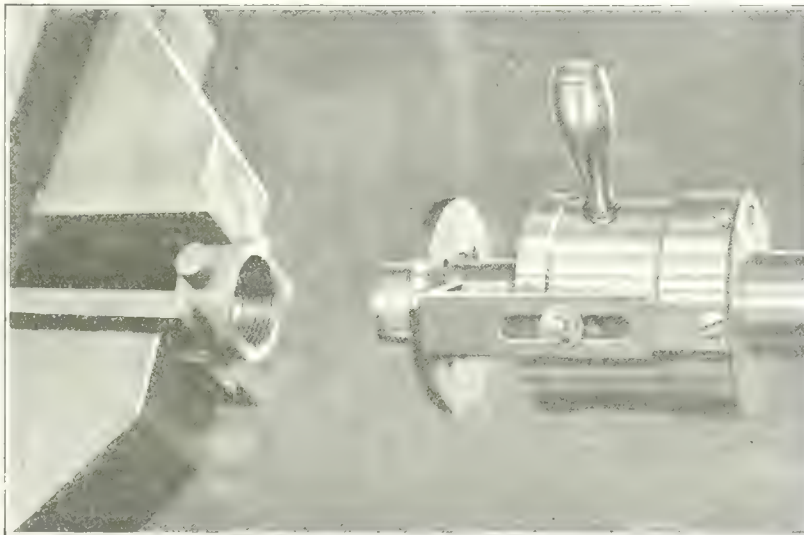
Consult our Service Department and get the benefit of professional advice—gratis.

SALES AGENTS:

The A. R. Williams Machinery Company, Limited
Toronto, Canada

IF IT'S MACHINERY—WRITE "WILLIAMS"

Let the Geometric Collapsing Tap Show You How



A Geometric Standard Tap on the Job

Universally adopted for tapping operations above 3/4-inch diameter.
Fitted for Turret Head Machines or Live Spindles.

Send along your specifications and get our quotation.

THE GEOMETRIC TOOL COMPANY

NEW HAVEN, CONN., U. S. A.

Canadian Agents: Williams & Wilson, Ltd., Montreal. The A. R. Williams Machinery Co., Ltd., Toronto, Winnipeg and St. John, N.B.

If what you want is not advertised in this issue, consult the Buyers' Directory at the back.

development of terminal facilities on the former Songhees Indian Reserve. It is hoped before the close of the year to have a section of the West Coast line completed as far as the first point reached at tidewater.

St. Marys, Ont.—An important hydro-radial highway meeting was held here on November 11. Mr. Lyon, chairman of the Ontario Hydro-Radial Union, presided. Secretary T. I. Hannigan was also present along with Engineer Gaby, chief engineer of the Ontario Hydro-Electric Commission, and about 35 representatives of the following municipalities: London, Lucan, Exeter, Bidulph, Blanshard and St. Marys. Resolutions were passed approving of the map plans as presented.

Toronto, Ont.—Plans for the second link in the Hydro-Electric Radial System that is to link up Toronto with Sarnia and take in all the municipalities along the line from Toronto, by way of Guelph and London, received emphatic approval on October 28 when the representatives of the eighteen municipalities interested in the section from Guelph to London met to consider the proposals of Sir Adam Beck and his colleagues of the Hydro-Electric Commission. By-laws will be prepared in the various municipalities and submitted to the ratepayers at the next municipal elections.

Trade Gossip

New Liskeard, Ont.—The Wabi Iron Works have recently installed an electric furnace.

The Linde Canadian Refrigeration Co. will install an ammonia rectifier and oil trap at the Municipal Abattoir, Toronto.

The National Steel Car Co., Hamilton, Ont., will manufacture motor-driven fire apparatus in addition to their present lines.

Gananoque, Ont.—The Ontario Steel Products Co. have received a large order for automobile springs and trench digging shovels.

Expansion of Hydro System.—Sir Adam Beck, Chairman of the Hydro-Electric Power Commission, had a meeting with the Ontario Cabinet recently and submitted further data with reference to increased power development at Niagara Falls.

The Standard Steel Co. has been organized at Montreal to manufacture steel products and shells. A building has been rented and will be equipped with the necessary machinery. The head

office is in the Transportation Building, and the president is E. G. Jackson.

Petrolia, Ont.—The Western Sugar Refining Co., which proposes building a sugar beet refinery here, have appointed the following provisional directors: Ralph D. Mitchell and D. J. Kelly of Cleveland, O.; David A. Gordon of Wallaceburg, Ont.; K. C. Kerr and R. G. R. MacKenzie, of Petrolia.

Agricultural Machinery for France.—Two big trams made up of sixty car-loads of agricultural machinery have been shipped by Massey-Harris Co., from Brantford, Ont., for use in France. War for some time cut off the export trade of the local branch of the firm, but lately it has picked up again.

The Nova Scotia Steel and Coal Co. has disposed of \$1,500,000 of common stock and \$1,000,000 of 6 per cent. debenture stock. The capital which has been obtained in this way will greatly strengthen the financial position of the company and enable it to comfortably take care of any additional business that is offering over and above the large amount which is now on hand.

The Canadian Briscoe Co. has been formed by Carriage Factories, Ltd., of Canada, as a subsidiary. The Canadian Briscoe Co. will assemble the parts in Canada from the Briscoe Motor Co., of Jackson, Mich., and the cars will be sold through Carriage Factories, Ltd., which has acquired the carriage manufacturing end of the McLaughlin Motor Co., Oshawa, Ont.

New Trade Commission.—The Minister of Trade and Commerce has appointed a new Trade Commission to the Far East. L. D. Wilgress, who for some time has been training in the department here, is going to Omsk, while C. W. Just will go to Petrograd. Mr. Just has conducted an extensive investigation into possibilities of trade with Russia and reports many promising openings.

Railway Earnings New High Record.—The gross earnings of the three Canadian railroads, the C. P. R., the G. T. R. and the C. N. R., for the month of October reached notable dimensions. For the fourth week they were \$7,147,358, or an increase of \$2,413,017, which is at the rate of 50.9 per cent. over the corresponding period a year ago. These are new high records for years. The combined gross earnings of the three roads for all October were \$21,656,192, an increase of \$4,942,000 over September, of \$7,464,000 over August, of \$8,500,000 over July, and of \$8,790,000 over June. Compared with a year ago, the increase was \$5,519,000, or 34.2 per cent., this being the first monthly increase since the war began, and compar-

ing with a decrease of 3.7 per cent. in September.

The Canadian Steamship Lines, it is stated, have 107 boats in active service, 65 freight, of which 16 are on the ocean and 42 passenger. The ocean freighters, the same authority states, earn on the average \$10,000 net per month, which for the winter months figures out at nearly \$800,000. In addition to this, six vessels of the Quebec Steamship Company, a subsidiary, operate all year. The passenger revenue this year has not been as large as in 1914, but the above figures indicate that ocean traffic alone will wipe out last year's deficit. Freights from the head of the lake average about 4 cents this year against 13/4 in 1914. Operating costs have been cut down by means of various economies to the extent of about \$400,000. These are the reasons why September and October earnings alone stood almost half a million dollars ahead of the corresponding months in 1914. It is well known that freight boats had very small storage cargoes at the head of the lakes last winter, but this year the capacity of the fleet of the company will be filled, to the extent of about 2,500,000 bushels, which, it is estimated, will net the company in the neighborhood of \$200,000.

New Incorporations

The Ontario Aeroplane Co. has been incorporated at Toronto with a capital of \$200,000 to manufacture aeroplanes, hydroplanes and water boats at Toronto. Incorporators: Jacob William Broudy and Thomas Hubert Wilson, of Toronto.

Gray-Dort Motors, Ltd., has been incorporated at Toronto, with a capital of \$500,000 to make motor cars at Chatham, Ont. Incorporators: J. Dallas Dort of Flint, Mich., Robert Gray and William Murray Gray of Chatham, Ont.

The Algoma Nickel Mining Co. has been incorporated at Toronto with a capital of \$10,000 to acquire and develop mines and mineral lands. Head office at Toronto. Incorporators: George Hugh Baird and Henry Nicol Baird, of Toronto.

The Maple Leaf Motors, Ltd., has been incorporated at Ottawa, with a capital of \$750,000, to manufacture automobiles and motor cycles, etc., at Brantford, Ont. Incorporators—James Harley and Edmund Sweet, of Brantford, Ont.

The Reginal Construction Co. has been incorporated at Ottawa, with a capital of \$100,000, to carry on business as contractors. Head office at Ottawa.

