

CIRCULATES IN EVERY PROVINCE IN CANADA

CANADIAN MACHINERY

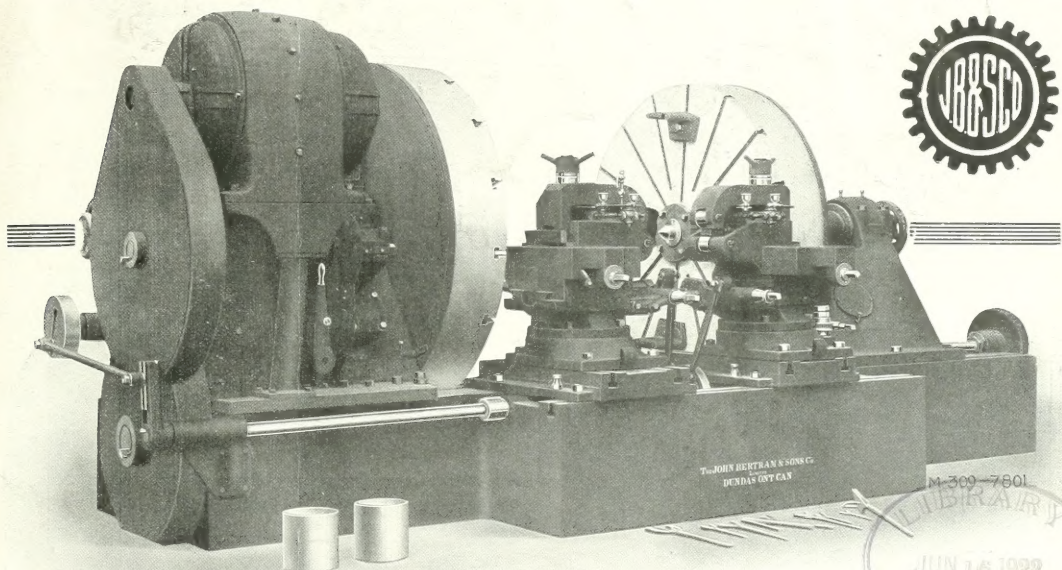
AND MANUFACTURING NEWS

A weekly newspaper devoted to the manufacturing interests, covering in a practical manner the mechanical, power, foundry and allied fields. Published by the MacLean Publishing Company, Limited, Toronto, Montreal, Winnipeg and London, Eng.

Vol. XIV

Publication Office: Toronto, October 28, 1915

No. 18



BERTRAM 80-in. Motor-Driven Extra Heavy Driving Wheel Chucking Lathe



One of our large line of heavy tools for Locomotive and Car Shops. Equipped with Teas Patent Sure-Grip Drivers and Pneumatic Tool Clamps. Movement of tail stocks by motor.

Drop us a line for full particulars.

The John Bertram & Sons Co., Ltd.

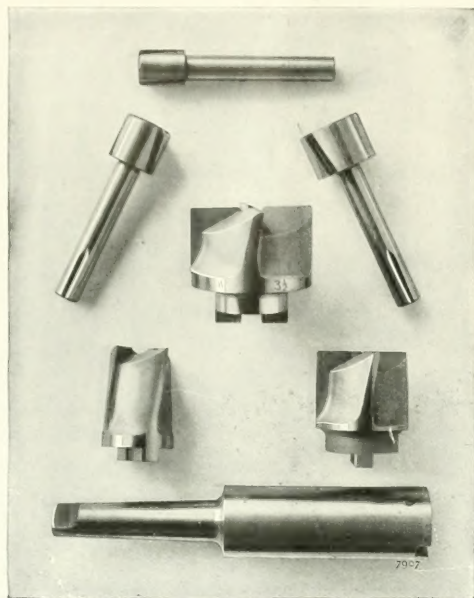
Dundas, Ontario, Canada

MONTREAL
723 Drummond Bldg.

VANCOUVER
609 Bank of Ottawa Bldg.

WINNIPEG
1205 McArthur Bldg.

Make Your Own Combination



For every counterboring job you can make immediately the right combination of holder, cutter and guide if your tool room is equipped with

P. & W. Interchangeable Cutter Counterbores

Holders, Cutters and Guides furnished in wide range of sizes.

Holders

End of holder is milled to receive the driving lug of the cutter and there is also a hole and set screw to accommodate the shank of the guides.

Guides

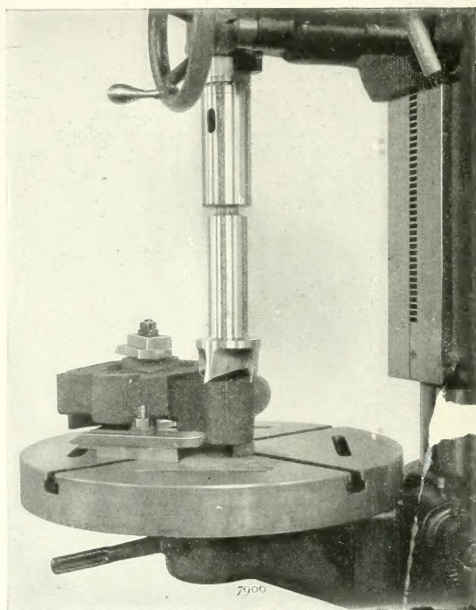
Are of hardened tool steel. They are held in place by means of a set screw in the holder engaging a V-slot in the shank of the guide.

Cutters

Can be furnished of either carbon or high speed steel.

The shank of the guide passes through the hole in the cutter and the shoulder between the guide and its shank keeps the cutter in place. Cutters can be sharpened on the face and the guide is simply pushed further in the hole after grinding.

Write for catalog "Small Tools"
showing our complete line.



Spot Facing
with a P. & W. Interchangeable Cutter Counterbore

Place a trial order with our nearest store.

Pratt & Whitney Company of Canada, Limited

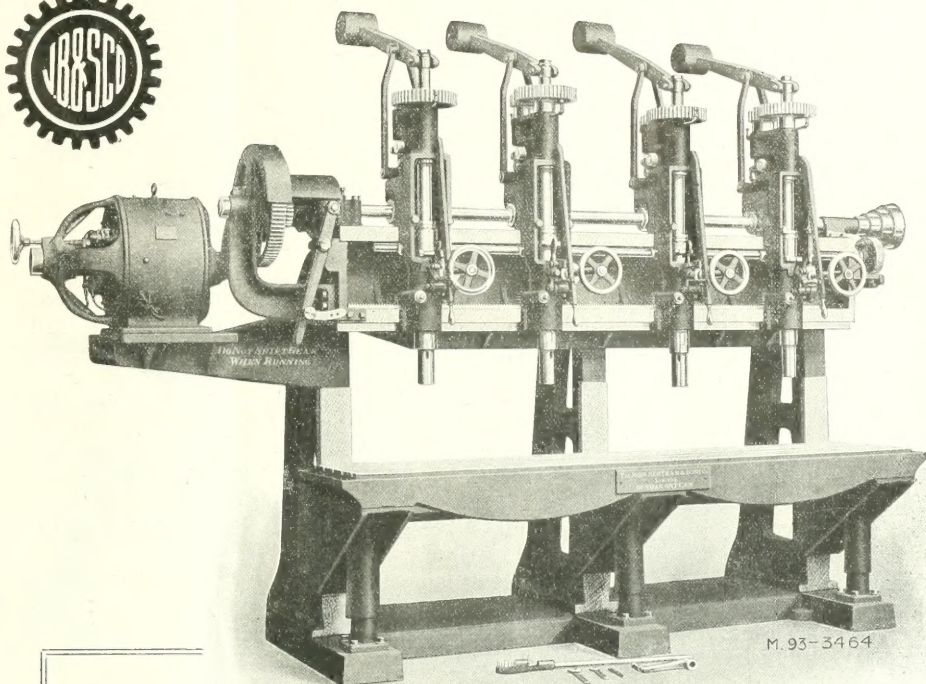
DUNDAS
Ontario

MONTREAL
723 Drummond Bldg.

WINNIPEG
Bank of Hamilton Bldg.

VANCOUVER
B.C. Equipment Co.

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



Multiple Drills

OF EVERY DESCRIPTION

Bertram Four-Spindle Multiple Drilling Machine for Locomotive and Other Work.

SIMULTANEOUS OR INDEPENDENT FEEDS WITH INDEPENDENT KNOCK-OFF FOR EACH HEAD AND CLUTCH DRIVE FOR EACH SPINDLE. CAPACITY, FOUR 2-INCH HOLES IN STEEL.

Drop us a line for photographs and full particulars.

The John Bertram & Sons Co.

Limited

DUNDAS, ONTARIO, CANADA

MONTREAL
723 Drummond Bldg.

VANCOUVER
609 Ottawa Bldg.

WINNIPEG
1205 McArthur Bldg.

The Publisher's Page

By B.G.N.

A Notable Acknowledgment of a Service Rendered

Canadian Machinery, through its advertising pages, has been privileged to serve for several years that increasingly well-known firm, The Chapman Double Ball Bearing Co., Limited, of Toronto, Can., and of Buffalo, N.Y., where a branch was recently established.

As makers of the Chapman Double Ball Bearings, this concern has consistently advertised, month in and month out, practically ever since Canadian Machinery was first published. Later and more particularly since the manufacture of war munitions commenced, Elevating Transfer Trucks and a Shell Banding Press were added to their principal product.

That they advertise in a modern technical journal proclaims them as being up-to-date in their business methods.

That they have been able to advertise continuously for many years would indicate that their product is good. That they so frankly and courteously acknowledge the results secured from advertising in Canadian Machinery suggests a policy of fair dealing which must have made many friends.

We have pleasure in reproducing their letter herewith.

THE CHAPMAN DOUBLE BALL BEARING CO. OF CANADA, LIMITED,
339 Spadina Avenue, Toronto.

MANUFACTURERS OF BALL BEARINGS AND ELEVATING
TRANSFER TRUCKS. SHELL BANDING PRESSES.

October 9th, 1915.

Canadian Machinery,
143-153 University Ave.,
Toronto, Ont.

Gentlemen:—

I want to congratulate you on the breadth of field which you are evidently covering with CANADIAN MACHINERY.

We have received a considerable number of inquiries for Ball Bearings, Elevating Trucks, and Banding Presses from centres in the United States as far separated as Portland, Oregon, and San Antonio, Texas, as well as inquiries from Europe, which have directly referred to our advertisement in CANADIAN MACHINERY. This is somewhat surprising, and also, I assure you, very gratifying.

I have found it in the past somewhat difficult to trace direct value from advertising in trade papers, but this has recently been brought very forcibly to my attention as shown in the replies referred to above.

I thought possibly this information might be of interest to you.

Yours very truly,

THE CHAPMAN DOUBLE BALL BEARING CO.

(Synd.) C. M. Murray,

Secy.-Treas.

CANADIAN MACHINERY

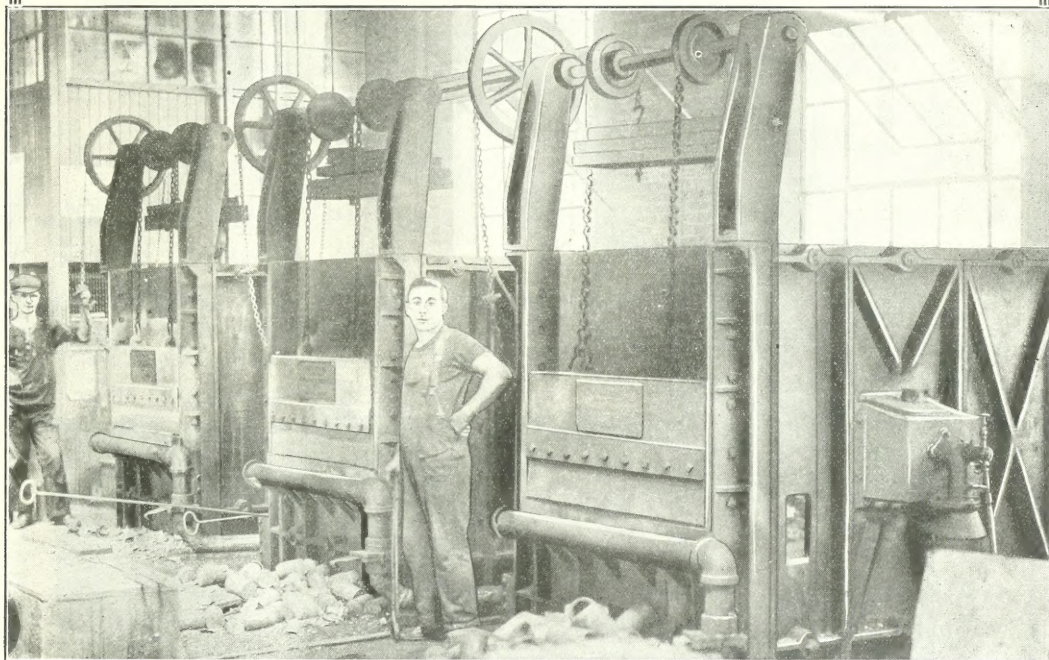
143-153 University Ave.

TORONTO

Heat-Treating Furnaces for **SHELL WORK**

"MECOL" FURNACES especially designed for this work
are giving entire satisfaction with **OIL,**
GAS, and other fuel

DESIGNED AND BUILT IN CANADA



Battery of our Furnaces in Operation in the Shell Shop of Canadian Vickers, Limited

- ¶ Shell, Howitzers and Cartridge Cases must be accurately **HEAT TREATED** for successful manufacture.
- ¶ See our Special Continuous Furnace for annealing Brass Cartridge Cases before buying your equipment.
- ¶ Largest manufacturers have them in use. Full particulars on request.

All Furnaces designed and built under personal supervision of F. DITCHFIELD, "THE FURNACE MAN."