PETRIE'S WEEKLY LIST

Of New and Used Machine Tools in Stock for Immediate Delivery

Turret Lathes and Screw Machines

- 22" x 7' Lodge & Shipley
- 20" x 10' American
- 20" x 6' Bridgeport
- 18" x 6' Desses
- 15" x 5 1/2' Fox, American
- No. 3 Pratt & Whitney
- No. 1 Pratt & Whitney
- 5" Cleveland automatic
- 5" Cleveland automatic
- 5" Cleveland automatic
- 8" x 31" Brown & Sharpe
- 6" x 28" Brown & Sharpe Co.
- Poster ring turret
- Garvin double turret

Engine Lathes

- 30" x 12' Putnam
- 30" x 10 1/2' Ford
- 24" x 24' Ethel
- 24" x 12' Niles
- 24" x 12' Dupret
- 20" x 12' Bertram (gap)
- 20" x 10' Powell
- 20" x 8' Bullard
- 18" x 8' Lodge & Davis
- 18" x 8' Bradford
- 18" x 8' Hochburg
- 18" x 6' Barker
- 17" x 8' Blanseth
- 15" x 5' Fuller

Upright Drills

- 20" Prentice
- 20" Rockford (2)
- 20" Baker (heavy duty)
- 20" Buff do (1)
- 20" Bertram (2)
- 20" Rockford
- 20" Barnes
- 14" Bertram universal radial
- 12" Bertram universal radial
- 12" Stevens plain radial

Planers

- 52" x 70" x 11' Ford
- 50" x 70" x 17' Wheeler
- 50" x 70" x 10' Putnam (2) (radial)
- 20" x 20" x 8' Bertram
- 50" x 70" x 12' Lodge & Davis
- 15" x 8" Cleveland automatic
- 10" x 10" Hochburg (2) (radial)
- 9" Smith & Mills
- 3" Forday
- 2" Barker
- 10" Garvin
- 10" Dimples
- 7" A. N. Stearns

Milling Machines

- No. 4 Brown & Sharpe (radial)
- No. 12 Brown & Sharpe (radial)
- No. 3 Greenough (planer)

Presses

- No. 300 Brown-Bogies
- No. 370 Brown-Bogies
- No. 41, Bliss
- No. 5 Waterbury
- No. 4 Sarnia
- No. 2, C. J. C.
- No. 1, Smith & Brown

Miscellaneous

- 50" lathe with gear change
- 14 1/2" Brown grinder
- Bullard universal grinder
- No. 1 Dwight S. lathe
- 1 1/2" Bertram slotter
- 11" Bertram ball mill
- 11" Special ball mill
- 2" Merrell pipe machine
- 6" Gunter pipe mill

Prices, Descriptions and Full Particulars on Request

H.W. Petrie, Limited

Front St. W. - Toronto, Ont.

real, Que. Incorporators Charles Gasparid Hebert and Arthur Laberge, of Montreal.

The Utilities Equipment Co. has been incorporated at Toronto with a capital of \$40,000 to manufacture electrical and mechanical apparatus and appliances at Toronto. Incorporators: William Davidson and John Calvin McFarlane of Toronto, Ont.

The Dominion Magnesite Co. has been incorporated at Ottawa, with a capital of \$100,000, to develop and operate mines, minerals, mining lands at Calumet, Que. Incorporators: Walter Robert Lorimer Shanks, Francis George Bush, of Montreal.

The Transcona Shell Co. has been incorporated at Ottawa, with a capital of \$50,000, to manufacture shells, bombs and munitions of all kinds. Head office is at Montreal. Incorporators—F. G. Bush, G. H. Drennan and H. W. Jackson, all of Montreal.

Cleveland, Ltd., has been incorporated at Ottawa, with a capital of \$40,000, to purchase a certain secret process known as the "Cleveland Process." Head office at St. John, N.B. Incorporators: Isaac MacDonald and Laurence Alexander Barry, of Halifax, N.S.

The E. W. Jeffres, Ltd., has been incorporated at Ottawa with a capital of \$500,000 to carry on the business of manufacturing chemists at Walkerville, Ont. Incorporators: Edward Worsham Jeffres, of Detroit, Mich., and Albert J. Gordon, of Walkerville, Ont.

The Central Engineering Co. has been incorporated at Ottawa with a capital of \$25,000 to carry on business as general dealers in and manufacturers of machinery at Montreal, Que. Incorporators: Thomas Arnold, Joseph Atter and Herbert M. Ewan, all of Montreal.

The Dominion Copper Products Co. has been incorporated at Ottawa, with a capital of \$400,000, to manufacture articles made of copper, brass and all other metals, at Montreal. Incorporators: Walter Lorimer Sands and Francis George Bush, of Montreal.

The Canadian Dove Smith Co. has been incorporated at Toronto with a capital of \$40,000, to manufacture machinery and munitions of war at Toronto. Incorporators—Roderick George Kennedy, Joseph Henry Barker, and Newton Howard Manning, all of Toronto, Ont.

Greenleafs, Ltd., has been incorporated at Toronto with a capital of \$40,000, to purchase the business of Greenleaf & Son, machinists, electricians, automobile repairers, at Belleville, Ont.



Will Give You Exceptional

Shell Forging Production

WITHOUT AN EQUAL FOR BOTH FIRST AND SECOND OPERATION PUNCHES.

Comes to you heat-treated and ready for use. It does not stick to the work.

There are many cases where each punch has turned out over 2,000 shells.

It means more shells, per machine per day.

STEEL OF EVERY DESCRIPTION.

Hawkrige Brothers Company

303 Congress St., BOSTON, MASS

ADVERTISING.

Advertising in a trade paper is simply stating openly who you are and what your business is. It is pointing out to the readers that you have something of service for them, a commodity or service that to profit both you and them. The only men who do not advertise are those who have nothing to offer. They are dead, even if they do not

LOWE

Service determines the value of a file

When we speak of "Service," our calculations mean a very broad interpretation of the term.

First of all we have in mind the "DELTA," its inimitable hardness and sharp, clean cutting teeth that make it a standard tool of quality for reducing jagged edges to smooth working surfaces.

Then we think of the man handling the tool.

We know perfectly well that a mechanic and a "DELTA" are life-long friends. He knows that his work is easier and that at the same time he can produce more of it.

This second consideration is the human element. With the "DELTA" you get all that counts in quality.

We have the tool and you have the man. **RESULT:** Quality of work and maximum output.

Our guarantee is "satisfaction," or money refunded.



DELTA FILE WORKS

PHILADELPHIA, PA.

CANADIAN AGENTS:

H. S. Howland, Sons & Co., Toronto
 Starke, Seybold, Montreal;
 Wm. Stairs, Son & Morrow, Halifax;
 Merrick-Anderson Co., Winnipeg
 ALL LEADING JOBBERS

Incorporators—Henry Wilbur Greenleaf and Charles Orlando Greenleaf, of Belleville, Ont.

Yukon Copper Co. has been incorporated at Ottawa, with a capital of \$200,000, to carry on the business of mining and smelting copper. Head office at Ottawa. Incorporators—W. D. Greenleaf, of Whitehorse, Y.T.; Alfred Thompson, of Dawson, Y.T., and J. E. Smellie, of Ottawa.

The Gunn Electric Co. has been incorporated at Ottawa, with a capital of \$20,000, to manufacture electrical hydraulic, mechanical and other machinery at Montreal, Que. Incorporators—Edward James Gunn, William James Shaugnessy and Clifton Graves Heward, all of Montreal.

The Wizard Tire Inflator and Fire Extinguisher Co. has been incorporated at Ottawa, with a capital of \$50,000, to manufacture tire inflators and fire extinguishers, fluid air, gas or other receptacles, at Toronto. Incorporators—John Edward Carroll, of Philadelphia, Pa., and James Douglas McWilliams, of Toronto, Ont.



TENDERS FOR SOUTH AFRICAN REFRIGERATING PLANT

THERE have been forwarded to the Department of Trade and Commerce, Ottawa, by W. J. Egan, Trade Commissioner, Cape Town, specifications and plans for the supply and erection of an ice-making and refrigerating plant and for the fitting up of refrigerating chambers at the municipal abattoirs, Newton, Johannesburg. The contract calls for the supply and erection at the above abattoirs of an ice-making and refrigerating plant with necessary foundations, etc., complete; all insulated walls, partitions, floors, ceilings, doors, etc., necessary to construct the various compartments in basement with all work required to leave same in complete working order; two lifts, with all operating gear, gates, etc., complete; all running rails for conveying, and hanging rails for hanging carcasses, complete with all switches, hangers, runners, etc., in basement and lifts. Tenders for the above are to be in the tender box, municipal offices, Johannesburg, by or before noon on Thursday, December 30, 1915. Specifications and drawings may be inspected at the Department of Trade and Commerce, Ottawa. (Refer File No. A-1842.)



MONTREAL DRY DOCK & SHIP REPAIRING CO.

WHEN the steamer Rock Ferry went into dock at the end of Wellington Basin on Mill Street, Montreal, on November

Fumely-Wachs Machinery Co.

121 N. JEFFERSON ST.

CHICAGO

ILLINOIS

A Few of Our Second-Hand Tools in Stock for Immediate Delivery:

Automatic Screw Machines

Brown & Sharpe No. 2, 5/8 inch (2)
 National Acme No. 53, 4-spindle, 1 inch.
 Pratt & Whitney, 1 inch.
 Hartford, 1 inch.
 Cleveland 3/4 inch, traction disc feed (5)
 Cleveland 3/4 inch, plain (2)
 Cleveland 3/8 inch, plain (15)
 Cleveland 2 inch traction jigger.
 Wells 3/8 inch.

Lathes

12" x 7' Fairbanks
 14" x 6' Silk
 16" x 6' LeBlond
 20" x 10' Fitchell
 25" x 12' Reed.

Planers

30" x 24" x 8' Pease.
 30" x 30" x 8' Gray.
 24" x 24" x 6' Lodge & Davis.
 36" x 36" x 8' Fitchburg
 36" x 35" x 15' Woodward & Powell.

Presses

Bliss No. 18 o.b.l. (10)
 Bliss No. 42 o.b.l. (5)
 Rockford No. 2 o.b.l.
 American Can No. 3 o.b.l.
 American Can No. 4 o.b.l.
 American No. 4 1/2 o.b.l.
 Wood No. 12 open back (5)
 Crosby No. 40 open back (4)
 Crosby No. 18 o.b.l.
 Crosby No. 19 o.b.l. (4)
 Crosby No. 119 o.b.l.
 Crosby No. 1 o.b.l. (4)
 Bliss No. 69-N Double Acting
 Advance No. 12 A Double-Acting
 George A. O'Brien Press or Brake
 Stone No. 3 8-1/2" Back (2)

Milling Machines

Brown & Sharpe No. 4 Universal
 Brown & Sharpe No. 12 Lincoln (5)
 Brainard No. 7 Lincoln
 Newton No. 4 Plain
 Pax No. 3, Hand and Power
 Brown & Sharpe No. 11 Lincoln (2)
 Warner & Swasey No. 2 Disc Sinker

Shapers

16" Stockbridge, crank
 15" Hendey Tool Room
 20" Smith & Mads. b.g.
 21" Averbeck, b.g.
 30" Gould & Touchard, b.g.

Drill Presses

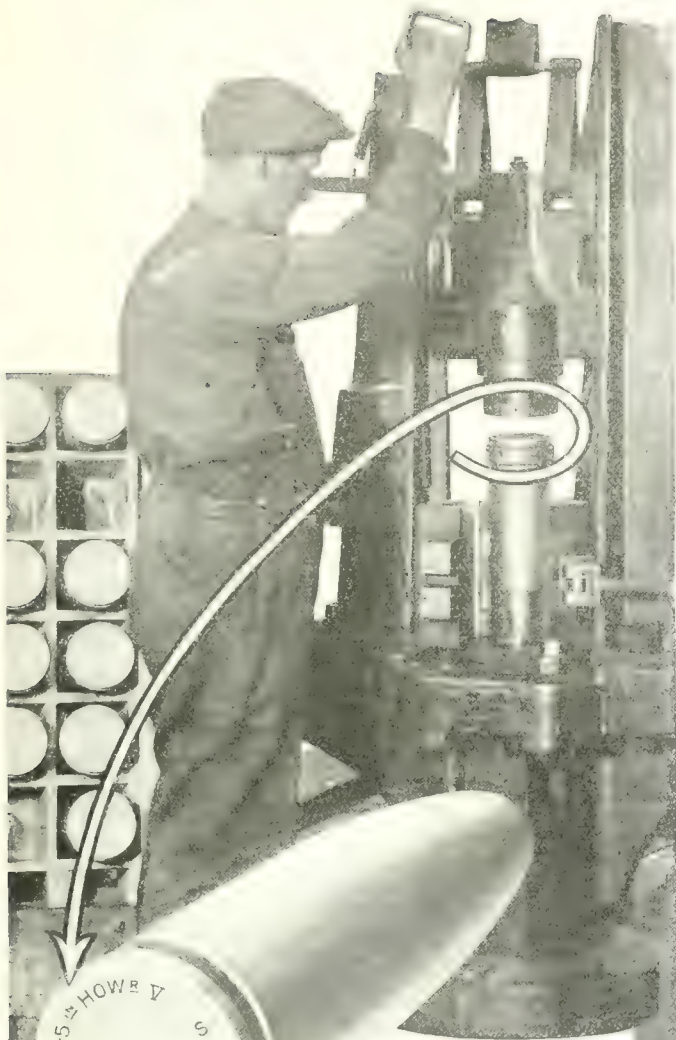
16" Square Base W & L feed (10)
 20" Wheel, lever and power feed (5)
 20" Wheel, lever and power feed, b.g. (4)
 21" Stationary Head, complete (2)
 24" Sliding Head, complete
 28" Sliding Head, complete
 31" Sliding Head, complete (2)
 18" and 14" Rod and Gear Box
 18" and 14" Rod and Gear Box

Boring and Turning Mills

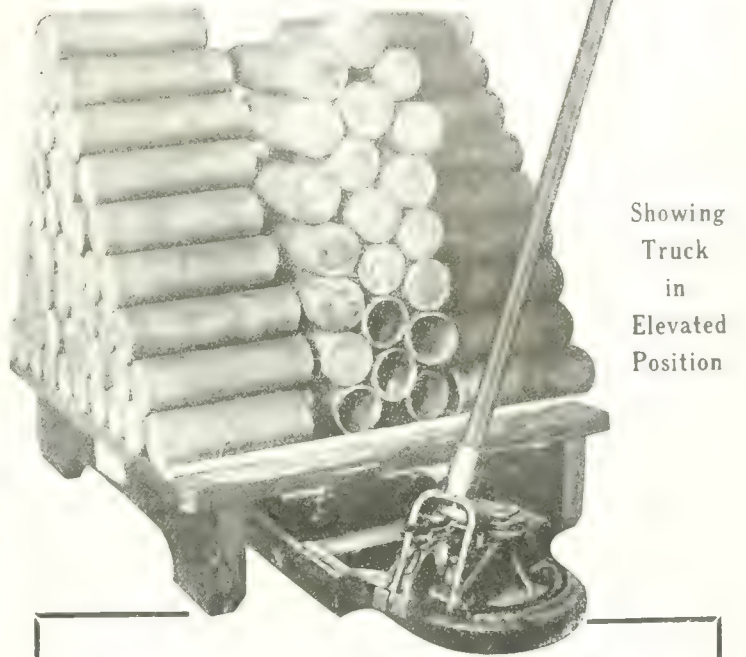
Bliss (S. W. & S. W.) heads
 Barrett No. 5 Cylinder Boring Mill

Miscellaneous

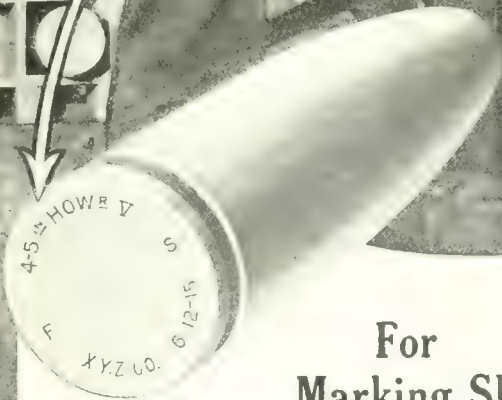
Large Stock Keyseaters, Ball Cutters,
 Centering Machines, Wire Straighten-
 ers,
 Rosly 20-18" 2-spindle Grinder with ring
 wheel chucks.



The Labor Saver



Showing Truck in Elevated Position



For Marking Shells

Leading shell contractors in the United States and Canada use J. A. Matthews steel lettering dies and stamps because Matthews have made a special study of the requirements for this work, gave their dies that stand up and make the promptest deliveries. They

Use Matthews Dies

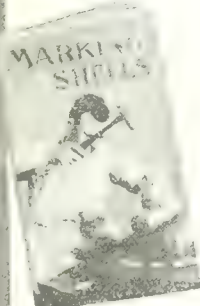
with various stamping machines, such as is shown above. Matthews special holders and interlocking type Matthews steel hard stamps.

This Book Shows How

well-known concerns are marking shells and illustrates, by actual photographs of shell marking, the various Matthews dies made for this work. The only book covering this important feature, containing valuable information and practical suggestions on marking shells.

Gratis sent on request to list of steel concerns. Kindly use the company's letterhead. If you use your stamps you will be recognized in Matthews complete catalog of steel lettering dies and stamps.

Please mail or wire your next order to:



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 PATENT OFFICE
 1150
 MARKS OF STEEL LETTERING CO. OF CANADA

This ELEVATING TRUCK

greatly reduces cost of producing
SHELLS
 or any factory product where numerous operations are required.

All material is stacked on the platforms. To move material the truck is backed under the platform; the handle of the truck is then pushed down, keeping the button depressed, which raises the truck bed, and with it the loaded platform, at the same time automatically locking it in its raised position.

When hauled to the desired position the button is pressed and the handle raised, lowering the platform to the floor. The truck is then drawn from underneath and is ready to move another platform.

Raising and lowering of the truck can be operated with one hand, can be raised or lowered at any angle.

Special features include: large, light, and short wheel base; extra large, heavy-duty shaft; wide, low, friction loading funnels; ball bearing fighting nuts; belt driven loading vibrators; bench vises and presses with attachments for pressing in bands; by using rollers attached to the truck, the truck is pushed and pulled.

You will profit by 20% to 25% by using this truck.

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LIMITED

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Transmission Ball Bearing Co. Inc., 1407 West Ave., Buffalo, N.Y.

to have no water required, so the original design for the work to be done by the Montreal Dry Dock & Ship Repairing Co.

For nearly two years this contract has been done, and at the dock, which before that time was known as the Tate Dry Dock. All this summer work has been proceeding at deepening the dry dock so that its scope could be greatly extended. On Friday, November 5, a group of prominent business and shipping men were shown over the plant to see for themselves just how the dock

can take any lake steamer which comes through the Lachine Canal.

The dock has been deepened four feet for 250 feet in length, and a new concrete bottom laid. The Rock Ferry is 260 feet long, and draws 11 feet when light, an indication of the capacity of the new dock. There is a good plant for iron work, completely supplied with air and electric tools. The dock is 50 feet wide and the blocks three feet six inches high. The entire length of the dock is 430 feet.

Among those present were Thomas Hall, of the Hall Engineering Works, who is managing director of the Montreal Dry Dock & Ship Repairing Co.; F. H. Fox, secretary-treasurer; Captain Johnson, marine superintendent of the Canada Steamship Lines; E. Marceau, chief engineer Quebec Canals; D. O'Brien, superintendent Lachine Canal; Captain Archibald Reid, port warden; Captain J. N. Bales, assistant port warden; L. L. Henderson, manager and director Montreal Transportation Co.; F. W. Cowie, chief engineer Harbor Commission; A. Kastella, chief engineer Department of Public Works; George Hadrill, secretary, Montreal Board of Trade; Captain J. O. Grey, Frank Wright, and Ralph Hall, the last three from the Hall Engineering Works.

CLASSIFIED ADVERTISEMENTS

If you want to sell or buy a second-hand lathe, planer or any other shop equipment, let "CANADIAN MACHINERY" pick out a seller or buyer for you. How about that second-hand engine or boiler which you would like to dispose of?

Rates (payable in advance):—2c per word first insertion, 1c per word subsequent insertion. 5c additional each insertion when Box Number is required. Each figure counts as one word.