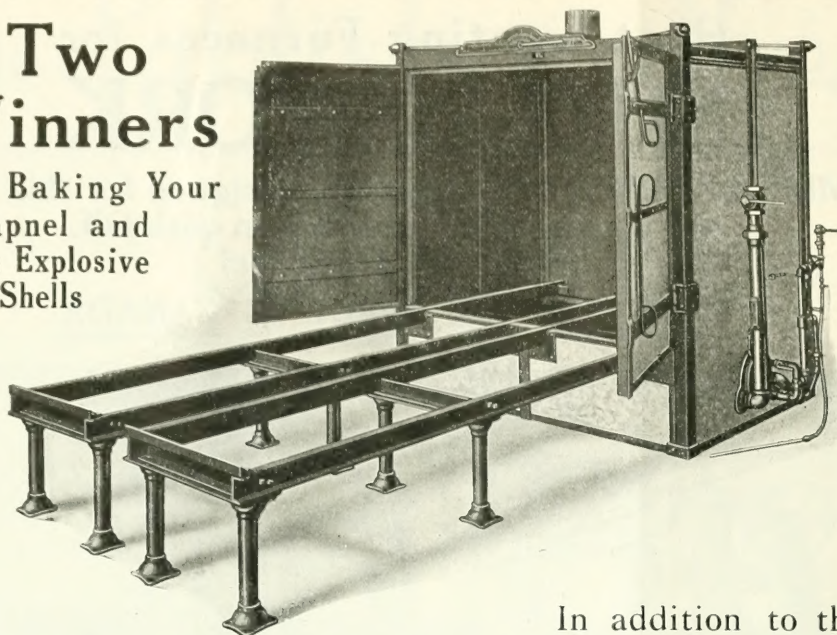
Mechanical Engineering Company, Limited
55 COTE STREET, MONTREAL, QUE.

PHONE—MAIN 3585

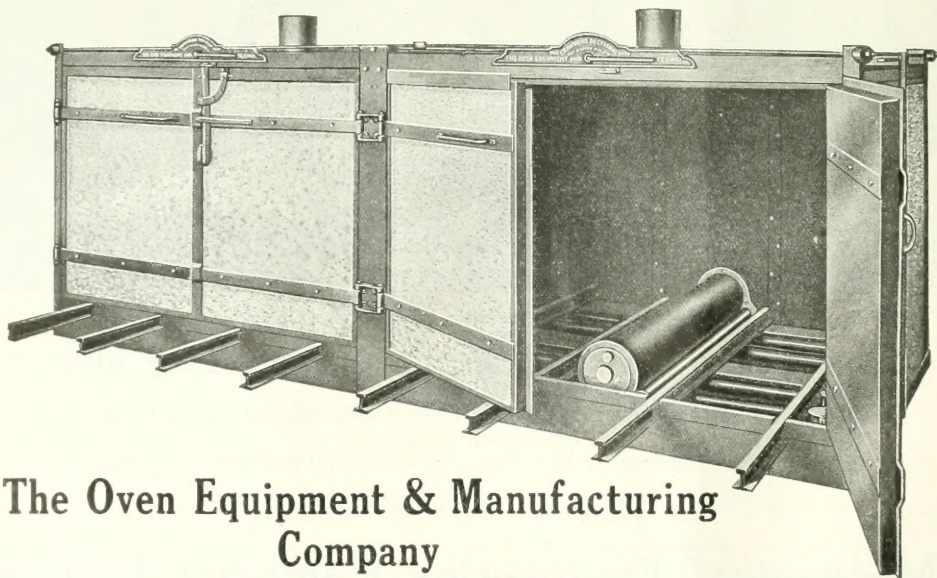
If what you want is not advertised in this issue consult the Buyers' Directory at the back.

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

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

FURNACES

for the manufacture of

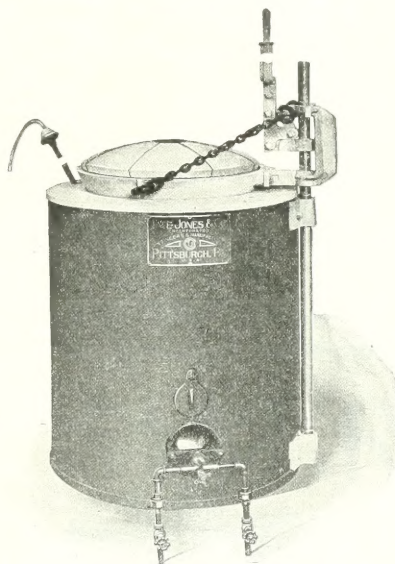
SHRAPNEL and LYDDITE

SHELLS and CARTRIDGE CASES

For Heat Treating Finished
Shrapnel use

A Circular Semi-Muffle Furnace

Heats from below. Semi-muffle chamber. Shells inserted at the top. This furnace heats the shells faster than a pot muffle furnace, uses less fuel and gives excellent results. No danger of scaling or injuring the shells while in the furnace. No upkeep expense for new pots.



We also build furnaces for Forging, Nosing, Banding and Baking Lyddite. Continuous furnaces for Heat Treating Rough Finished Shells. Annealing Cases and for all classes of Forging and Heat Treating Work.

*See pages 244 and 246, September 2nd issue
Canadian Machinery for further information
about these furnaces.*

Tate-Jones & Co. Inc. Pittsburgh, Penna.

FURNACE ENGINEERS

Ontario Agents: Rudel-Belnap Machinery Co., Limited, Toronto

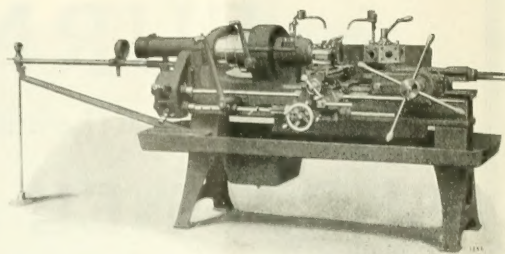
For Double Duty

While the tools of the hexagon turret are boring or turning, you can face or form or undercut with the tools of the square turret on the carriage, thus taking two cuts at one time on the

No. 4 UNIVERSAL Turret Screw Machine

This is because the carriage and turret saddle have separate feed shafts, entirely independent of each other, and each with a wide range of feeds adaptable to any diameter within the capacity of the machine.

Incidentally, the exceptionally broad equipment of standard tools provided for this machine makes it possible, without special tools, to handle almost any kind of work with great rapidity, accuracy and economy.

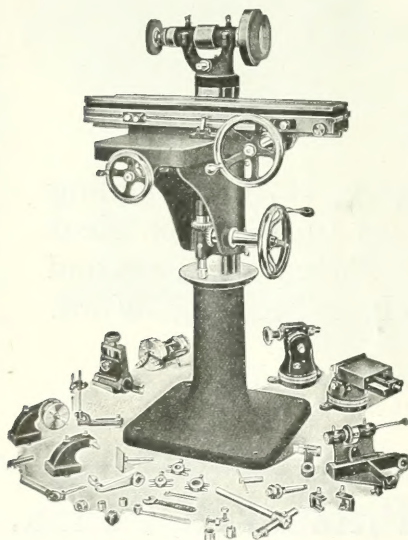


No. 4 Universal Turret Screw Machine with Bar Equipment.

To find the time-saving on your work, send blueprints with rough and finished samples.

THE WARNER & SWASEY CO., Cleveland, Ohio, U.S.A.

Canadian Agents: A. R. Williams Machinery Company, St. John, Toronto, Winnipeg, Vancouver; Williams & Wilson, Montreal



The

Greenfield

For Special Work, Tools, Jigs, Etc.

This Universal Grinder is just the machine needed in many of the shops engaged in equipping for the manufacture of special lines. It is an all-around grinder and will handle about any kind of a job that comes within its range.

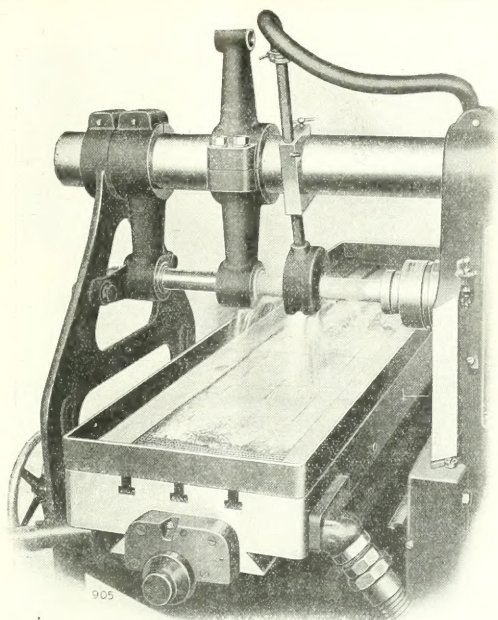
It has a stiffer, more rigidly supported table than any similar machine. It will turn out accurate, dependable work. Also, we believe we are perfectly correct in stating that we furnish this machine with a larger and more complete set of attachments than can be had for any grinder selling at anything like the same price.

How can we do it? Specialization and building in quantities.

Ask for Catalog No. 5, showing the machine in twenty-one different "set-ups" and explaining the purpose of each.

Greenfield Machine Company
Greenfield, Mass., U. S. A.

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



Stream Lubrication on Cincinnati High Power Plain Millers.

New Possibilities In Milling

The commercial limit of milling depends primarily on finish and secondarily on metal removal. Finish is determined by the amount of feed per revolution of the cutter. With a given finish production can be increased only by increasing the cutting speed.

Cincinnati Stream Lubrication (patented) has opened up new possibilities in milling. It properly deluges the cutter in coolant — removes all heat as fast as generated—allows cutting speeds two to three times faster than the best former practice, with the same degree of finish.

COLD CHIPS—450 Feet Cutting Speed describes this, and other recent Cincinnati Miller improvements. A copy is yours for the asking.

**The
Cincinnati Milling Machine Co.**

Cincinnati, Ohio.

Canadian Agents: H.W. Petrie, Ltd., Toronto, Ont.
H. W. Petrie of Montreal, Ltd., Montreal, Que.
Taylor Engineering Co., Ltd., Vancouver, B. C.

A MODERN SAVER

of Time, Money, Space and Labor

Here is a machine that is well worthy of your attention — our "Double C Punch and Shear" with 48-inch throat.

This machine has an enormous capacity for doing rapid, accurate and economical work of quality. Let us send full description. If you are interested in up-to-date money-saving machinery you cannot afford to remain uninformed. We manufacture a complete line of

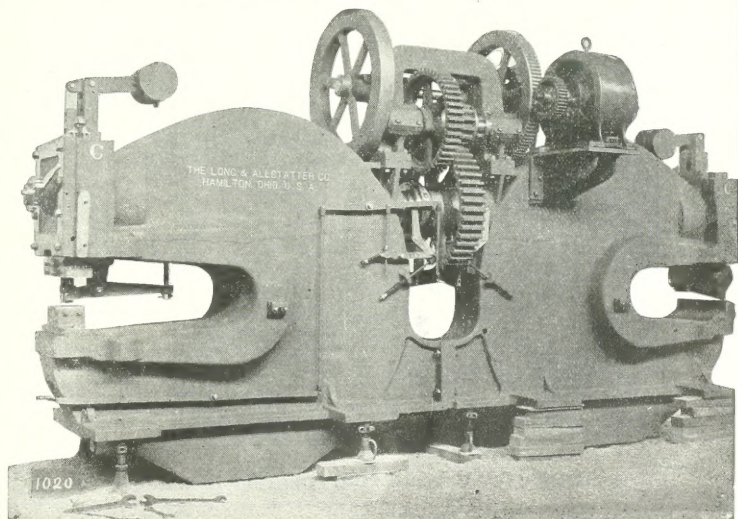
LABOR-SAVING MACHINERY

all kinds and sizes, for

Structural Iron Works, Railroad and Locomotive Shops, Boiler Shops, Rolling Mills, Agricultural Implement and Plow Shops, etc

The Long & Allstatler Co.
HAMILTON, OHIO

Canadian Representatives
RUDEL-BELNAP CO.
Montreal, P.Q. Toronto, Ont.



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

HYDRAULIC PRESSES

For Piercing and Drawing

SHELLS AND PROJECTILES

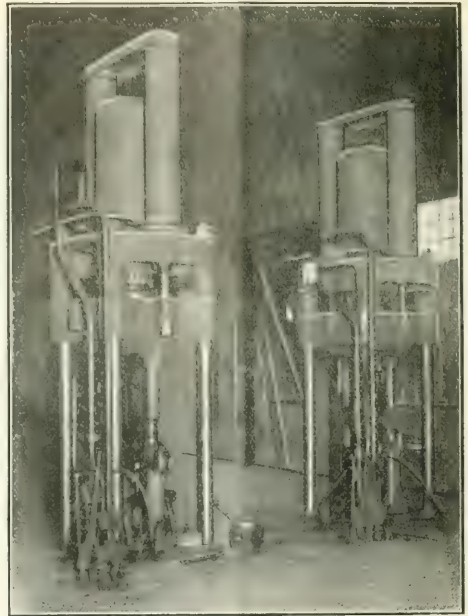
Our facilities for manufacturing Hydraulic Presses assure you a product of very high quality and efficiency at reasonable cost.

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



No. 314 Heavy Pattern High-Speed Drill

IT'S A BAKER

**Enlarging 2½" hole to 4" in
hammered steel forgings at
the rate of 4" feed per minute**

THIS DRILL PRESS HAS AMPLE CAPACITY TO DRIVE 3-INCH, HIGH-SPEED DRILLS TO THE LIMIT OF THEIR EFFICIENCY IN STEEL. IT WILL BORE WITH GREAT EFFICIENCY IN STEEL OR CAST IRON UP TO 6 INS.

A rigid, rapid, powerful machine, driven by positive, fast-running gears immersed in oil. Eight speed and twelve feed changes within easy control of the operator.

BAKER DRILLS ARE POPULAR TOOLS ON LYDDITE AND SHRAPNEL because they produce accurate and dependable work at extremely low labor cost, low installation cost and they take small floor space.

May we furnish more reasons why you need them?

BAKER BROTHERS
TOLEDO, OHIO, U.S.A.

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

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

KEMPSMITH

MILLING MACHINES

Embody the following three distinctive features of construction, which make them unusually rigid and convenient in operation:

Keyed Overhanging Arm

This patented feature provides for positive engagement of arbor and boring bar, and prevents the cutter being pounded out of line under cut.