FOR SALE

FOR SALE - NEW HAVEN SIXTY INCH face plate Lathe—fifteen foot bed, complete with countershaft, steady rest, etc. Excellent tool for boring and nosing shells. Cost thirty-five hundred—will take two thousand. Bancroft Lathe, ten inch swing, 5 ft. bed, screw cutting, good condition, \$125. Winnipeg Machinery Exchange, Winnipeg. (21)

FOR SALE

FOR SALE—GAS ENGINE. 22 H.P., WITH Magneto, Battery, Water Tank, Gasometer, Muffler and 26" Clutch Pulley, cheap. This engine was used four months during the erection of our plant. The same is equipped for natural gas, but can be changed and used with gasoline at very reasonable expense. Known United States engine. Original cost, \$600.00, besides the duty. Address H. Mueller Mfg. Co., Ltd., Sarnia, Ont. (21)

FOR SALE—ELECTRIC PASSENGER AND freight elevator plant. Patterns—Drawings—Blueprints—special and ordinary machinery and stock. This is a splendid business—few competitors. We offer a decided bargain. Winnipeg Machinery Exchange, Winnipeg. (21)

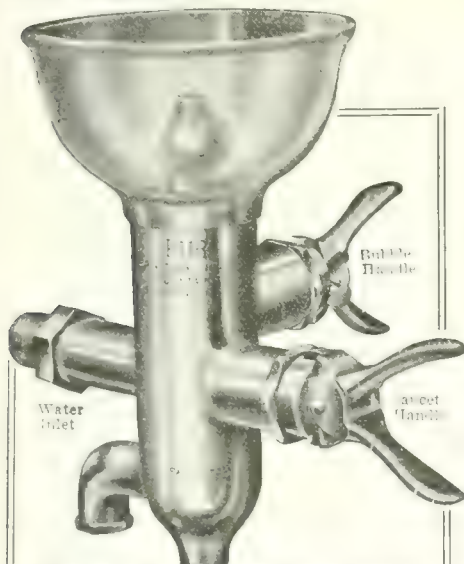
FOR SALE—RICHARDS INDICATOR, complete, with attachments, nearly new, in perfect order. Apply Canadian Machinery, 113 University Ave., Toronto.

I BELIEVE

*In Safety, First and always.
In providing for the Health of my Fellow Workmen.
In Light and Air and Sanitary Working Conditions.
In Clean, Fresh drinking water for everybody.
In the Safety, Economy and Betterment.*

PURO SANITARY DRINKING FOUNTAIN

MADE IN CANADA



For many years the Sanitary drinking fountain has been the most popular fountain in the world. It is the only fountain that is truly sanitary. A simple fountain is not sanitary. It is only when the water is filtered and aerated that it is safe to drink. The Puro fountain does this. It filters the water through a special filter and aerates it by passing it through a series of small openings. This process kills the germs and makes the water fresh and palatable. The Puro fountain is also very durable and easy to clean. It is made of brass and has a polished finish. It is the only fountain that is truly sanitary and safe to drink from. It is the only fountain that is truly sanitary and safe to drink from.

"PURO - FY"

YOUR WATER SUPPLY

Puro Sanitary Drinking Fountain Company
147 University Ave., TORONTO, CAN.

MUNITIONS EXPORTS FROM THE UNITED STATES

EXPORTS of war materials from the United States now average more than \$1,000,000 a day, according to a statement issued yesterday by the Foreign Trade Department of the National City Bank. From the port of New York alone the exports in September included \$6,500,000 worth of gunpowder, \$3,500,000 worth of shells and explosive projectiles, \$1,250,000 of cartridges, nearly \$1,000,000 of dynamite, cordite and trinitrophenol, \$500,000 worth of primers and fuses, \$1,000,000 worth of empty projectiles, and nearly \$1,000,000 worth of firearms.

In addition there were shipped in September \$1,000,000 of military goods, nearly \$1,000,000 of aeroplanes and more than \$6,000,000 worth of auto trucks. There also were enormous shipments of copper, lead, spelter, hospital goods, harness and saddlery. Most of the shipments were to Great Britain, France and Russia.

Catalogues

Don't Waste Your Fuel is the title of a folder issued by the James Morrison Brass Mfg. Co., Toronto. The folder describes and illustrates two patterns of

FOR SALE

**16 Engine Lathes
18-in. to 42-in. Swing**

**American Machinery Exchange
217 Centre St., New York City**

For Sale

Second-Hand Steel Tiering Machine, operated by hand.

By the use of this machine one man may lift as high as the ceiling, if necessary, heavy boxes, bales, rolls, etc.

This machine is in first-class condition, and is offered at a sacrifice.

**Box 157
Canadian Machinery**

We are installing
Beath Overhead Tracks, Trolleys and Hoists
 For Hoisting and Conveying
5-in., 6-in., 8-in. and 9.2-in. Shells

in the receiving, forging, machinery and shipping departments. Beath Overhead Runways require no floor space and are particularly adapted for this service. The weight of these Shells have caused a new problem in handling that will have to be met and overcome by manufacturers of these heavier types of explosives. *Let our engineering department show you how a Beath Overhead Runway can be made to fit into your requirements.*

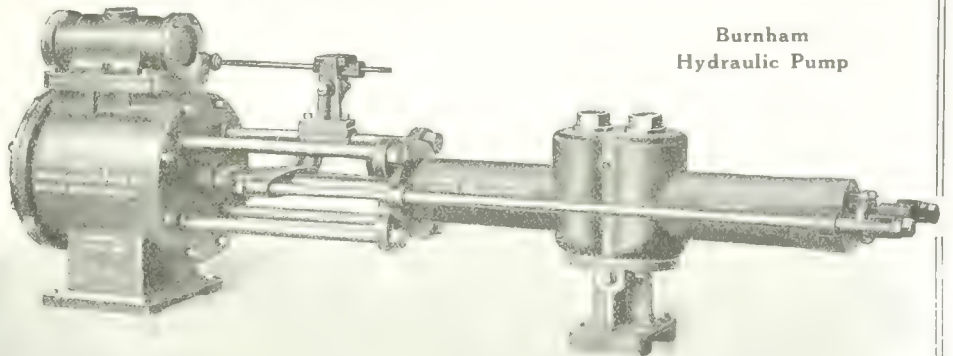
W. D. Beath & Son, Limited

ENGINEERS AND MANUFACTURERS

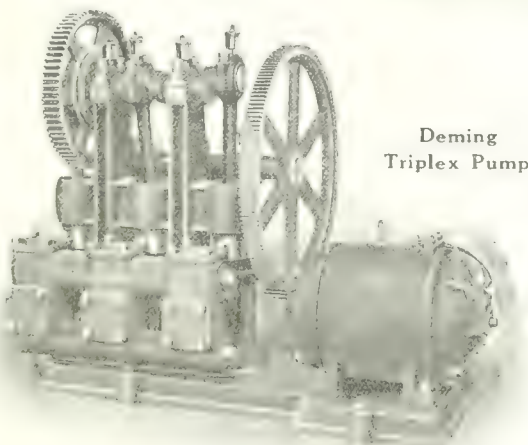
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Pumps
 for
**SHELL
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Burnham
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GOOD PUMPING MACHINERY is essential to greatest output on shells or any other work.

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Darling Brothers Limited
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SHEET METAL STAMPINGS

Automobile Fenders, Hoods and Gasoline Tanks

We are now manufacturing a number of lines for Canadian firms filling war contracts.

The quality of our production is one grade — THE BEST. Our facilities and equipment enable us to give a very attractive price and prompt service.

THE
Dominion Forge & Stamping Co.
 LIMITED
 Walkerville, Ont.

DROP FORGINGS

recording gauges for steam pressure, vacuum and temperature range.

Temperature Booster.—The W. E. Clark Co., Toronto, have issued a folder describing the Clark temperature booster. This is a device for increasing the circulation of the water in hot water heating systems. A full description covering the construction and method of operation is given, accompanied by sectional views.

Shop Furnaces made by the American Steam Equipment Co., Chicago, Ill., are the subject of a supplementary bulletin recently issued. The lines briefly described include portable and stationary rivet forges, welding and forge furnaces, annealing, tempering and hardening furnaces, etc. The bulletin contains complete export shipping data for each product listed.

Heat Generator.—A booklet describing the "Knickerbecker" heat generator made by the James Morrison Brass Mfg. Co., Toronto. This appliance, which is designed for hot water heating systems, is illustrated and described, the illustrations including a number of diagrams of heating systems showing location of the generator. The method of installing the generator is described and also the benefits to be derived from its use.

Piston Rings—"To Save and to Hold Power" is the title of a bulletin issued by W. H. Banfield & Sons, Toronto, Ont., and describing the "Leak-Proof" piston ring. The bulletin first of all deals with piston rings in a general way and then proceeds to describe in detail the principal features of "Leak Proof" ring. The method of making these rings is described, followed by instructions for installing and the variety of uses.

The Lighting of Textile Mills with Edison Mazda lamps is the title of bulletin No. 4906 distributed by the Canadian General Electric Co., Toronto. The bulletin contains a number of excellent half-tones showing interior views of textile mills where "Mazda" lamps are installed. The reading matter deals with "Mazda" lamps as applied to the illumination of textile mills, while a variety of types of lamp are illustrated. Tables are included giving data covering these lamps.

Book Review

Forging of Iron and Steel, by William Allan Richards, B.S., M.E., 219 pages, 8 in. x 5 in., 337 illustrations. Published by the D. Van Nostrand Co., New York. Price \$1.50 net. This is a new text book for the use of students in colleges, sec-

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In all countries. Ask for our Inventor's Adviser, which will be sent free.
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We are manufacturers of stamped parts for other manufacturers.

We do any kind of sheet metal stamping that you require. Our improved presses and plating plant enable us to produce the finest quality of work in a surprisingly short time.

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About Belts**



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Contains Chapters On

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Main Belting Company:

Please send that 64-page book about belts, postpaid and without cost, to me.

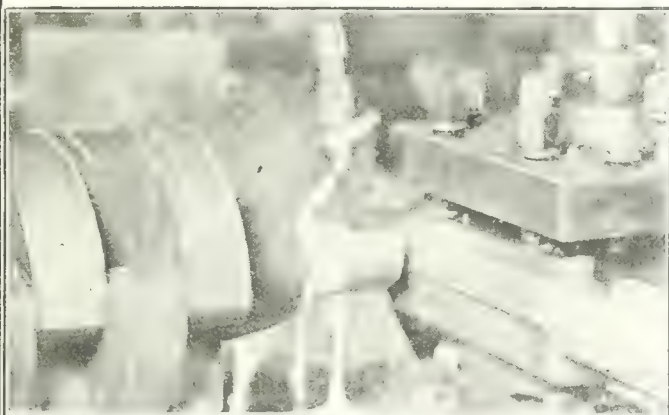
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10½ St. Peter St., - MONTREAL



Economic Quenching Oil

SHELL MANUFACTURERS use ECONOMIC QUENCHING and TEMPERING OILS. They are MONEY SAVERS, and we guarantee immediate delivery.

Made in Canada

**Canadian Economic Lubricant Co.
LIMITED**

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Exhibitors' Weekly Bulletin

San Francisco, Saturday, September 4, 1915.

Published by the Exposition Exhibitors' Service Bureau, Waldemar de Bille, Manager, at 308 Wells Fargo Building, San Francisco.

Subscription Price: One year, \$2.50. Remit by check, postal or express money order, or bank draft.

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**American Pulley Company Given
Gold Medal by Jury of
Awards**

Exhibit in Palace of Machinery is Comprehensive and Intensely Interesting

Again the American Pulley Company of Philadelphia, Pa. seems to have taken the lead in the manufacture of its products, having been awarded the Gold Medal by the international Jury of Awards at the Pan-

We are naturally gratified at this distinction—especially so because it is an emphatic endorsement—an amplification—of similar awards accorded AMERICAN STEEL SPLIT PULLEYS in former years.

It is another argument, too, for the pulley buyer to consider in addition to the strength, light weight, general engineering excellence and wide use—over 2½ million—of AMERICAN Pulleys. Listed sizes—3" to 120" diameter. Stocks in Philadelphia, New York, Boston, Chicago and Seattle, and the stores of over 200 dealers.

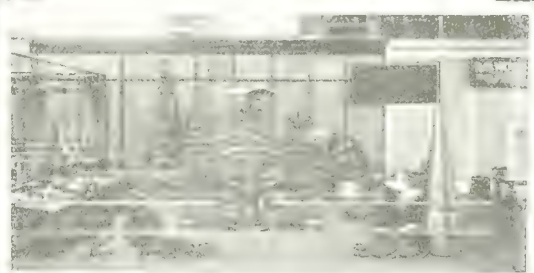
Full information on inquiry.

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Steel Split Pulleys**



IMMEDIATE DELIVERY

We always carry a large stock of machine tools for general manufacturing purposes, and solicit inquiries requiring prompt delivery.

We call attention to the following, on which we will quote attractive prices. All in thoroughly first-class condition:

- One No. 10. Best Vertical Boring Mill, with two heads.
- Two No. 12. Nos. and King vertical boring mills, with two heads.
- Two No. 13. W. and Sharpe turret lead vertical boring mills.
- One No. 4 Perkins heavy punch and shear, 30" throat, capacity 1" hole.
- One No. 10. 12" x 12" planer, with one head.
- One No. 5. Backlund and Practice radial drills, with belt or motor drive.
- One No. 6. 2" radial drill, B.G., with reverse.
- Two No. 36" Snyder upright drills, power feed, etc., heavy duty.
- One No. 21. American turret machine, 2 1/2" hole through spindle.
- One No. 18. Cast steel double lead shaper, with two tables on 12" bed.
- One No. 17. A. S. Benson & Smith slab miller, with two hor. spindles.
- One No. 14 Gardner disc grinder.
- One No. 65. Bessemer steam drop hammer, 6 1/2" diam., 30" stroke.
- One No. 20. A 27" lathe engine lathe, C.R. and change gears.
- One No. 19. A 16" New Haven lathe, C.R. and change gears.
- One No. 26. A 12" New Haven lathe, C.R. and change gears.

Girard Machine and Tool Co.

491-493 N. Third Street, Philadelphia, Pa.

oday's schools and the shop. The author, as stated in the preface, has endeavored to treat the forging of iron and steel, and the hardening and tempering of tool steel simply enough for the high school boy, and at the same time thoroughly and systematically enough for the veteran smith. An endeavor has been made to bring out principles, and all methods used toward this end have been thoroughly tried out during ten years of experience of teaching and supervising manual training. The book contains sixteen chapters, including one devoted to a series of calculations, and the introduction. Chapter one is an historical sketch, while chapter two deals with the characteristics of iron and steel and methods of production treated simply. Equipment used in the forge is described in chapter three and chapter four deals with fuel and fires. The next four chapters describe the different smith shop operations and tools. Chapters nine, ten and eleven describe various methods of welding and brazing. The two succeeding chapters contain some interesting matter on carbon and high-speed tool steel, describing methods of annealing, hardening and tempering steel for various purposes. Chapter fourteen treats on art ironwork, and chapter fifteen describes the operation of steam and power hammers. The chapter on calculations contains the information necessary to know in order to obtain the exact size of stock to be used to make a forging. The appendix contains a course of exercises consisting of 42 examples which help to demonstrate the principles of forge work and the application of the methods described in the preceding pages. At the end of each chapter is a series of questions for review, a useful feature in helping to draw the attention of the student to the main contents in the chapter. This book is written in a comprehensive style and will be a great help to the student or smith, used in conjunction with the work in the forge. The book is printed in clear type, is fully illustrated and bound in substantial cloth covers.

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For
Heat-Treating
Furnaces, etc.

USING ELK FIRE BRICK IN LINING HEAT-TREATING FURNACES IS ANOTHER WAY OF ADDING TO THEIR EFFICIENCY, ECONOMY AND DURABILITY.

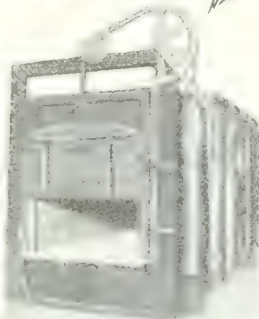
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with 35" spindle capac-
ity, 1909 model. First
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THE DUPONT Patent Power Hammer

BEST FOR Durability, Economy of Power, Simplicity of Adjustment.

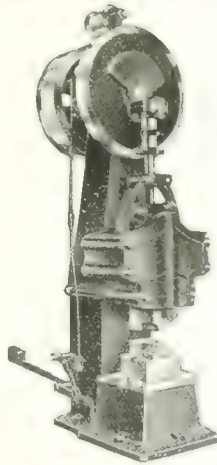
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FOR SMALL, LIGHT BORING

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ARMSTRONG BORING TOOL HOLDER

4 SIZES
Bars 1/8 in. to
7/16 in. Diam.

It is reversible and can be used as either right or left-hand offset tool for turning.

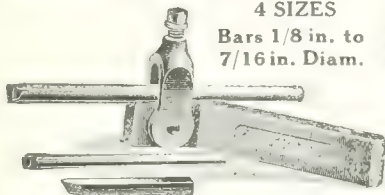
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Catalog for the Asking

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"The Tool Holder People"

306 N. Francisco Ave., CHICAGO, U.S.A.



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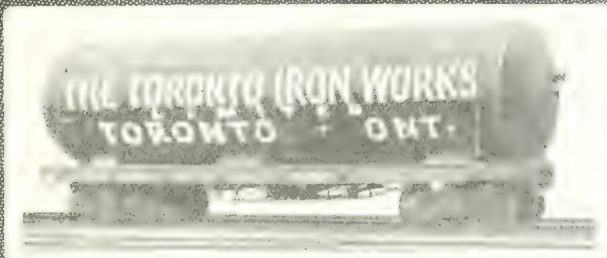
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Special facilities for Keyseating up to 6 in. diameter.

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CANADA

GEARS



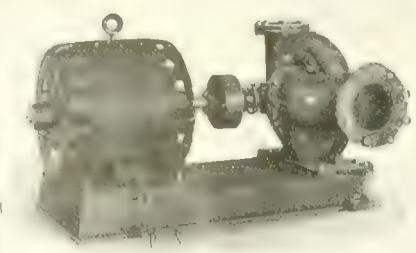
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Cut gears only. The rough, molded kind are obsolete.



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Gardner Disc Grinder

Gardner Disc Grinders are made in all sizes, types and combinations. We can successfully meet any disc grinding problem in existence. Largest builders of Disc Grinding machinery in the world.



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For Marking Shrapnel Shells

or they will mark any article, either round or flat. Power or Hand Machines recommended.

Steel Stamp and Die Cutting by expert engravers.

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Noble & Westbrook Mfg. Co.
Hartford, Conn., U. S. A.

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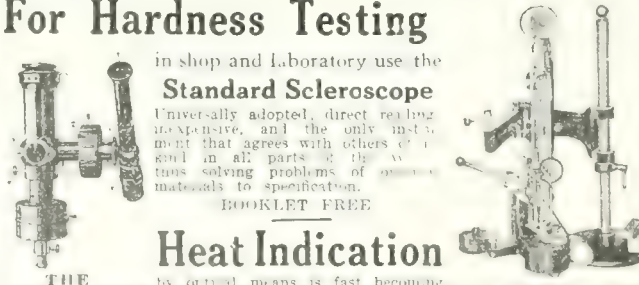
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Cuts Off In Half The Time


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**GEARS AND GEAR CUTTING
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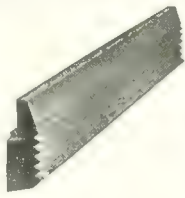
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High Speed Milling Cutters of High Speed Steel, with Corundum Back. Also Tool Bits, High Speed, and Heavy Duty.