Keyed Spindle Nose

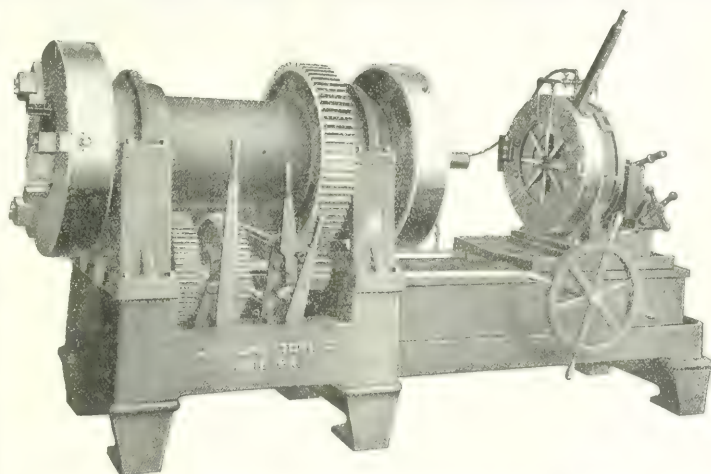
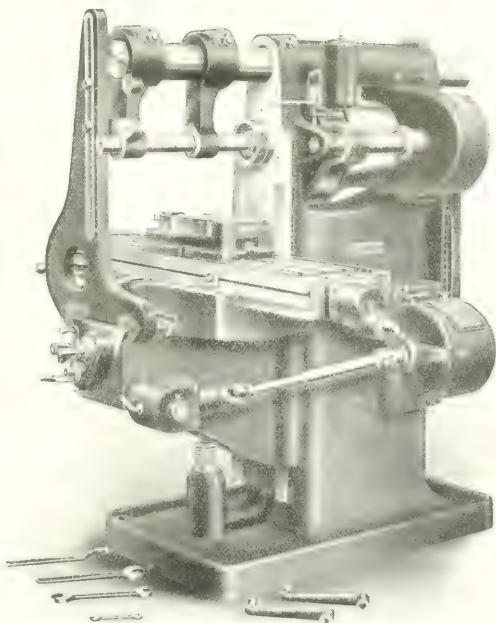
Our patented spindle nose is slotted for positive drive of arbor, and also permits the use of either right hand or left hand face milling cutters.

Reversible Outboard Support

Outboard support is a rigid one piece casting, reversible according to direction of cut. It leaves ample room for the operator to handle his work.

Catalog explaining this and other features gladly sent on request.

KEMPSMITH MFG. COMPANY
MILWAUKEE, WIS.



The gas light was a big improvement over the tallow dip, but it had to give way to the electric light; and the Tungsten has superseded the little glimmer that once delighted us.

If you are still employing pipe-cutting methods as antiquated as the tallow dip, you need a Williams Pipe Machine, which occupies the same position in the pipe-cutting field as the Tungsten does in the lighting world, to bring you up-to-date.

Let us quote you prices and terms any machine to cut 10 sizes of pipe between 1 1/4 inch and 18 inch, with any kind of power.

Anyone making, selling or buying a pipe machine, claimed to be a Canadian-made Williams Pipe Machine, does so without right or authority from us, and is liable to prosecution for damages.

Williams Tool Co., Erie, Pa., U.S.A.

AGENTS:

A. R. WILLIAMS MACHINERY COMPANY
ST. JOHN, N.B. TORONTO WINNIPEG VANCOUVER

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

Tool Slides and Spindles are always in perfect alignment on Gridley Automatics

"GRIDLEY" Single SPINDLE



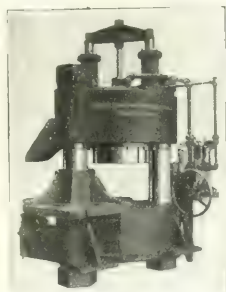
The tools simply cannot get out of alignment with the spindles, because the tool-slide is mounted on an extension of the spindle carrier. If either end of this spindle-carrying cylinder wear so that it becomes loose on its bearings, the alignment between spindles and tool-slide would not be disturbed, because then the cylinder wears, the tool-slide goes with it, thereby maintaining the alignment. Gridley Automatics are just as accurate and efficient after long years of service as when new.

Every operation on these modern machines can be made at a considerable saving in time and labor. But more than that, the operator can use tools tandem when rapid production is necessary. When you are forced to get work out in a hurry, remember that with "Gridley" Automatics, your operator can often do at one operation, the same work that would require two or more operations on all other machines. In fact, you can frequently double or treble your output.

Windsor Machine Co., Windsor, Vt., U.S.A.

Canadian Office: 1501 Royal Bank Building, Toronto
E. C. ROELOFSON, Manager

YOU WILL PROFIT BY GETTING ACQUAINTED WITH ALL THE MONEY-MAKING FEATURES OF THE GRIDLEY SINGLE AND MULTIPLE SPINDLE AUTOMATICS. Drop a line for catalogue and full details.



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

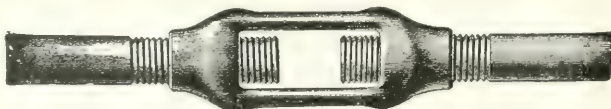
Charles F. Elmes Engineering Works

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

Over 50 years' experience building hydraulic machinery.



Pliers, Structural Wrenches, Track Wrenches, Machine Wrenches, Eye Bolts, Lathe Dogs, Journal Box Wedges, Etc.



All Kinds Of Special Drop Forgings

Send Models or Blue Prints for
Estimates

WRITE FOR CATALOG

Canadian Billings & Spencer, Limited, Welland, Ontario

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

SOUTHWARK

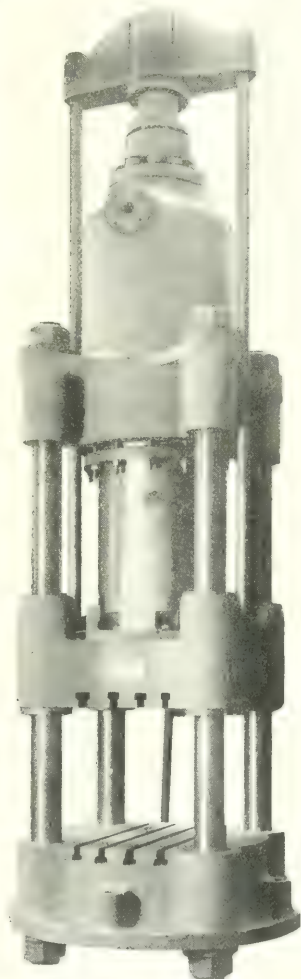
HYDRAULIC MACHINERY

FOR ALL PURPOSES

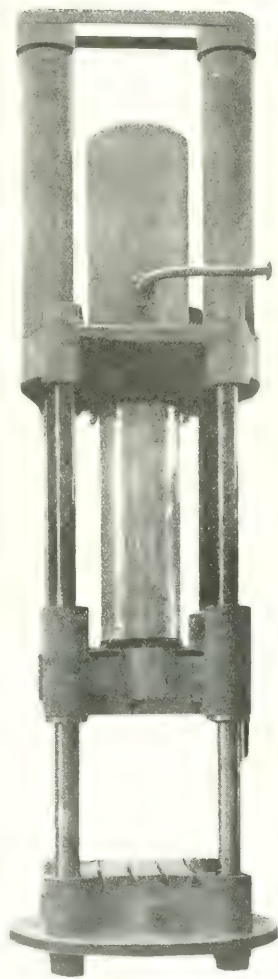
Presses, Jacks, Intensifiers, Riveters, Pipe Fittings, Leather Packings, Cranes, Pumps, Gauges, Hoists, Accumulators, Valves, Etc., Etc.

Other Southwark Products

Centrifugal Pumps, Turbo Generators for Direct or Alternating Current, Turbo Blowers, Surface and Jet Condensers, Southwark-Harris Valveless Oil Engine (for marine and stationary use). Built in sizes up to 1000 B. H. P.



350-TON SHELL PIERCING PRESS



210-TON SHELL PIERCING PRESS

Southwark Foundry & Machine Company
PHILADELPHIA

Founded 1836

Old Colony Building, Chicago

Brown-Marx Building, Birmingham

"First Builders of Large Centrifugal Pumps in America."

The advertiser would like to know this issue consult the Rogers Directory at the back

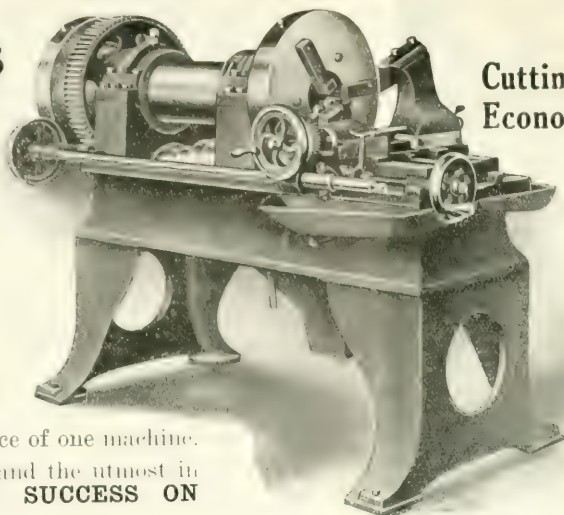
Two Cuts

Simultaneously

One up, the other down. This is what makes the **Hurlbut - Rogers Cutting-Off and Centering Machine** virtually double the output and reduce the cost per piece about one-half.

The **Hurlbut - Rogers Machine** gives you capacity of two machines at the expense and in the floor space of one machine.

We build them for hard work and the utmost in accuracy—and their **GREAT SUCCESS ON SHELLS** shows it.



**Cutting-off
Economy**

5-inch Accelerated Machine

Let us go into details.

HURLBUT-ROGERS MACHINE CO., South Sudbury, Mass.

FOREIGN AGENTS—England, Chas. Churchill & Co., Ltd., London, Manchester, Glasgow and Newcastle-on-Tyne. H. W. PETRIE, TORONTO, CANADA.

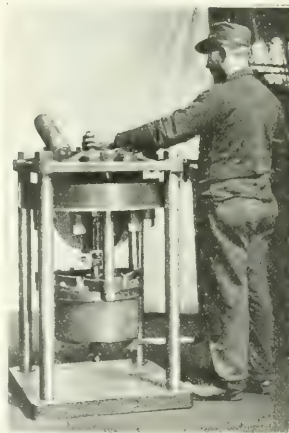
Shell Banding

The action of this pneumatically operated Banding Press is such that the dies strike a sharp blow and exert a heavy pressure, firmly forcing the band into the shell groove.

It is all ready to connect to your shop line. Production is only limited to your operator's ability to handle the shells. One operator and helper could easily produce three to four shells per minute.

The capacity of the machine is up to $5\frac{1}{2}$ " shells.

For full details and price write



THE MOTT & MERRYWEATHER MACHINERY CO.

CLEVELAND

DETROIT CINCINNATI PITTSBURGH

In our Cleveland warehouse we have some 500 second-hand machines of all kinds, ready for immediate delivery.

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

Why go to the expense of buying new machines for the manufacture of

SHELLS?

We have already shipped some 75 car-loads of

Rebuilt Machine Tools

to CANADA since the outbreak of the war, with absolute satisfaction in each case.

If you need any equipment it will be to your advantage to get in touch with us as our facilities for furnishing rebuilt machinery are second to none on the continent.

EVERY MACHINE WE BUY IS PUT THROUGH OUR OWN SHOPS AND COMES OUT IN ABSOLUTELY PERFECT ORDER—AND WE STAND BEHIND EVERY ONE WE SELL.

The demand is enormous, but we are not taking advantage of the war by putting on exorbitant prices—our aim is a good, square deal to everybody all the time. You can often get something practically equal to a new machine at a very great saving in price.

As we carry a large stock, we can likely supply you from stock, or if we cannot do this, we will take your order for future delivery, specifying a definite time when we will supply you with such tools as you may require.

New York Machinery Exchange
50 Church St., New York

Our Newly Designed

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.

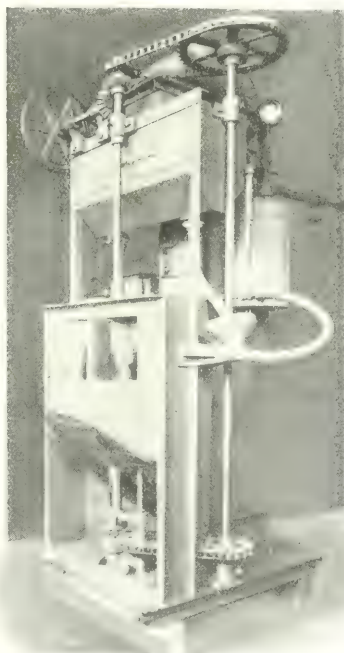
On the sand blasting table proper the division plates are lined with wood. This protects the steel plate. The wood is inexpensive and easily replaced.

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.

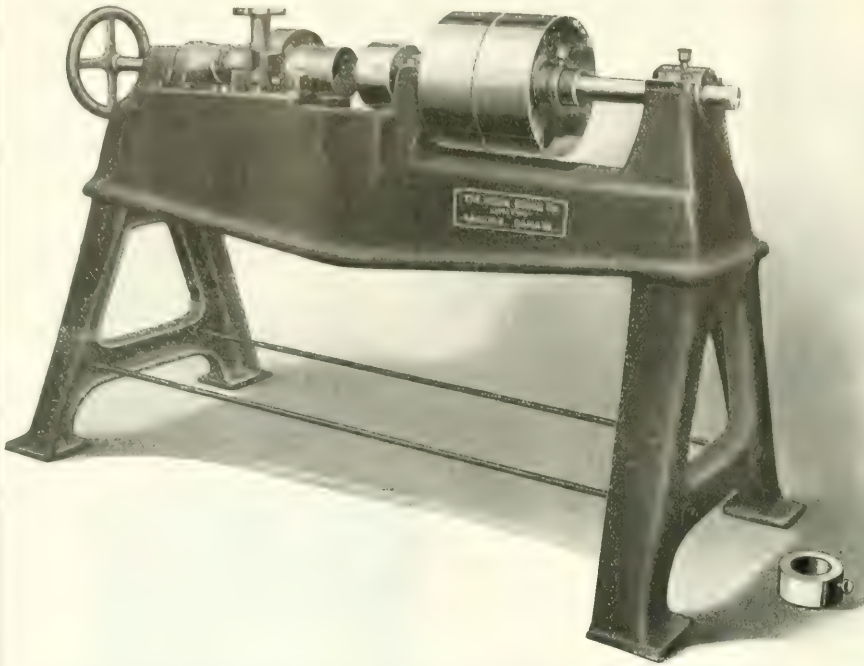
Write us.



We are manufacturers of Sand Blast equipment for any particular need. Also cleaning mills, dust arresters, cinder mills, resin grinders and other foundry equipment.

**The W. W. SLY MANUFACTURING
COMPANY**
CLEVELAND OHIO

SHELL BASE MARKING MACHINES



ONE OF THE MOST IMPORTANT OPERATIONS IN SHELL MANUFACTURING IS THE "MARKING." OUR BASE MARKING MACHINE WILL SOLVE YOUR MARKING TROUBLES. IT IS A WONDERFUL INVENTION.

The mechanical device employed in marking the base of Shells in this machine is somewhat of a departure from the general principles. It is so arranged that the entire pressure of the machine is exerted on each individual letter and figure successively.