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Manufacturers of

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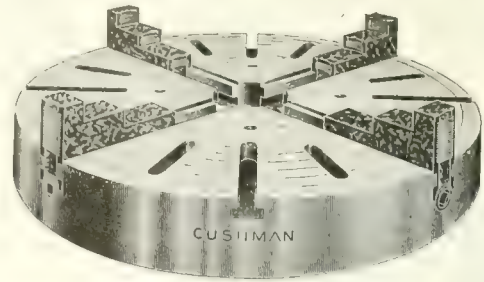
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Our line of styles and sizes is very complete—

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Our regular chucks are known as the heavy pattern, but we now have a new line called "Blue Line" Chucks, made entirely of steel.

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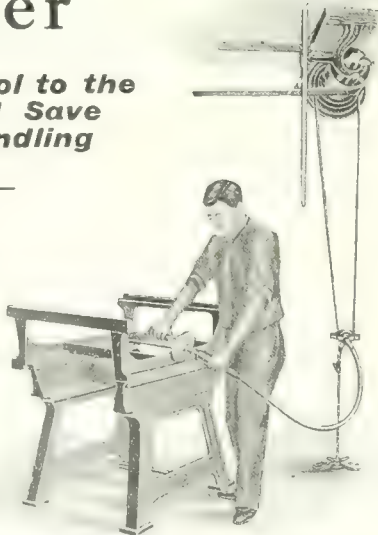
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Take the Tool to the Work and Save Heavy Handling

We are inventors of the Flexible Shaft For all Purposes.

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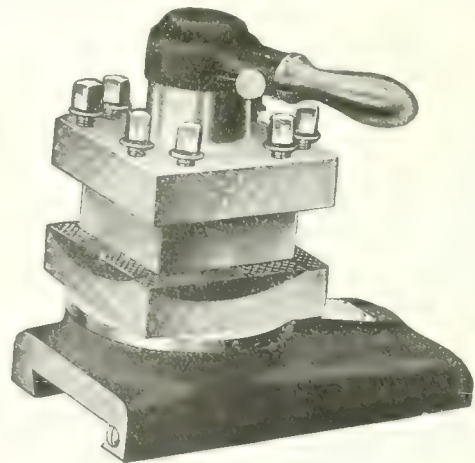
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Here is Standard Equipment

The Fay & Scott turret tool post shown here is being universally adopted as standard equipment for the manufacture of shrapnel.

The square head turret, style G, is used for turning the outside of the shell. We have made these turrets for years, and can fit them to any make or size of lathe, old or new.



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Catalog and full details on request

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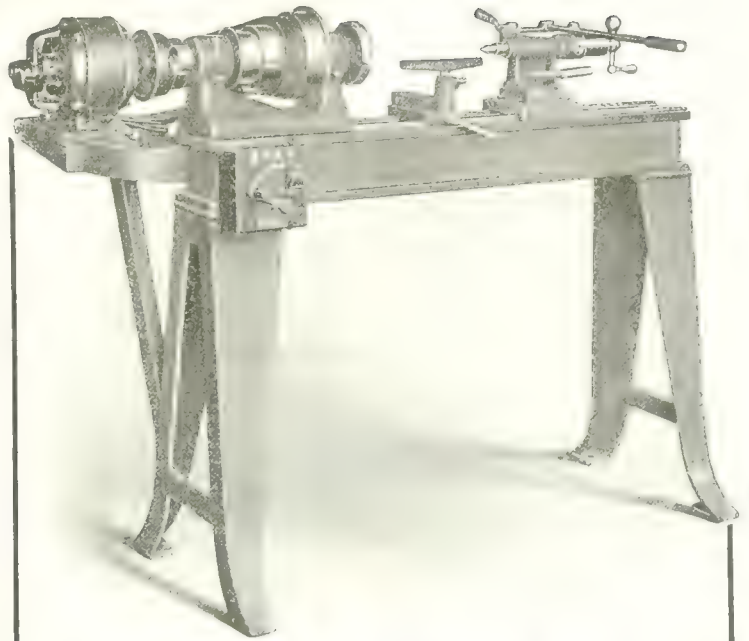
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Get our prices.

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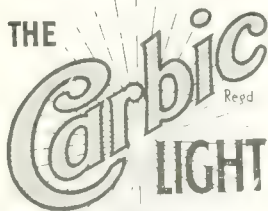


Motor Driven Speed Lathe

This style of motor drive employs a constant speed motor mounted on a plate having an extension arm to support a bearing for the outer end of the motor shaft. The motor plate is fitted to a slide on a shelf which is securely fastened to the back of the lathe bed. The motor plate is moved by means of a screw which tightens or loosens the belt. A four-step cone pulley on the motor shaft is belted to a four-step cone pulley on the spindle. This gives the same speed variation as when a countershaft is used, and by means of various size cones on the motor a wide range of speeds are obtainable.

The lathe spindle is made from high carbon steel, ground to size, and running in self-oiling bronze bearings. The tailstock has screw and lever feed. The bed is cross-braced and all clamping levers are above the ways.

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**URNS
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Indispensable for Construction Work,
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**Absolutely Non-Explosive. Easy to
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Made in two sizes:

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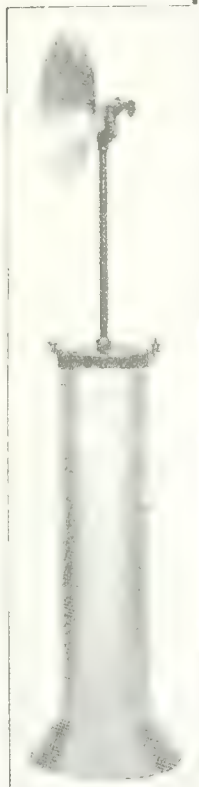
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16 in. Lever POST DRILL

**A Giant Little Machine
 For Light Drilling.**

Will drill up to 7/8 inch.

The Feed Lever Socket is adjustable on the lead shaft, to provide for setting the lever in the most convenient position for the operator.

An adjustable friction is provided for the lead shaft, which acts as a balance to the weight of the spindle.

Bevel Gears, Feed Pinion and Rack are all machine cut, working smoothly and without noise.

Drill's capacity of 16 inch diameter.
 Run of feed 5 1/4 inches.

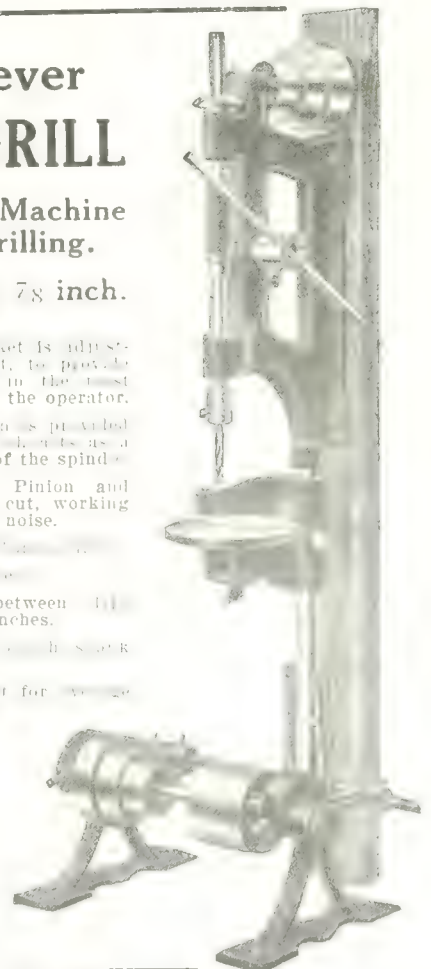
Greatest distance between drill spindle and table, 23 inches.

Spindle used for both straight and twist drills.

Speed of countershaft for average work 300 per minute.

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Hespeler, Ontario



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FOR QUICK SHIPMENT

EACH MACHINE CAREFULLY REMANUFACTURED IN OUR OWN SHOP, TESTED AND GUARANTEED.

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- 1-11" x 5' Rockford
- 1-12" x 5' Rock
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- 1-12" x 5' Hendley
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- 1-12" x 5' Pratt & Whitney
- 1-12" x 5' Anson
- 1-12" x 5' W. & S. H.
- 1-12" x 5' L. B. H.
- 1-12" x 5' L. B. H.
- 1-12" x 5' L. B. H.
- 1-12" x 5' W. & S. H.
- 1-12" x 5' R.
- 2-12" x 5' L. B. H. & S. H.
- 1-12" x 5' Van W. & K.
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- 1-12" x 5' L. B. H.
- 2-12" x 5' R.
- 1-12" x 5' L. B. H.
- 1-12" x 5' S. H. & B. & B.
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- 1-12" x 5' Hendley
- 1-12" x 5' A. & S.
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- 1-12" x 5' Bradford
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- 1-12" x 5' New Haven
- 1-12" x 5' S. H. & B. & B.
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- 1-12" x 5' G. & K.
- 1-12" x 5' Gleason
- 1-12" x 5' Davis
- 1-12" x 5' L. B. H. & S. H.
- 1-12" x 5' W. & S. H.
- 1-12" x 5' Gleason
- 1-12" x 5' L. B. H.
- 1-12" x 5' New Haven
- 1-12" x 5' Mitchell

HAND TURRET MACHINES

- 1-15" x 5' Anson
- 1-15" x 5' Davis
- 1-15" x 5' W. & S. H.
- 1-15" x 5' W. & S. H.
- 2-No. 4 Windsor
- 1-15" x 5' L. B. H.
- 1-15" x 5' L. B. H. & D.
- 1-15" x 5' Springfield