By this action a very deep impression is obtained with very little power and consequently no crushing strain. The depth of the impression can be increased or decreased as desired.

The method of operation is exceedingly simple. First, the Marking Chuck (shown in cut) is fastened on the end of the Shell by means of Thumb Screw. The Shell is then placed on Saddle, clamped, and by the aid of Hand Wheel the Shell is moved up to the Revolving Pressure Chuck, whence the operation is completed.

It only requires a few seconds to do the marking; the balance of the time being consumed inserting and removing the Shell. An output of sixty Shells per hour should easily be obtained.

We make these machines for 3" Russian, 4.5 and 5" British High Explosive Shells. We can also make them for any size Shell desired.

SHELL BODY MARKING MACHINES

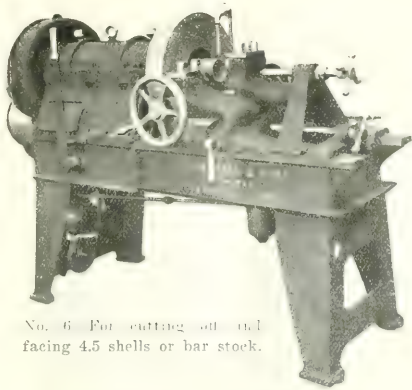
Our Body Shell Marking Machines are, without doubt, the most efficient on the market. Sixty Shells per minute is what we claim for it. *If interested, write for prices.*

The Brown-Boggs Co., Limited, Hamilton, Can.

Tinsmiths' Tools, Sheet Metal Working Machinery, etc.

WESTERN AGENTS: Messrs. Bissett & Webb, Limited, Winnipeg and Edmonton

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



No. 6 For cutting off and facing 4.5 shells or bar stock.

We manufacture a full and complete line of machinery for the above operations, used in the manufacture of shrapnel, 4.5, 60-Pr. and 10" shells.

Write us for particulars of our new 12" cutting-off machine, designed especially for the new 10" shells and ingots now to be made in Canada. Single or double cut at one chucking.

Let us tell you the nearest point at which you can see some of our machines in operation.

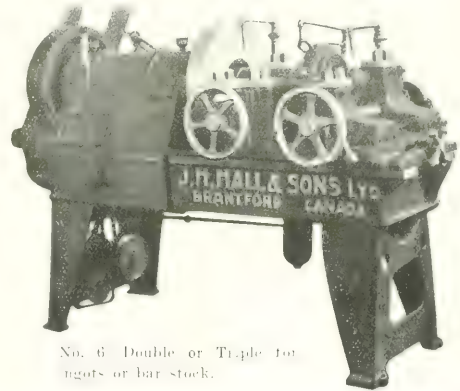
John H. Hall & Sons, Limited

Manufacturers of Pipe Threading and Special Machinery.
BRANTFORD, CANADA

HALL SHELL CUTTING-OFF and FACING MACHINES

For Shells, Bar Stock, Ingots—High Speed, Heavy Duty

For cutting off the open ends.
For facing off the closed ends.
For facing off projecting ends of pipes.
For cutting off bar stock.
For cutting off ingots, etc.

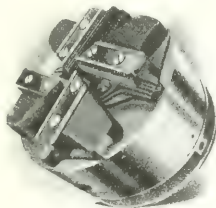


No. 6 Double or Triple for ingots or bar stock.

The Thread-Cutting Head of To-day

The Landis Die to-day is used the world over where the best results only will satisfy. It has set a standard for accuracy, economy and high production which has won for it a reputation of being the best threading tool on the market.

Have you noted:—



- The long life,
- The high cutting speed,
- The absence of annealing, hobbing and retempering,
- The variable rake angle,
- The permanent throat?



Let us give you further particulars relative to the merits of the Landis Die. It will pay you to know them.

LANDIS MACHINE COMPANY
WAYNESBORO, PA.

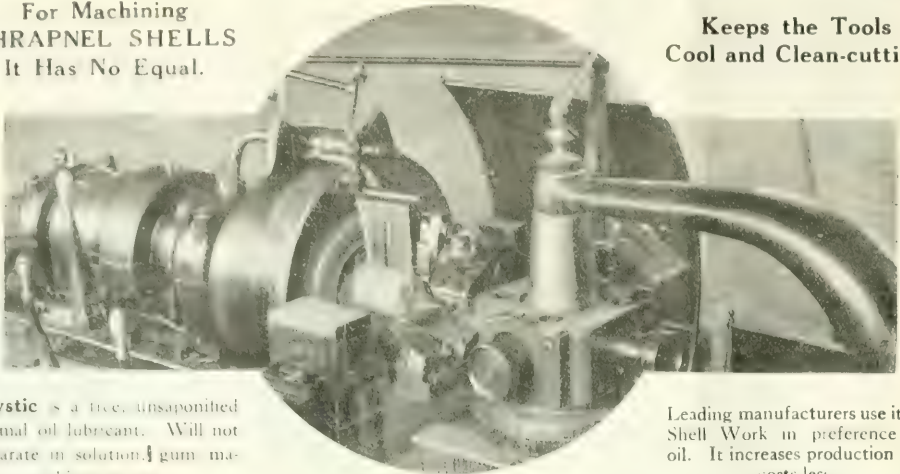
Exclusive Canadian Agents:—Williams & Wilson, Limited, Montreal, Canada

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

Mystic Cutting Compound

For Machining
SHRAPNEL SHELLS
It Has No Equal.

Keeps the Tools
Cool and Clean-cutting



Mystic is a free, unsaponified animal oil lubricant. Will not separate in solution. I gum machines or rust.

Leading manufacturers use it on Shell Work in preference to oil. It increases production and costs less.

Cataract Refining Company, Limited, Toronto, Ont.

**Carborundum and Aloxite
Grinding Wheels—Factors in
the Production of Precision
Work at a Lessened Cost—**



IT is seldom now that a piece is turned to the extreme limits of accuracy. In precision work the grinding wheel has proven superior to the lathe tool, being more accurate, faster cutting and capable of producing work within closer limits. Carborundum and Aloxite wheels play a most important part in this development of precision work—every wheel being definitely adapted to the working condition—clean, free cutting—holding its shape and requiring but little dressing—each wheel

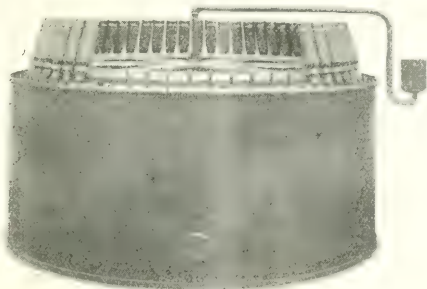
The Right Wheel in the Right Place

The Carborundum Company

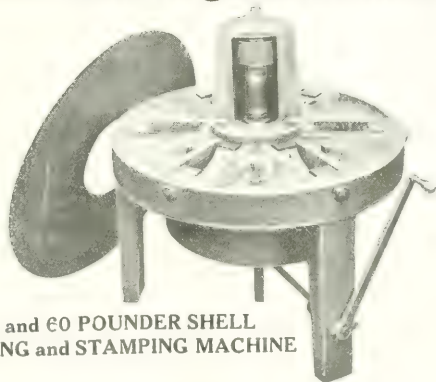
Niagara Falls, N. Y.

New York Chicago Boston Philadelphia Cleveland
Pittsburgh Cincinnati Milwaukee Grand Rapids
Manchester, Eng. Dusseldorf, Ger.

Shell Painting, Nosing and Banding Machines



PAINTING MACHINE



4.5 and 60 POUNDER SHELL
BANDING and STAMPING MACHINE

SIMPLICITY: That is the beauty of these machines: they are so simple that a woman or even a child can control them. This is an important feature in reducing operating expenses.

Banding Press is sold without stamping attachment if desired.

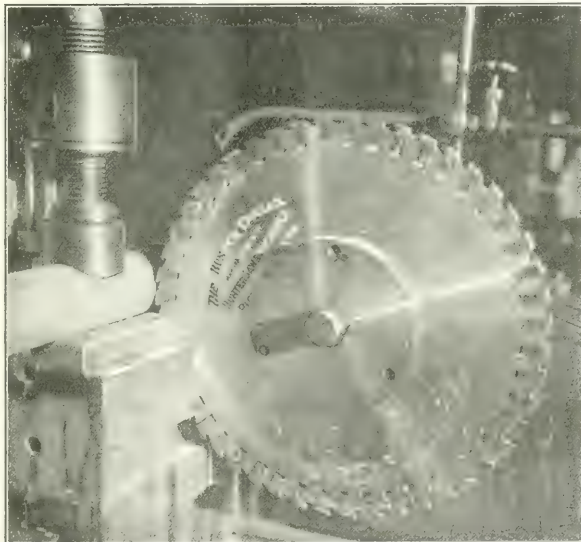
Painting Machine is operated with an ordinary air drill, and, if desired, a heating coil under table, enclosed in a sheet steel shell, can be supplied, as shown in cut.

Canadian Locomotive Company, Limited, Kingston, Ont.

SALES HANDLED EXCLUSIVELY BY

The John Bertram & Sons Company, Limited, Dundas, Ontario, our agents for these machines

A Hunter "Duplex" on Shrapnel Stock



FAST GOING
on Newton Machine

Through 3½" round 60 Carbon, 70 Manganese Shrapnel Stock every

2 MINUTES

The secret of Hunter "Duplex" Saw speed is the method of holding the high speed teeth.

You can use this speed profitably—on shrapnel or any other stock.

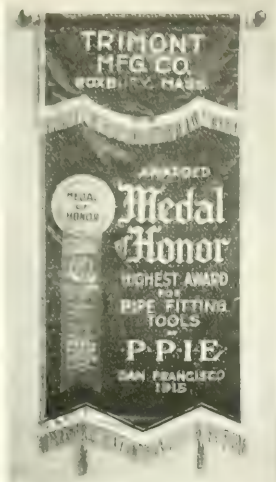
*Let us send full
Particulars.*

HUNTER SAW & MACHINE COMPANY, Pittsburg, Pa.

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

THE BANNER OF MERIT

Showing the Official
Award Ribbon of the
Medal of Honor
awarded TRIMO



TOOLS at the
PANAMA-PACIFIC
INTERNATIONAL
EXPOSITION.

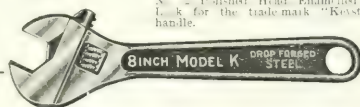


SEND FOR CATALOGUE No. 200.

TRIMONT MFG. CO., ROXBURY, MASS.

KEYSTONE "Model K" Wrench

All drop-forged steel.
No. 1 Polished all over.
No. 2 Polished Head Enamelled Handle.
Look for the trade mark "Keystone" on the handle.



KEYSTONE TOOLS

—the cheapest in the end.

Their utility, strength and convenience,
recommend them to the most discriminating
workman.

Any better class wholesale house will supply
you. Ask us to refer you to our nearest dealer.

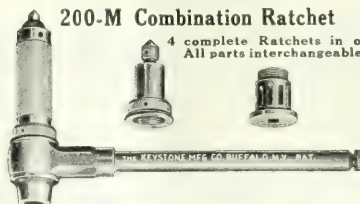
THE KEYSTONE MFG. CO.
BUFFALO, N.Y.

"Keystone Quality"

"KEYSTONE"

200-M Combination Ratchet

4 complete Ratchets in one.
All parts interchangeable.



The Original

"WESTCOTT" Adjustable "S" Wrench

HANDLE MALLEABLE IRON. JAW FORGED STEEL.
The "Westcott" Wrench is acknowledged to be the most convenient and useful wrench for general use, and can be used in many places inaccessible to the Model K Wrench. These wrenches are made of first-class material, are strong and durable.

The genuine "Westcott" Wrenches have the trade mark "Westcott" on the handle.

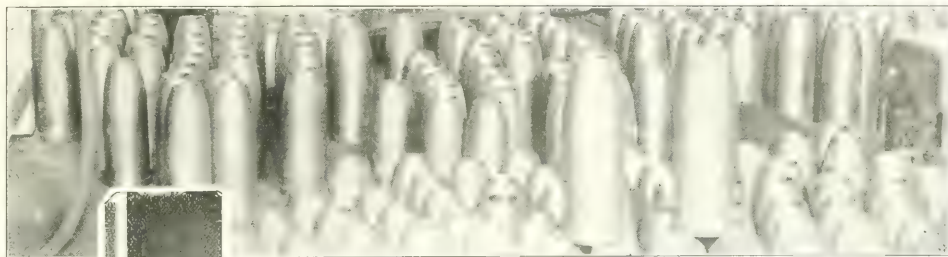
"KEYSTONE" Weston Ratchet

For Square Shank Drills Only.
—STRONGEST RATCHET MADE.

Fully guaranteed.



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



Butterfield Taps

**are strengthening popularity
by their work on munitions.**

They have been wonderfully successful and superior on ordinary jobs, but their work on munitions proves that they have the backbone essential to the economical and rapid production on the toughest of materials.

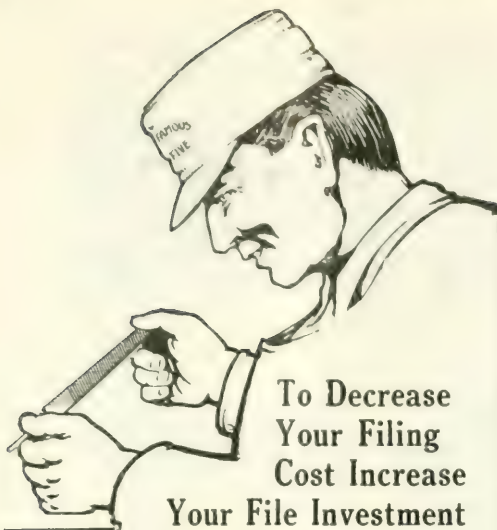
Get a Butterfield Tap and put it up against the same proposition as the kind you are now using. Keep close tab on it and see for yourself.

Positively guaranteed.

Butterfield & Co., Inc.

Rock Island, Quebec

**MADE IN
CANADA**



A file when it is half worn takes more time to do a certain piece of work than a new file.

Therefore when your files reach the "inefficient" point, they should be properly discarded and replaced with new ones.

Preferably with

KEARNEY & FOOT GREAT WESTERN AMERICAN ARCADE GLOBE

(Made in Canada)

The cost of a new file more than pays for the saving in time and labor.

And with new files your workmen do cleaner, better work.

Our 50 years' experience in the making of the above brands guarantees their efficiency.

An output of 60,000,000 yearly proves their popularity.

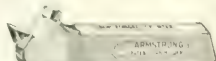
A FREE copy of "File Philosophy" will be sent you on receipt of a card.

Nicholson File Company
Port Hope (Dealers Everywhere) Ontario

YOU WANT TOOL HOLDERS THAT HAVE MADE GOOD ARMSTRONG TOOLS

Made good from the start and have kept pace with modern improvements in Machine Tools and tool steel — enlarged head, heat treated shank, heavier screw, bigger cutter, all making for increased production.

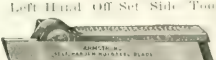
You can't afford to shut your eyes to a proposition which so directly affects your



Straight Shank Tool



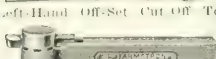
Left Hand Off Set Side Tool



Straight Shank Cut-off Tool



Left-Hand Off-Set Cut-off Tool



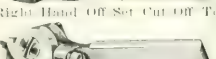
Planer and Shaper Tool



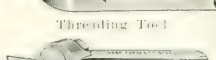
Boring Tool



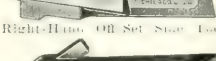
Right Hand Off Set Cut-off Tool



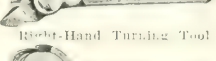
Threading Tool



Right-Hand Off Set Side Tool



Right-Hand Turning Tool



Knurling Tool

PROFIT and LOSS on LATHE and PLANER TOOLS

TOOL HOLDER PROFIT

No Forging.
Mighty Little Tool Steel.
Minimum of Grinding.
Machines All Running.
Men All Working.

FORGED TOOL LOSS

Blacksmiths' Time, etc.
Large Stock of "Dead" Tools, Steel, etc.
Men Waiting at Forge or Tool Room.
Machines Standing Idle.
Wasted Time and Material Grinding Tools.

THE ARMSTRONG SYSTEM

recognizes the Human Factor, cuts out Red Tape and increases efficiency of Men and Material.

More than 100 shapes and sizes for performing every operation on lathe, planer, shaper and slotter.

THE LATEST ARM- STRONG CATALOG

is a complete exposition of the whole Armstrong System. We want the man interested in keeping down production costs to have a copy mailed free for the asking.

Our complete line is on exhibition in Block 41, Palace of Machinery, Panama-Pacific Exposition, San Francisco.



Armstrong Bros. Tool Co.
"The Tool Holder People"
306 N. Francisco Ave., CHICAGO, U.S.A.

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.

Manufacturers of

STEEL

FOR SHRAPNEL SHELLS,
AND SHELL BLANKS.

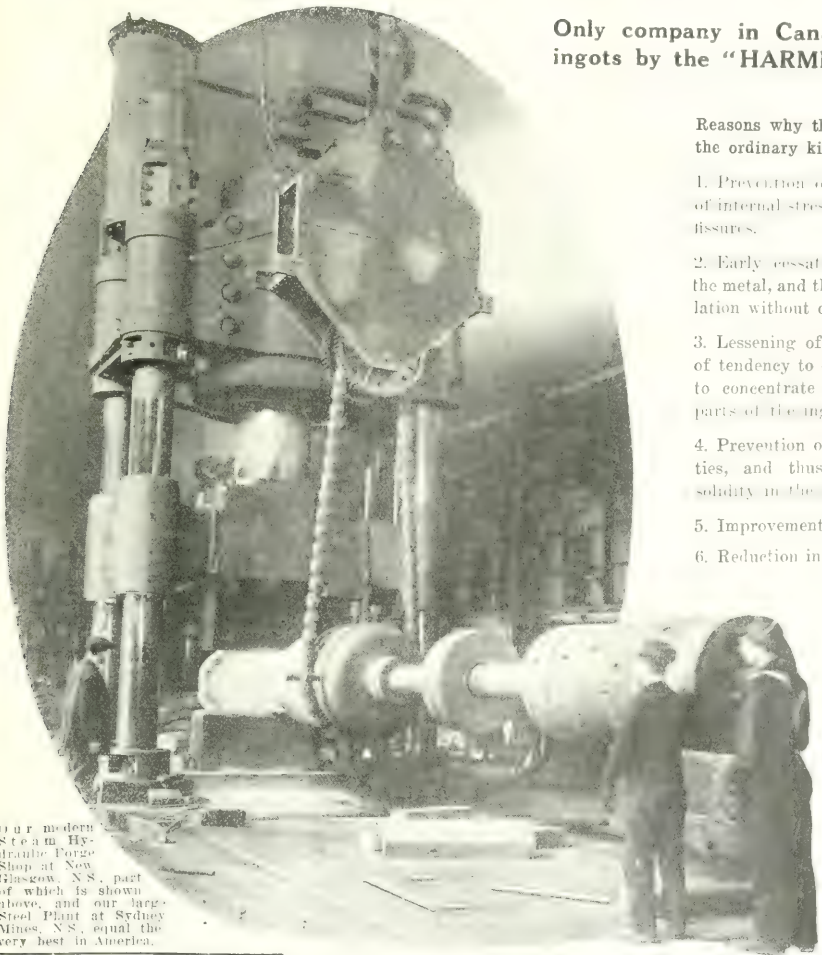
Western Sales Office,
Room 14 Windsor Hotel,
MONTREAL

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 Index Directory at the back.

SaBeN Extra

HIGH SPEED STEEL



*The most economical and
efficient steel for
machining shells*

Manufactured by Sanderson
Bros. and Newbold, Limited,
Sheffield, England

H. A. Drury Company
LIMITED
Montreal and Toronto

Steel for Shells!

PROMPT SHIPMENT

Billets and rounds
of suitable physical
and chemical speci-
fication for forging
and turning into
shrapnel cases and
lyddite shells of any
size.

LACKAWANNA STEEL COMPANY

Standard structural shapes,
Standard heavy and light rails,
Sheared and universal mill plates,
Sheet bars, and Lackawanna
Sheet Steel Piling.

General Sales Offices: LACKAWANNA, ERIE CO., N.Y.

Canadian Correspondents:

H. A. DRURY & CO., LTD., 309 Craig St. W., MONTREAL

If you are hot-forging SHRAPNEL CASES you cannot afford to overlook the merits of "HAWK" D CHROME VANADIUM STEEL

for both first and second operation Punches. This steel comes to you heat-treated and ready for use. It gives excep-
tional production. Many cases have been reported to us where each Punch turned out over 2,000 Shells. It does not
stick to the work. This enables you to turn out more Shells, per machine, per day.

STEEL OF EVERY DESCRIPTION.

HAWKRIDGE BROTHERS COMPANY, 303 Congress St., BOSTON, MASS.

ARMSTRONG WHITWORTH OF CANADA

LIMITED

MANUFACTURERS OF CELEBRATED BRANDS OF
HIGH SPEED STEEL & DRILLS

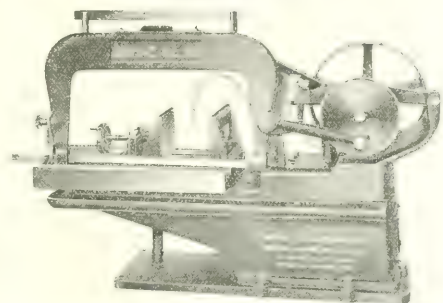
"AW" FOR CUTTING ALL METALS
AT HIGH SPEEDS

FOR HARD METALS — "TYR"
RAILWAY & TRAM TYRES

OFFICE 22 VICTORIA SQ. MONTREAL — WORKS LONGUEUIL QUE.

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

The Newly Improved Racine High Speed Metal Cutting Machine



No. 9-A Heavy Duty Machine—with 3-Speed Attachment.

For cutting Angles, Channels, I-Beams, Die Blocks, Pipe, Tubing and so forth.

SPECIAL FEATURES: Automatic Lifting Device, Combination Vise, Cooling System, Blade Holders, Saw Frame.

Write for list of Canadian users—we will mail promptly, together with specifications.

Manufactured by

Racine Tool & Machine Company

Racine, Wis., U.S.A.



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
ALIQUIPPA, PA.

Established 1840

Firth's "SPEEDICUT" High-Speed Steel

FOR LATHE, PLANER AND BORING TOOLS, ETC.

THE IDEAL STEEL FOR MACHINING SHELLS

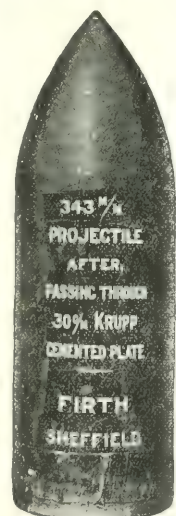
Being one of the largest manufacturers of Armour-Piercing and High Explosive Projectiles we possess unusual facilities for testing the cutting capabilities of High-Speed Steel, and our improved SPEEDICUT has been elaborated after many years of scientific research to meet the demand for a steel of the highest efficiency. It is sold in Annealed Bars and Discs.

High-Grade Tool Steel for Every Purpose.
The Largest Stock in Canada.

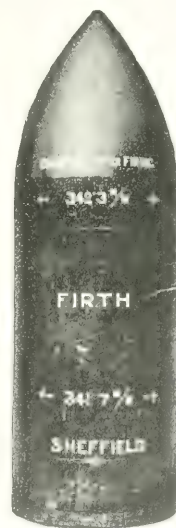
Thos. Firth & Sons, Limited

Norfolk Works and Tinsley Works
SHEFFIELD, ENGLAND

Works also at Riga, Russia; McKeesport, Pa., and Washington, D.C.



Weight 1400 lbs.



13 1/2 inches Dia.

Canadian Warehouses { 507 St. Paul Street, MONTREAL
79 Adelaide St. W., TORONTO

J. A. SHERWOOD,
Canadian Manager

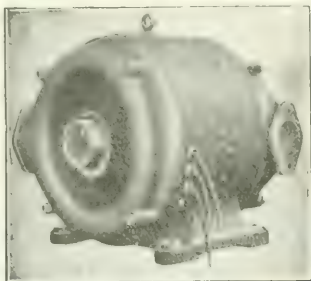
If what you want is not advertised in this issue, consult the Buyers' Directory at the back.

The Lancashire Dynamo & Motor Company, of Canada, Limited

107-109 Duke Street, TORONTO

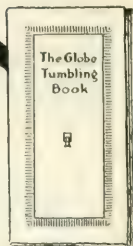
ELECTRICAL MACHINERY for all Purposes.

ELLIOTT BROS. INSTRUMENTS
RECORDING GAUGES



PIPE VENTILATED A.C. MOTOR
FOR VERY DIRTY PLACES

GET YOURS



If you do—or intend to do Tumbling you should have this practical treatise.

It is the result of ten years' experience with Tumbling methods and barrels—and contains many helpful hints.

The man responsible for results in your Tumbling Room may find it instructive.

Your free copy is awaiting your call. Mention Canadian Machinery.

THE GLOBE MACHINE
& STAMPING CO.
CLEVELAND, OHIO

Buy an

ALLEN Portable Pneumatic RIVETER

AND BE SURE OF THE **FASTEST AND TIGHT-EST** RIVETING AT THE LOWEST COST. →

"Whatever the riveting, there's an ALLEN for the job."

Special riveters designed to meet all requirements.

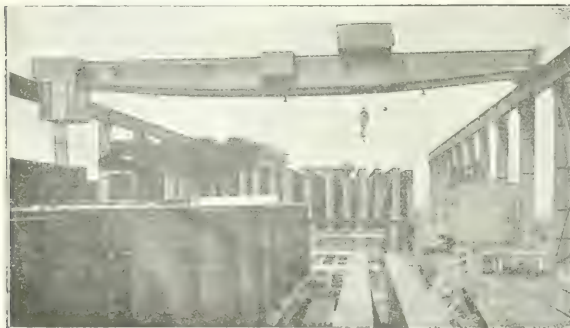
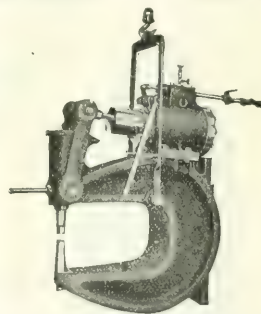
Send for Illustrated Catalogue

JOHN F. ALLEN COMPANY, (Established 1872)

370-372 Gerard Avenue, NEW YORK

Liebertson and W. I. "Codes," "Riveter."

AGENTS—Canadian Ingersoll-Rand Co., Ltd., Toronto, Ont.; Montreal, Que.; Winnipeg, Man.; Vancouver, B. C.; Seattle, N. S.; Cobalt, Ont.; Lethbridge, Alta.; Nelson, B. C.; So. Porcupine



Electric Travelling Cranes

(Direct or Alternating Current)

Steam and Electric Derricks

(Stationary or Travelling)

Up-to-date design. Built for fast, continuous service.

ACCESSIBILITY—DURABILITY.

Dominion Bridge Company, Limited

MONTREAL

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



A FIRST-RATE RECORD

CENTRAL SASH & DOOR COMPANY.

Topeka, Kansas, February 25th, 1915.

Gentlemen:—

Your representative, Mr. F. W. Bailey, two weeks ago, took a trip out to Levee (Sander of Rolls) with Magnolia Metal. We were very much pleased to find that, following his suggestion and equipping this old-style sander with Magnolia, we have been entirely free from any trouble whatsoever, and what is remarkable, upon recently balancing the rolls we found the bearings in perfect condition, in fact, in better shape than when freshly poured, due, as Mr. Bailey states, to the Graphite in your metal having built up flush the surface of the journals and leaving a highly polished condition. We also find that, due to the remarkable coolness of the bearings, that we are not constantly feeding oil over the boxes, as was necessary before using Magnolia.

This machine runs 2,500 R.P.M. and the Rolls oscillate which greatly increases the friction.

We remain,

Yours very truly,

CENTRAL SASH & DOOR CO.

Per Fred Scarlett

PRACTICAL ENGINEER POCKET BOOK:

1915 Edition. Over 600 pages. A valuable reference work imported from England and sold as an advertisement at the very low price of 40c. post paid.

Address Montreal Office.

SOLD BY LEADING DEALERS EVERYWHERE OR BY

MAGNOLIA METAL CO.

OFFICE AND FACTORY:

225 St. Ambrose St.

MONTREAL

No, Stevens' Stopper won't stop a train, but it will stop the blow hole in a defective casting so that you cannot find it.

In this way, it helps your bank account. The casting that otherwise would have to go to the scrap heap can be converted into good coin of the realm.

Same color as the rest of the casting. Doesn't look like a blue patch on Casey's faded overalls.