- 1-30" Eddy
- 3-No. 1 Pratt & Whitney
- 1-No. 2 Pratt & Whitney
- 1-No. 2½ Pratt & Whitney
- 1-Wood Turret
- 1-Bardou's & Oliver
- 1-17" Wood Turret
- 1-17" American
- 1-17" Garvin
- 2-27" Garvin
- 2-27" x 24" J. & L. Gortel
- 1-27" x 24" J. & L. Gortel
- 1-27" x 24" J. & L. Gortel

VERTICAL BORING MACHINES

- 8-30" B. & S.
- 2-24" Bickford
- 1-30" Burr 2-spindle
- 1-30" Burr 4-spindle
- 1-30" Bausch
- 4-34" Bullard
- 1-34" Rogers
- 1-30" Brown & Sharpe
- 1-37" Bausch & Harris
- 1-40" Bullard
- 1-41" Bullard
- 1-42" King
- 1-47" Gisholt
- 1-43" Bullard
- 1-44" King
- 1-51" Gisholt

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- 12-No. 1 2 Spindle Pratt & Whitney Rate B. & L. Drillers
- 1-Flather
- 1-No. 1 Niles
- 1-Newark
- 4-Brent
- 2-Busse
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- 1-Sellers
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- 1-No. 9 Gortel
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- 1-No. 15 Garvin
- 1-No. 7 Brown & Sharpe
- 2-No. 20 Oesterlein
- 1-No. 13½ Garvin
- 1-No. 2-B Brown & Sharpe
- 1-No. 2-B Brown & Sharpe
- 1-No. 2-B Brown & Sharpe
- 1-No. 2-B Brown & Sharpe
- 2-No. 2-B Brown & Sharpe
- 2-No. 3 Becker Brainard
- 1-No. 28 Oesterlein
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- 2-No. 12 Pratt & Whitney

- 7-No. 13 Pratt & Whitney
- 2-No. 5 Hendley
- 5-No. 6 Becker Brainard
- 4-No. 7 Brainard
- 2-B. & S.
- 4-No. 7 Becker
- 2-36" Chicago
- 1-No. 2 Newton
- 1-No. 4 Newton
- 3-Cutter & Hakes
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- 1-24" x 24" x 5' Flather
- 1-24" x 24" x 6' Davis & Eggen
- 1-24" x 24" x 6' Whiteside
- 1-24" x 24" x 6' Flather
- 2-24" x 24" x 6' American
- 1-24" x 24" x 6' Pond
- 1-24" x 24" x 6' Gray
- 1-24" x 24" x 8' Flather
- 1-24" x 24" x 8' Gray
- 1-26" x 26" x 5' Gray
- 1-24" x 26" x 6' Hendley
- 2-26" x 26" x 7' Gray
- 1-27" x 27" x 6' Ohio
- 1-27" x 27" x 7' Flather
- 1-28" x 28" x 6' Gray
- 1-30" x 30" x 6' Pease
- 1-30" x 30" x 8' Gray
- 1-30" x 30" x 8' Flather
- 1-30" x 36" x 8' Ohio
- 1-30" x 35" x 10' Pond
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- 1-No. 11 Landis
- 3-6" x 48" Pratt & Whitney
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- 1-No. 23-A Landis
- 1-16" x 60" Landis

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- 1-2" Fosdick
- 3-2½" Fosdick
- 2-2½" Gang
- 1-2½" Gang
- 1-2½" American
- 1-2½" Mueller
- 1-2½" Drees
- 2-3" Fosdick
- 2-3" Drees
- 1-3½" Gang
- 1-3½" Hamilton
- 1-3½" Bickford
- 1-4" Drees
- 1-4" Bickford
- 2-5" Drees
- 1-5" Bausch
- 2-5" Western
- 1-6" Bickford
- 1-6" Bausch

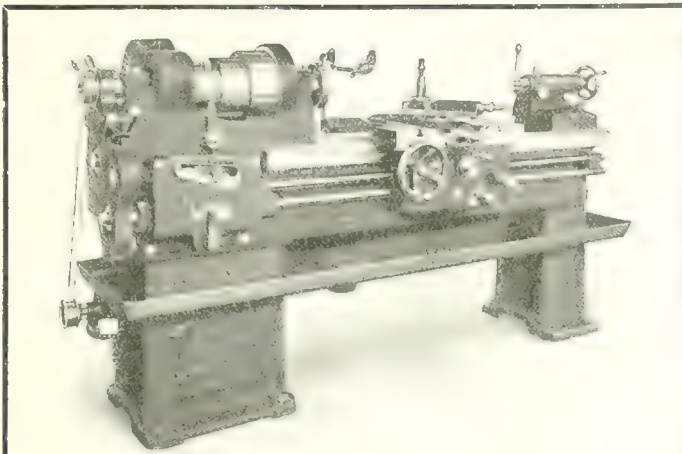
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Watson-Stillman Co., Aldene, N.J.
- Cranes, Pneumatic.**
Northern Crane Works, Walkerville.
Whiting Foundry Equipment Co., Harvey, Ill.
- Cranes, Post Jib.**
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Smart-Turner Machine Co., Hamilton, Ont.
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- Cranes, Portable.**
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Whiting Foundry Equipment Co., Harvey, Ill.
- Cranes, Swing Jib.**
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Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
- Cranes, Transfer.**
Northern Crane Works, Walkerville.
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
- Cranes, Wall.**
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Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.
- Cranes, Travelling Electric and Hand Power.**
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Niles-Bement-Pond Co., New York.
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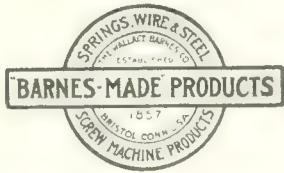
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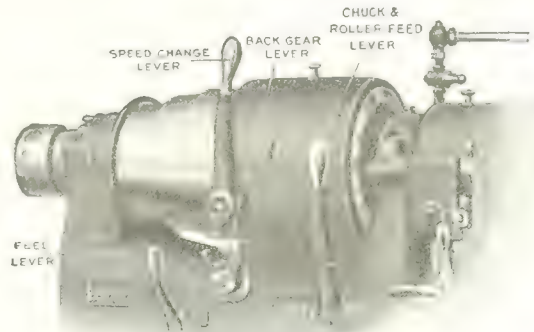
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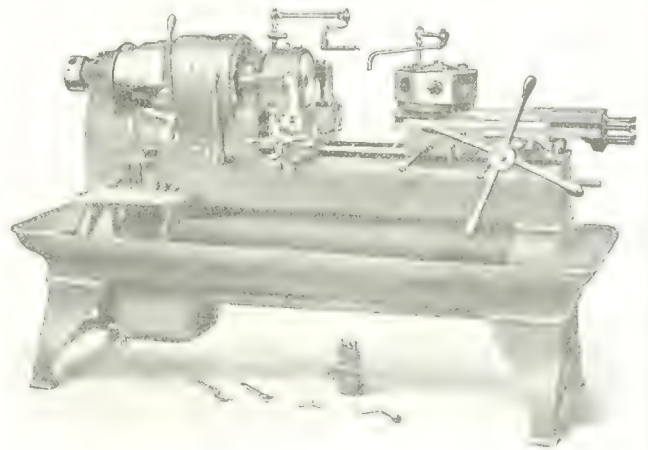


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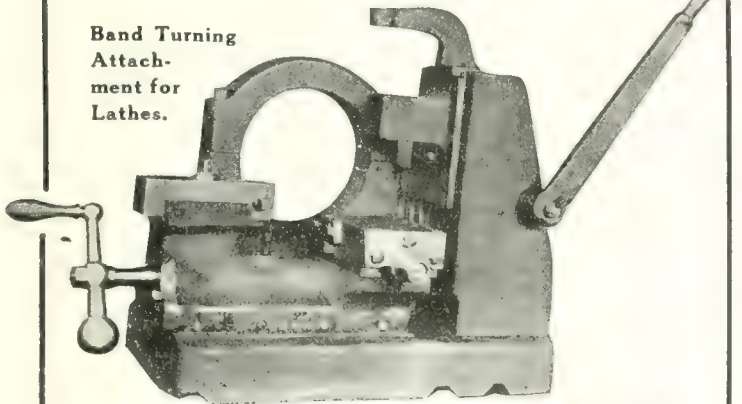
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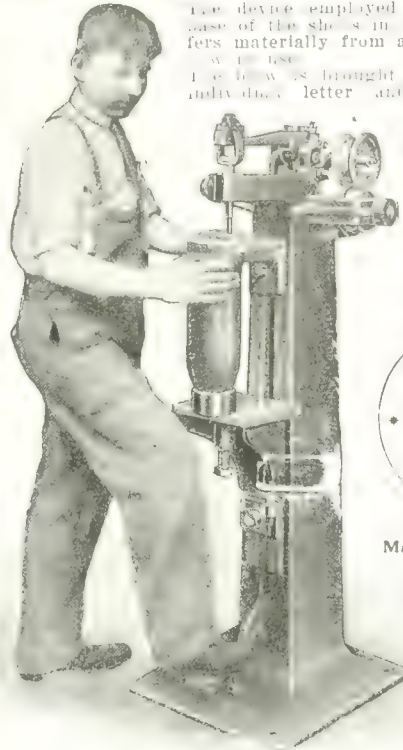
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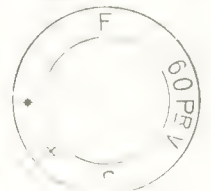
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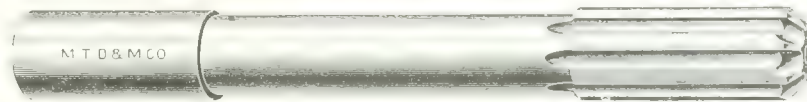


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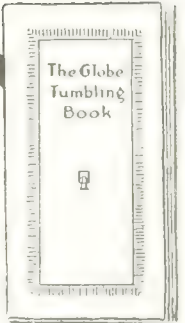
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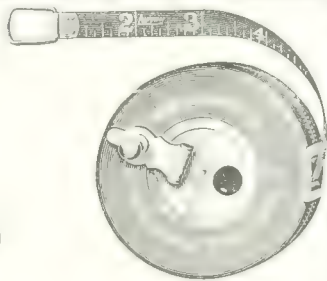
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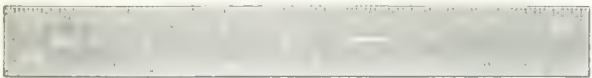
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Shrapnel Shell Cleaning Machine

**Cleans all *Standard* Sizes
and accommodates various *other* sizes**

The table of this machine has six shell pockets. Three of these are in the Blasting Department, and the other three, as shown in the illustration, are in the open. Thus, while three of the shells are being cleaned, the operator can remove the other three that have been cleaned, replacing them with three more to be blasted.