How to use Stevens' Stopper, or Circle Cement:

Stevens' Stopper is a fine powder, used with a little water and made into a paste—the hole is easily filled with a putty knife or trowel. It takes anywhere from two to twenty-four hours, depending upon the size of the patch, for the filler to become as hard as the casting itself. When rubbed with a file it shows the color of the casting, hence it is the best filler and the one thing that saves your castings, and that means the saving of your dollars.

Another thing—I do not ask a fancy price for it.

A pound will save many dollars' worth of castings. Put up in 5-lb., 10-lb., and 25-lb. cans.

FREDERIC B. STEVENS

Manufacturer of
Foundry Facings and Supplies, Buffing Compositions
and Platers' Supplies

Corner Larned and Third Sts. DETROIT, MICH.

BRANCHES

WINDSOR, ONTARIO, 20 PITT STREET

INDIANAPOLIS, IND., 138-143 SOUTH DELAWARE STREET

CLEVELAND SAND RAMMERS

FOR FLOOR, BENCH, PEIN AND FLASK RAMMING

Cleveland Sand Rammers are made in several sizes and weights, and are adapted for all kinds of ramming in general foundry service.

The Pump Rods are packed with a resilient packing that conforms to the shape of Rod without marring its free action, and prevents any dirt from entering piston chamber and working parts. Rammers are fitted with either Round or Flat Rods as required. Cleveland Rammers are light in weight, have high speed and practically no vibration, making them ideal foundry tools.

CLEVELAND CHIPPING HAMMERS

For General Foundry Work. Are furnished in any required size or weight for grey iron or steel castings. They have high speed, and are particularly adapted for the chipping now required by piecework operators.

BOWES AIR HOSE COUPLINGS

Over 1,000,000 in General Use

Bowes Couplings are instantly connected or disconnected.



Bowes Couplings are absolutely air tight under all pressures.

Also shown the New Slip Coupling for Bowes Couplings.

Also shown: REAMING HAMMERS, DRILLS, REAMING TAPPING AND FILE ROLLING MACHINES, CORNER DRILLS, PORTABLE AND BENCH GRINDERS, ETC.
Catalog No. 12 mailed on request.

CLEVELAND PNEUMATIC TOOL CO. OF CANADA, LIMITED

80 DUCHESS STREET, TORONTO, ONT.

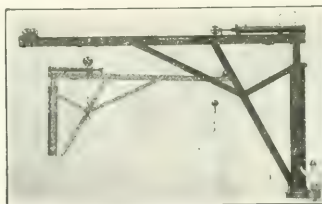
Agents: A. R. WILLIAMS MACHINERY CO., TORONTO

WILLIAMS & WILSON, MONTREAL



Sand Rammer in Operation.

IDEAL FOR CRANE ELEVATOR OR OVERHEAD SYSTEM



CURTIS POWER JIB CRANES

CURTIS AIR HOISTS

OR REGULATABLE AIR CYLINDERS

are virtually straight line motors, capable of the widest application to shop and industrial requirements.

FOR GENERAL HOISTING, they are superior to electric motors, are cheaper, more reliable, simpler, and have lower maintenance cost.

FOR DELICATE HOISTING, as for instance,

DRAWING PATTERNS—SETTING CORES—POURING METAL

and machine shop and foundry SERVICE GENERALLY. They start or stop as slowly and gently as you please, absolutely without jerk or jar. Any speed operator desires. Will hold the load at any point of the lift and cannot drop load, even should air line break or air supply fail.

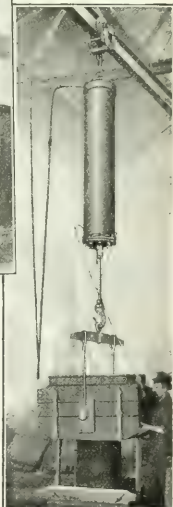
If you have hoisting or other problems, requiring hoists, air compressors, cranes, pneumatic or hydro-pneumatic elevators, sand blasts, or overhead trolley systems, give our Engineers an opportunity to help you. Their advice will cost you nothing.

WRITE FOR CATALOG 62 AND NAME OF NEAREST CANADIAN AGENT.

CURTIS PNEUMATIC MCHY. CO.

1585 Kienlen, St. Louis, Mo.
New York Office: 531F Hudson
Terminal Building

WRITE FOR
CATALOG
A-1



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



When This Man Buys Instruments or Tools



he goes to the leading dealer and buys tools that he knows to be standard in accuracy and quality.

Engineers, technical men, expert machinists take great pains in the selection of their instruments and tools.

The dealer who has Starrett tools establishes a high standing with buyers of this class.

Starrett Tools

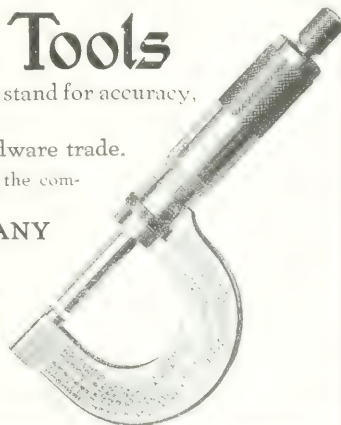
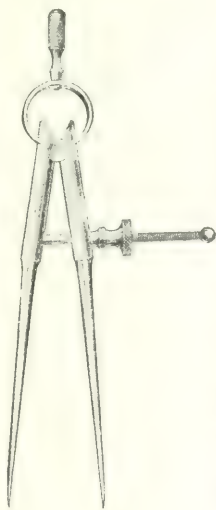
among technical men are known to stand for accuracy, efficiency and fine workmanship.

We deal direct with the retail hardware trade.

Send for free catalog No. 20-3 showing the complete line and secure our prices and terms.

THE L. S. STARRETT COMPANY

"The World's Greatest Tool Makers"
ATHOL, MASS.
New York London Chicago



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

MALLEABLE IRON



Trade Mark

Castings

Any Size—From Ounces Up



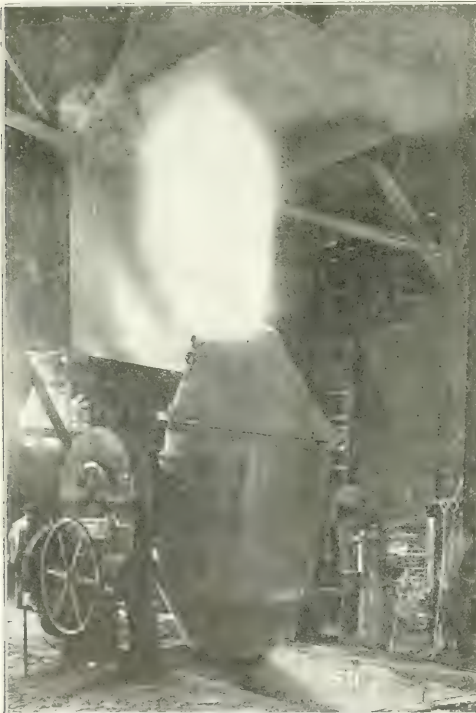
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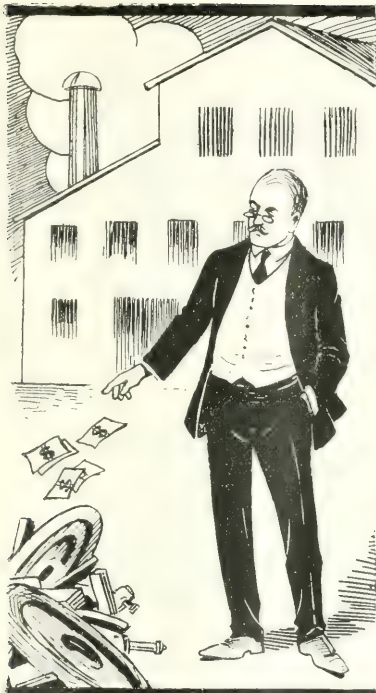
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Why then scrap castings that cost dollars to make just because of blow holes, sand holes, etc., when by using

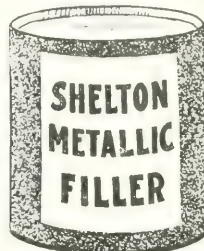
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you can eliminate these defects and the expense of make-overs? You will not be delayed in filling orders—you will have no dissatisfied customers and no lost business.

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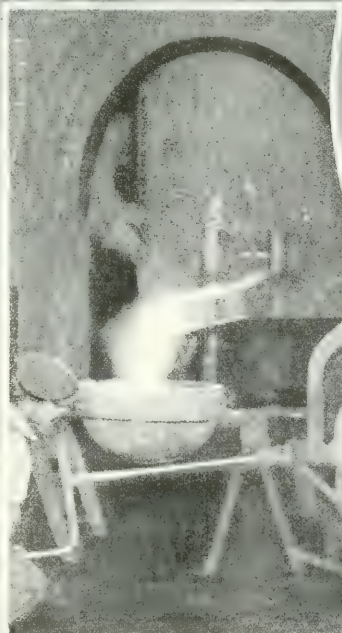
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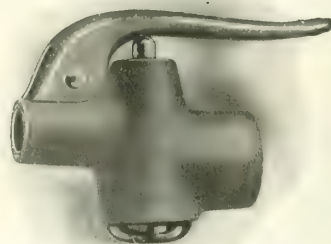
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At slight cost a whole shop may be equipped with a system for cleaning inaccessible parts of machinery, tools, patterns, etc.

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Operatives to work at their highest point of efficiency must be comfortable.

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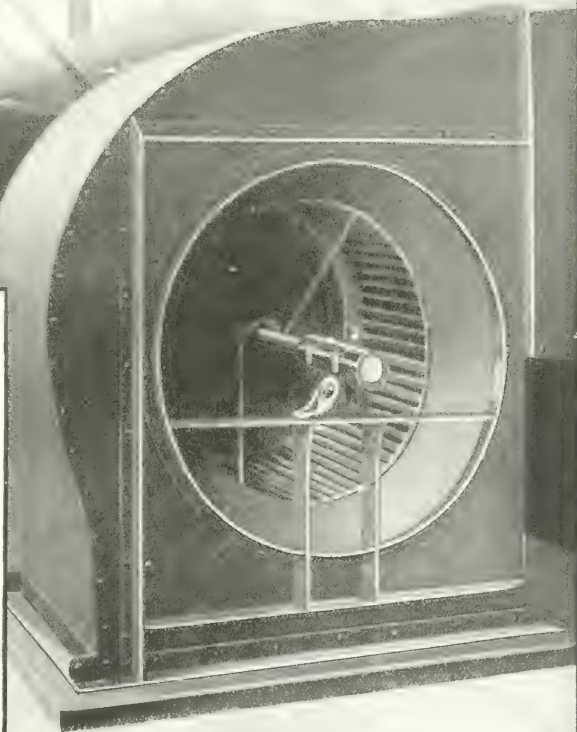
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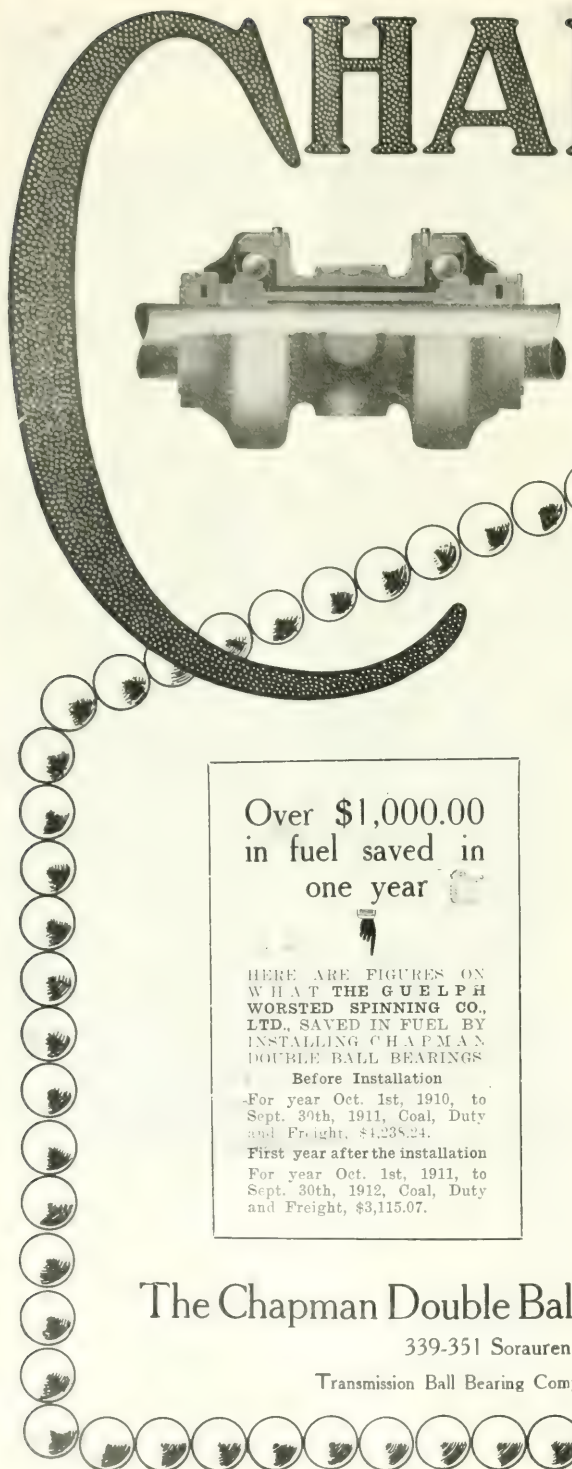
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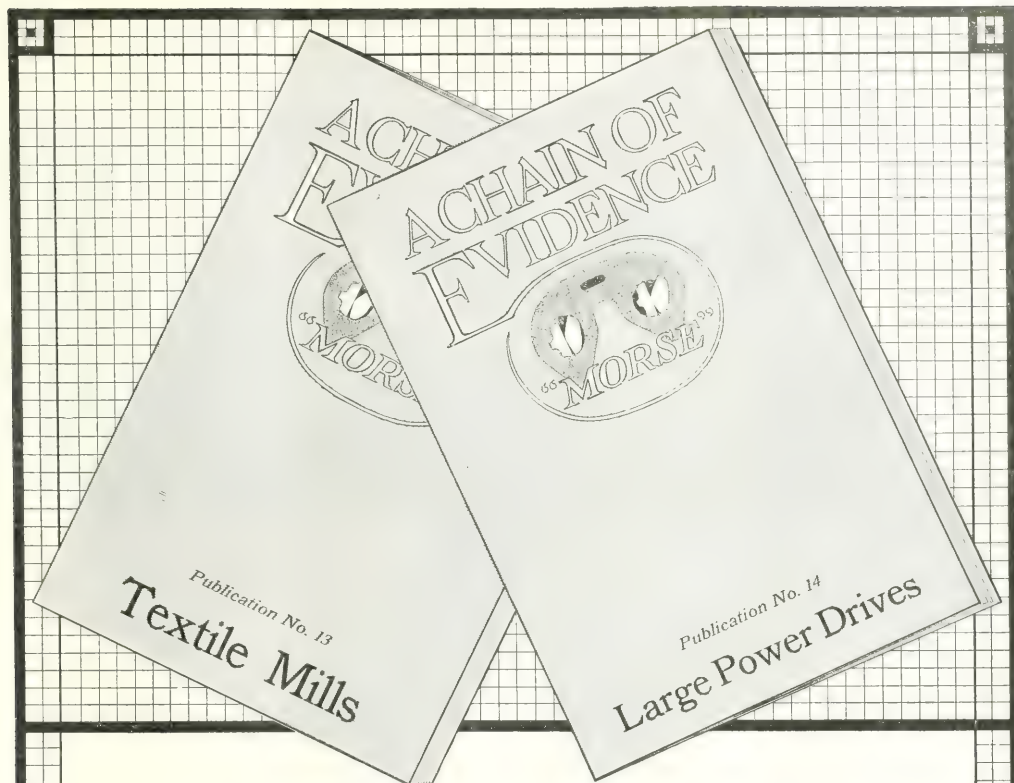
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We also manufacture Hydraulic Presses for Shell Banding, Loading Funnels, Ball-Bearing Tightening Nuts, Belt-Driven Loading Vibrators, Bench Vises and the Universal Elevating Truck.

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is a 6 x 9", 12-page and cover bulletin descriptive of the MORSE Silent Chain, its construction and operation, and illustrating its application to *Textile Mill Machinery*.

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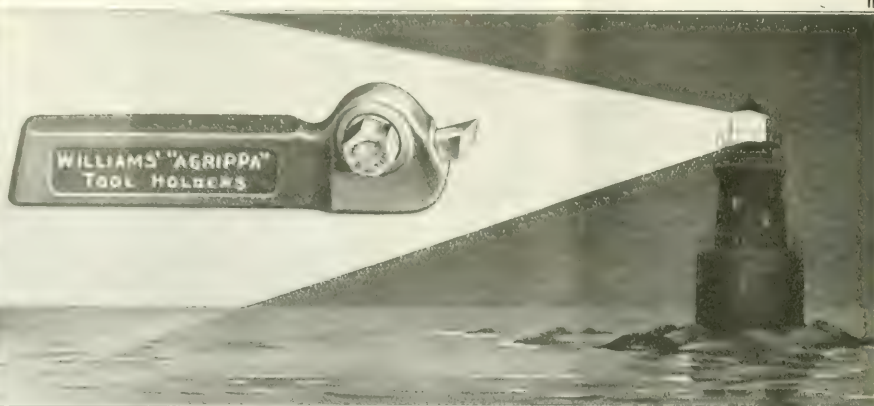
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Let a score of reasons emblazon their score



"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.
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8. They never lose their heads.
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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.
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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.
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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.

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Wheels are suitable for nearly every grinding operation and furnish an abrasive



material that is almost ideal.

When properly selected for the work to be done, an Alundum Wheel will cut cleanly, rapidly and smoothly; it will not burn or heat, causing unequal expansion of the metal and consequent irregularities, but will make a true cut within close limits of accuracy.



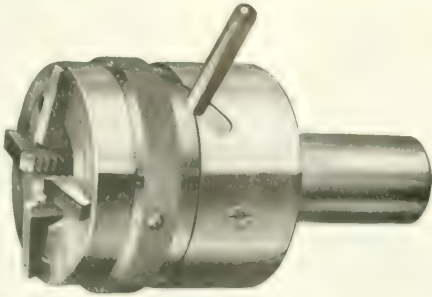
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Wells Self-Opening Die - Model B.

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.

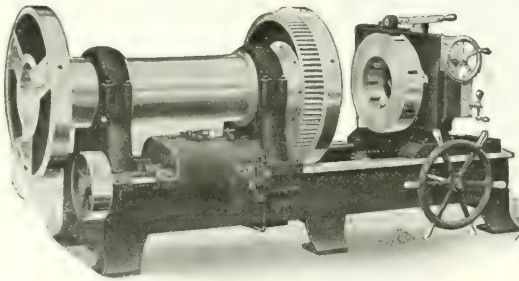
Do you want us to prove it? We are ready.

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?

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SHOP REQUIREMENTS

are such that the most modern machinery is needed, built for long, hard service. We know those requirements and make our machines to stand the wear and tear which the service demands.

When deciding on a new machine it is well to con-

sider what it will be worth in ten or fifteen years, and what it will cost to keep it in good running order during its natural life. Endurance is only one of their good points.

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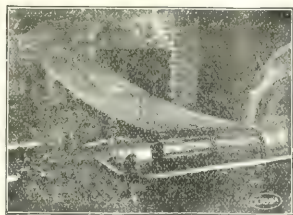
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RENOLD PATENT SILENT CHAIN QUIET—EFFICIENT—DURABLE

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U. S. Electric Drills and Grinders

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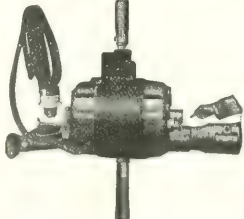
SIZES.
8-16 inch, W.G.T. 6 lbs.
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All motors wound for 110 or 220 volts. Direct or alternating current.

Try a few of our Electric Drills and Grinders and you'll send us an order for more. Our guarantee protects you.

They can be attached to any lamp socket.

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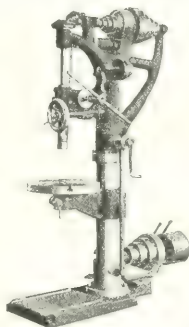


½ inch—2 SPEED.
Speed, 400-750 R.P.M.

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THE UNITED STATES ELECTRICAL TOOL CO.
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Standard 20-inch Drill Press

The Canadian Standard 20-inch Drill Press can be used for the various operations of reaming, sizing, centering, tapping, etc., on high explosive shells. It is adapted to meet the severe demands of shell manufacturers, and is fulfilling all requirements for special-sized work.

Write for full particulars.

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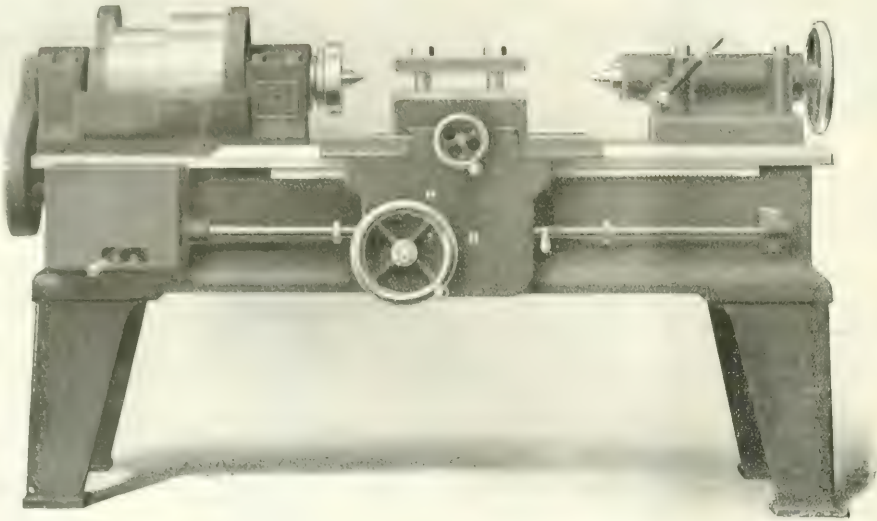
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ROBERT GARDNER & SON
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RAWHIDE

OR METAL



Do You Want a Lathe for Your Rush Work?

Here is a lathe for turning and boring projectiles ranging from 3 to 6 inches in diameter. It can also be used for general manufacturing work. It is a 24" lathe cut down to swing 16", adding to the rigidity and convenience of operation. Can be operated by unskilled labor.

Specifications

Dia. of spindle	5
Swing over bed	16"
Swing over carriage	10"
Distance between centers	21
Ratio of back gearing	6.25 to 1
Diameter of tailstock spindle	3½"
Travel of tailstock spindle	8"

Large diameter two-step cone for 6" double belt. Steel gears.

Let us give you full details on this lathe. It will prove a money-maker for you on your work. Good deliveries still available.

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Canada's Departmental House for Mechanical Goods

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Systematized Shell Production: Methods and Results

Staff Article

Efficient teamwork by any organization is only possible when a clear and complete understanding exists between all members. Frequent conferences between responsible parties for open discussion of common problems, effectively prevents subsequent delays due to overlapping or failure of any particular department to maintain scheduled output.

SHELL making in Canada has now reached the stage where it might seem impossible to further enlighten those interested in any way, with the manufacture of these munitions of war. While this may be true regarding the various operations required to produce

entirely different. It is this variation in detail that is constantly keeping the attention of the readers of trade papers in close touch with the many ingenious methods and devices which are being adapted for the maximum output of this much needed article.

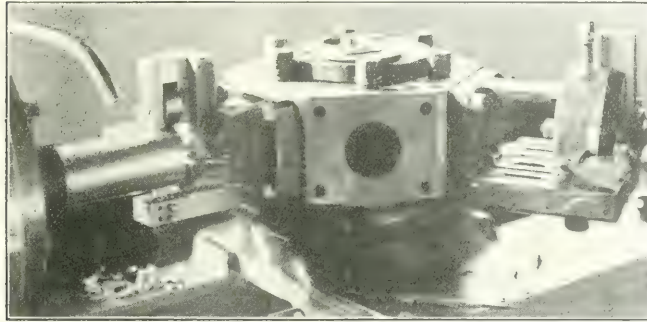


FIG 1—OUTSIDE ROUGH TURNING ON "LIBBY" TURRET LATHE

the completed shell, the system whereby these operations are performed and the methods devised are often so different, and correspondingly interesting, that a great deal can yet be said on the methods adopted in the various plants.

It is strangely true that no two men think alike, and it is also true that no two shops (even if they are producing the same class of goods) are similarly equipped. It is, therefore, reasonable to expect, with the same proposition, is placed before a number of men, each surrounded by his own individual re-

While there has been quite a number of plants specially constructed for the manufacture of 3.3 and 4.5 shells, there are a far greater number who have taken the opportunity of the times and equipped their present factory with the necessary tools for producing these shells.

In the present situation, when the desired tools are practically unobtainable, much thought and consideration have been given to the designing and developing of jigs and attachments, whereby the present equipment (often of ancient origin) can be used to the best advantage.

fore the actual work was commenced. One of the chief features in this connection was the organization of a private shell committee, composed of the manager, superintendent and foremen of the various departments. From the commencement of operations this committee has met regularly to discuss ways and means whereby the production of shells can be handled to the best advantage. The success of this firm, in producing shells of first-class quality, is largely due to the methods of co-operation among the members of this committee. Suggestions and ideas are here advanced and every detail carefully considered before any actual work is performed.

That this method of solving the problems of shell making has met with satisfactory results, is shown in the report, that this firm have one of the best records of any in Canada. The efficiency, in series of 120 has averaged 117, and in some cases 118, which is practically perfect. In consideration of this showing

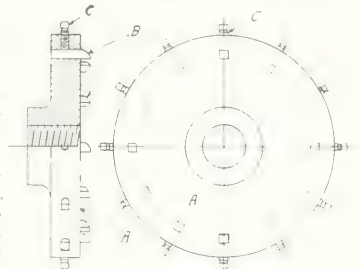


FIG 1A—CUTTER FOR FACING OFF SHELL BASES

they are now making series of 250 in place of the ordinary quantity of 120.

In addition to the good showing being made in production, this firm have designed and installed several novel and useful attachments in connection with the manufacture of shells which have proved highly satisfactory; some of these devices are now being used by other plants with excellent results.

Shell Production

The sequence of operations in this plant is somewhat similar to that in other establishments; however there are several very interesting devices that are worthy of description.

Roughing to Length

The open end of the 120's are cut off by a Hall cut-off machine and the

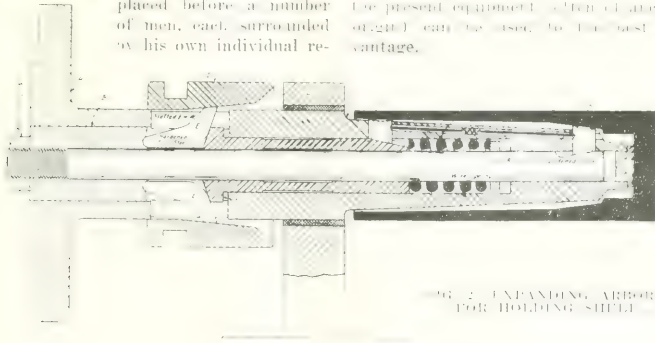


FIG 2—EXPANDING ARBOR FOR HOLDING SHELL

quirements and experience, that the final solution to the same problem—while having the same answer—may vary to such an extent in detail, as to appear

Plant Organization

When the plant herein described, first considered the manufacture of shells, every detail was carefully considered to

base is faced off on a Hyatt lathe, the rollers for moving the shells are set in it for the same purpose. The inside of the shell, shown in Fig. 4A is used for facing the rod. Another Brown 20 inch

Brown X is for cast steel after C, when carries the expansion mechanism. When the final shell has been placed on the arbor, sliding sleeve D is advanced by means of a lever. The internal tapered

of the dogs G and H, whereupon they contract and allow the shell to be removed. A hardened steel plug is placed in the end of the arbor to gauge the lateral position of the shell. To insure rigidity the steady head I is used; this is made of cast iron with a babitted bearing.

Inside Boring

The inside boring is done on four Jones & Lamson double spindle flat turret lathes, the operation being shown in Fig. 3. After the shells are bored the driving band groove is formed on an 18-inch Bertram lathe with Bertram waving and undercutting attachments.

Hardening and Tempering

The hardening of the shells which is done in much the same way as already described in previous articles is shown in Fig. 4. The furnaces used are two of Dominion Bridge Co. make, while four others are being installed. The oil bath is placed inside a larger tank which gives a space about 10 inches completely around it; this space is filled with cooling water which is in continual circulation. In addition, the oil is further cooled by being pumped through a suitably arranged cooling tank. After the shells have been tempered they are placed in line to give sufficient annealing for further machining.

The scale and lime is then brushed off and the part of the base diameter back of the copper band groove is ground to size.