Consequently the machine can be kept in constant operation.

This machine, if connected to any exhaust system, will be nearly dustless and absolutely automatic in operation.

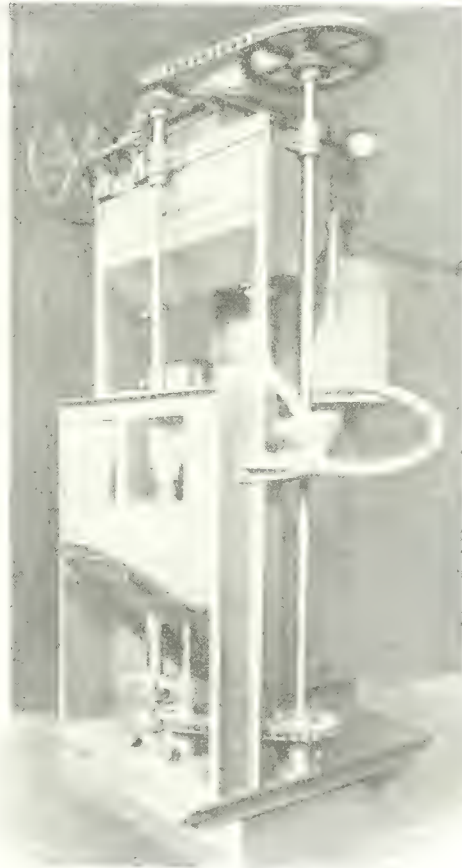
On the sand blasting table proper the division plates are lined with wood. This protects the steel plate. The wood is inexpensive and easily replaced.

The machine is so designed that the copper band groove is blasted on the exterior of the shell and another nozzle blasts the upper part of the exterior of the shell.

Its capacity for continuous running is from 150 to 200 shells per hour.

We are anxious to tell you all about it.

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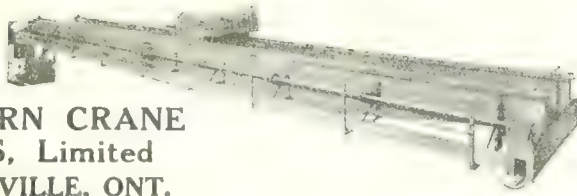
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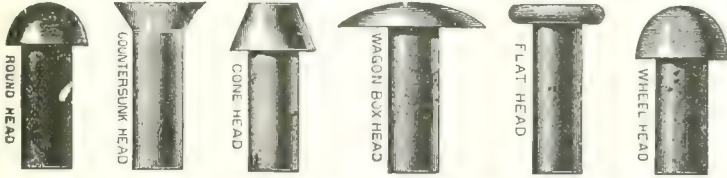


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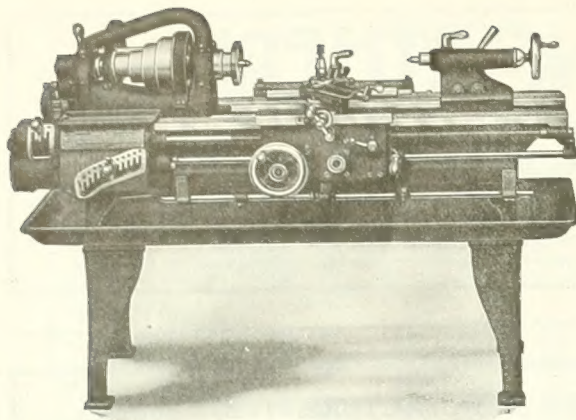
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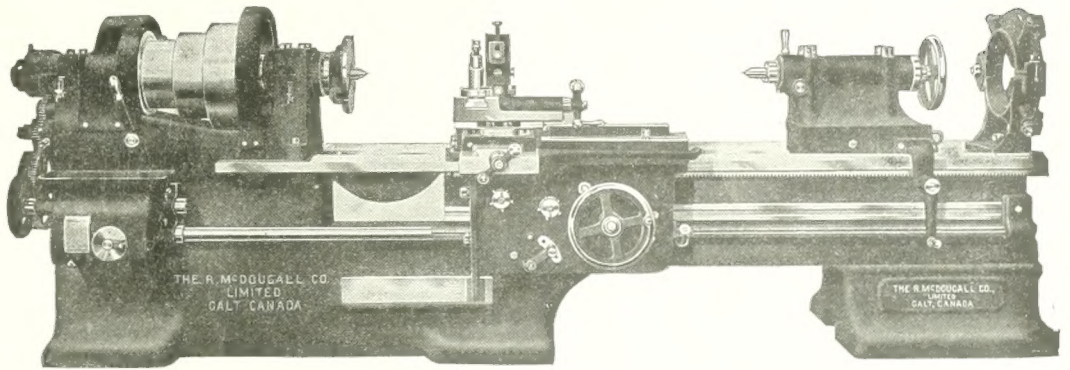
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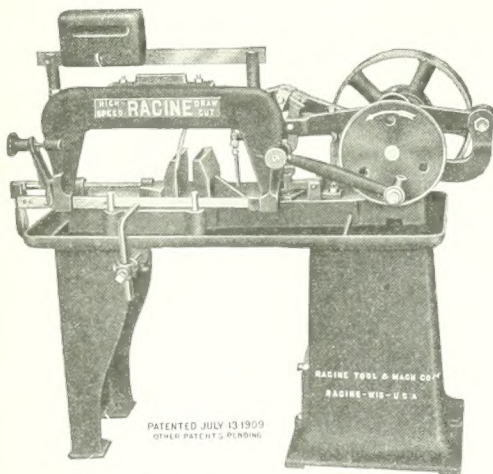
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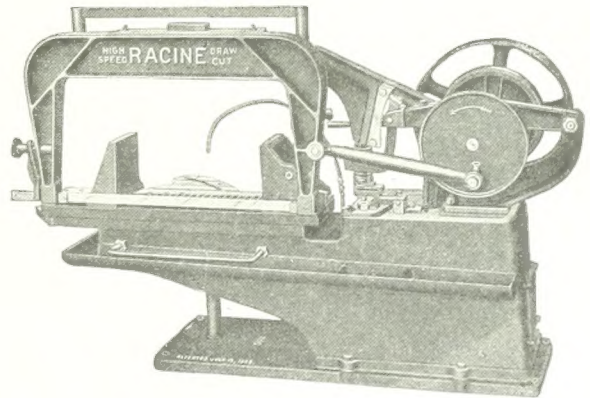
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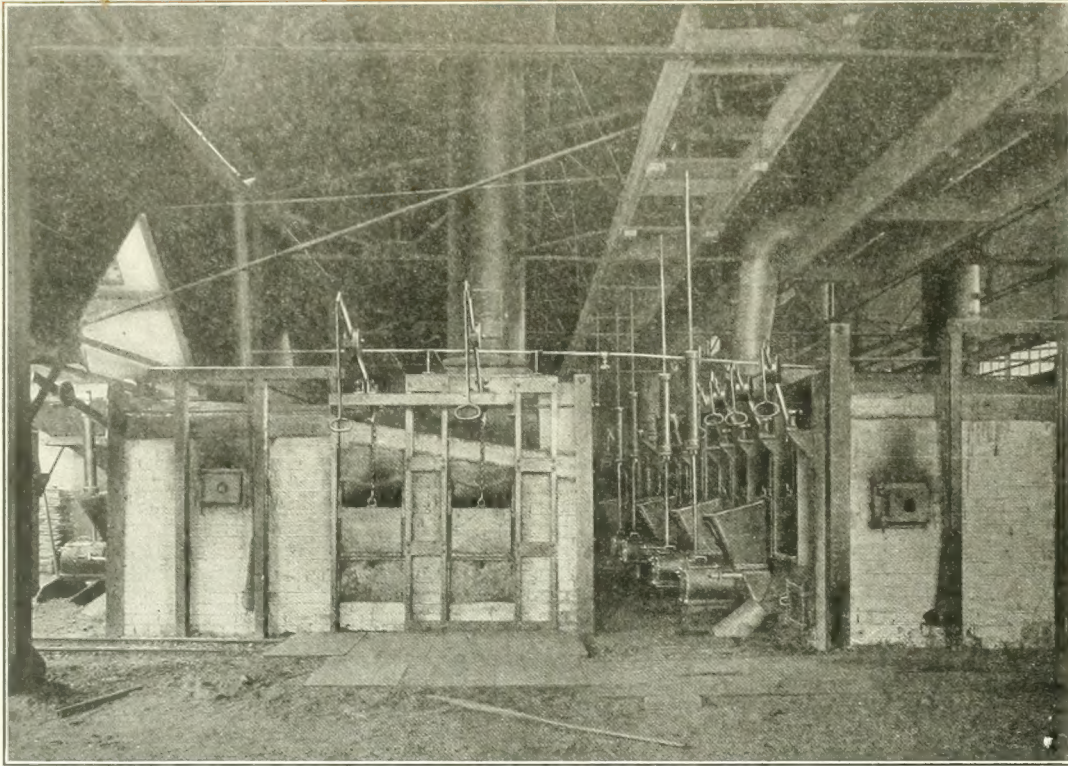
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