Nosing

The nose is now heated in a lead bath to a temperature of about 1,500 degs. F., and formed to shape in a Brown-Boggs No. 320 A geared straight side press.

The nose of the shell is finished in three Jones & Lamson single spindle flat turret lathes. The profile of the outside is formed, the nose bored and threaded, internal profile formed and the end beveled. A sizing tap is then run in by hand.

Grinding and Cleaning

The body diameter and nose are then ground to final size and shape in four Ford-Smith grinders. After the shells are thoroughly cleaned they are stamped in a Brown-Boggs stamping machine.

Putting on Copper Band

The copper bands are pressed on in a 150-ton hydraulic press constructed by the Lymburner Co., of Montreal. A sketch of this press is shown in Fig. 5. This press was designed to operate with a maximum pressure of 1,500 lbs. per sq. inch. To avoid any excess pressure taking effect upon the shell (which would have a tendency to distort it) a relief valve, set to open at the desired limit of pressure was placed on the feed pipe at one of the hydraulic connections, as shown at A.

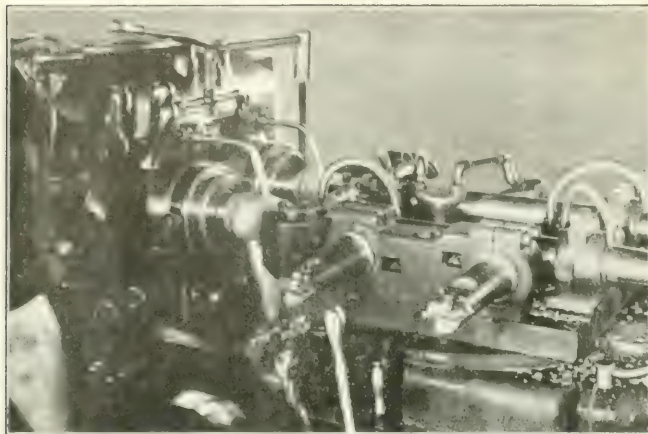


FIG. 3. INSIDE BORING ON JONES & LAMSON DOUBLE SPINDLE FLAT TURRET LATHE

starting lathe is also being fitted up to perform this operation.

Outside Rough Turning

The outside rough turning is accomplished on three single spindle Jones & Lamson flat turret machines, and one lobby turret lathe. A view of the operation on the lobby lathe is shown in Fig. 1. The shell is held on the expanding arbor shown in Fig. 2. The flange A is secured to the chuck or face plate of the lathe. Within this piece is the steel regulating bush B, which is held in position by a nut at the back. Secured to

slots in this piece now act upon the three dogs E, which force the hardened steel bush F forward and pull the central rod backward; the hardened steel dogs G and H are thereupon forced outward by tapered grooves formed in bush F, and the rod end respectively. These dogs are arranged in groups of three and centralize the forging very accurately.

After the shell has been turned sleeve D is moved back, when the spring I acting on the bush F and a steel collar fastened to the shaft, causes a relative movement between the bush and the shaft, removing the pressure on the end

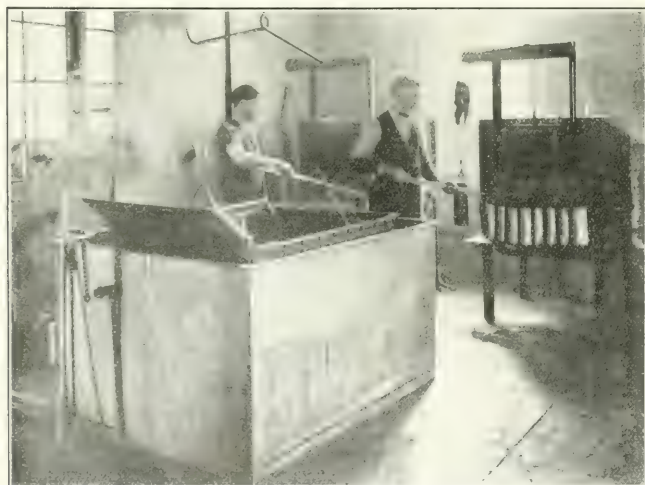


FIG. 4. HARDENING AND TEMPERING, DOMINION BRIDGE CO. FURNACES

The sectional view of Fig. 5 shows very clearly the detail construction of this press. Oil is used for operating the press and is supplied by pressure pump shown in Fig. 6. The fluid passes through the $\frac{3}{8}$ inch pipes B and enters the space between the pistons C and the movable cylinders D. As the pressure rises to 1,500 lbs. per sq. in., it is transmitted to the area of the piston, which is $6.5 \times .7854 = 33.18$ sq. inches.

At a pressure of 1,500 lbs. per square inch this gives a total pressure acting on each cylinder of $1,500 \times 33.18 = 49,770$ lbs., or about 25 tons. This pressure is transmitted through the die blocks E to the copper band. The coil springs F are to force the cylinders back after the fluid has been released.

Pressure Pump

The pressure pump which supplies fluid to this press—also designed and constructed by the Lymburner Co., is shown in Fig. 6; this pump, which is of the duplex type, has

D. during the intake stroke of the plunger. The discharge stroke of the plunger forces the fluid through the supply pipe E to the six cylinders of the

burner copper band turning attachment. Besides this special turning device there are some other interesting contrivances to be seen here. One of these is a special draw-in collet chuck operated by the toggle gear described below, which has been successfully adapted for use on several of the machines used throughout the factory.

Special Chuck

The details of the chuck (designed and constructed in the shop), which is used on a number of machines, is shown in Fig. 8. The body of the chuck A is threaded to fit the screw on the lathe spindle and turned on interior to the desired dimensions, to receive the split collet B. Inside of this split collet is another split bush C, turned to fit the collet B and ground out (when in position) to fit the diameter of the finished shell;

this inner bush is held in position by two screws D, which pass through slots in the collet B. This allows the collet B to be moved laterally by means of the rod E, which connects with the toggle arrangement at the rear of the lathe spindle.

Toggle Arrangement

The toggle arrangement is shown in

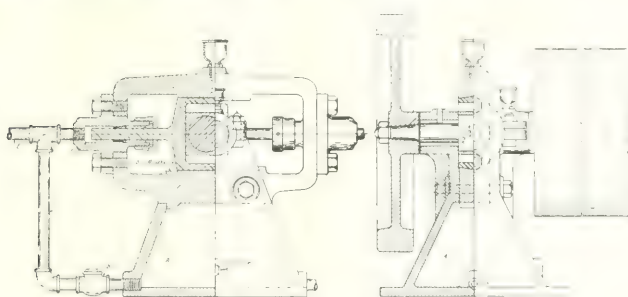


FIG. 6. HYDRAULIC PRESSURE PUMP

two plungers of $\frac{7}{8}$ inch in diameter and a stroke of 2 inch. The fluid is drawn from the reservoir A, through the check valve B, up through the pipe C and into the cylinder chamber

press. When the pressure has reached 1,500 lbs. per sq. inch on the gauge the controlling lever is released and the fluid passes back into the reservoir A.

Copper Band Turning

After the driving band has been pressed on the shells are taken to a Rahn & Carpenter 16-inch lathe shown in Fig. 7. The device here shown is the Lym-

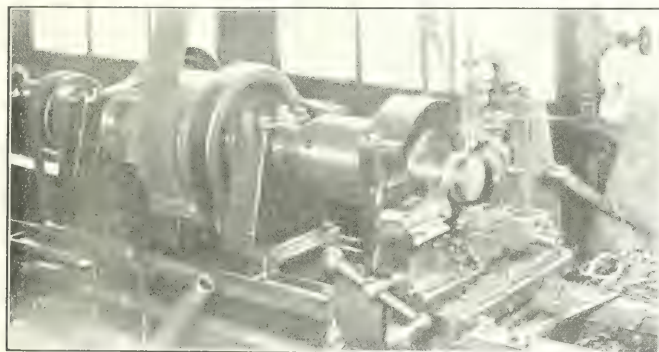


FIG. 7. TURNING COPPER BANDS

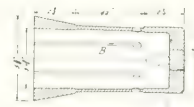
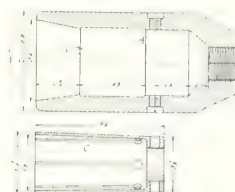


FIG. 8. SPECIAL LATHE CHUCK FOR TURNING COPPER BANDS

detail in the sketch Fig. 10. This device which has displaced the hand wheel previously used was also designed and installed by the superintendent of the shop and is proving very efficient.

The cast iron piece A, which is screwed on the tail of the lathe spindle carries the two bell cranks B; these connect with the sliding collar C, by means of the links D. The short arm of the bell cranks B fits into a groove in the adjustable col-

the lathe, which supports the gear upon the work. The drilled end of the lever F works in the pin of a steel ring G, the collar of which fits loosely over the

pin and the shells, filled with bullets and acted with an air vibrator, they are then fired with resin from the two electric heated furnaces shown at either

a special machine shown in Fig. 12, where the socket is screwed home by the power supplied by the machine. After the socket is screwed in the shells pass to a

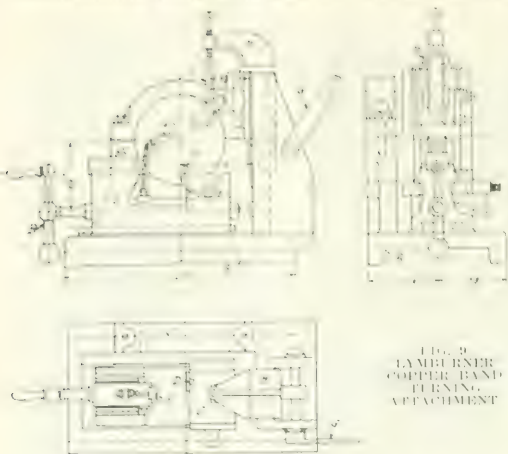


FIG. 9
LYMBURNER
COPPER BAND
TURNING
ATTACHMENT

ing adjusted by the nut H. The bracket I, which is secured to the bed of the lathe, carries the arm F, and likewise supports the outer end of the rod J.

Band Turning Device

Fig. 9 shows a sketch of the Lymburner band turning attachment which has been doing excellent work in the finishing of the copper rifling band, on 3.3 and 4.5 British shells and also French and Russian. The frame A of the device is secured to the shears of the lathe in the desired position. By turning the handle B, the slide C with tool D travels in a direction parallel with the lathe spindle; this is obtained by means of a pair of spiral gears beneath the slide C. The tool D is in such a position that the copper is roughed off with a single point tool.

While the tool D is roughing the band on, the slide E and tool F are advancing toward the work; when the roughing is finished the turning tool F shapes the band. Lever G is then pulled forward and by action of the pinion and rack, the slide H is fired down, and the tool I sizes and polishes the copper band. The part of the frame J acts as a steady head.

Assembling

Fig. 11 shows the assembling bench. The brass tube is screwed into the

end of Fig. 11. The man at the right of the figure paints the brass sockets with red lead and enters it into the nose of the shell; it is then passed across to the man in the centre who places the shell in

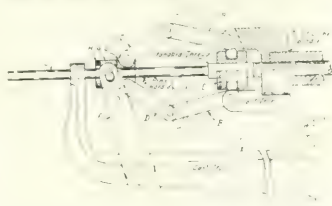


FIG. 10
TOGGLE JOINT FOR LATHE
CHUCKS

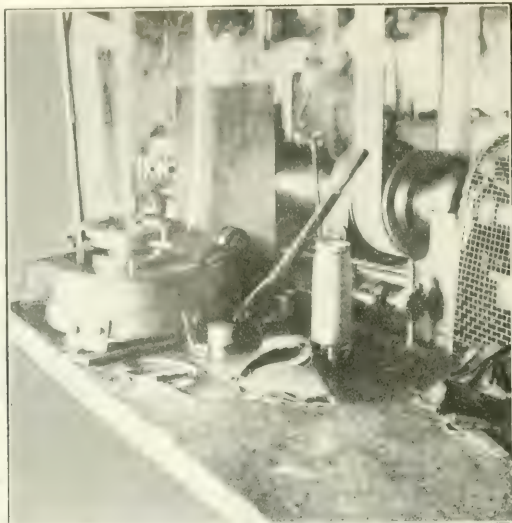


FIG. 12
SCREWING IN SOCKETS WITH SPECIAL DEVICE

and at the end of the bench where the tubes are soldered with two electric irons; from here they go to the machine shown in the background of Fig. 11, where the sockets are finish turned. The arrangement here is so compact that the shells pass from one operator to the other without the men taking more than one step.

Socket Screwing Machine

The details of the socket screwing machine (designed and built by the Lymburner Co.) are shown in Fig. 13. The frame A of the machine is secured to the bench; this casting is bored to receive the split collar B, which is operated by the rod C as shown. This arrangement of the handwheel has been displaced by the toggle device described above, which gives better satisfaction, with increased production. The copper band, being of a larger diameter than the body of the shell, it is necessary to place an auxiliary bush over the shell before placing in the chuck.

On the outer diameter of the centre casting A is placed the large worm gear D, which meshes with



FIG. 11
FILLING SHELLS WITH RESIN. TANKS HEATED BY ELECTRICITY

the worm E. The shaft F, upon which the worm is secured, runs in brass bushes held in the housing of the frame A. The end thrust is taken up by the fibre collars shown, the position of which can be adjusted by the threaded brass bushes. The driving pulley G is keyed to the end of the shaft F. Varying force can be applied to the screwing arrangement by means of the idler pulley H, which revolves on a pin secured in the arm I; on the opposite end of the shaft that carries the

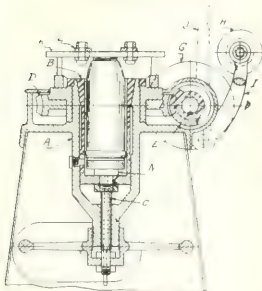
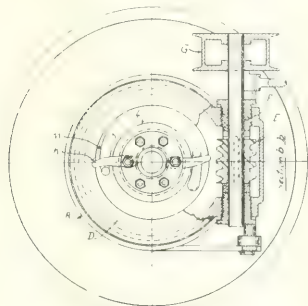


FIG. 13. SPECIAL APPARATUS FOR SCREWING IN BRASS SOCKETS

arm I is the lever J, which controls the cushion put upon the belt. In preference to the two-point driving arrangement shown in Fig. 13, a three-point drive is now being used. The dogs K, with teeth on the inner end, are pivoted on studs in the collar L. These dogs come in contact with self adjusting bell cranks M mounted in the worm gear.

Operation

The operation is as follows: the slip bush is placed over the shell and placed in the chuck and resting on the ejector

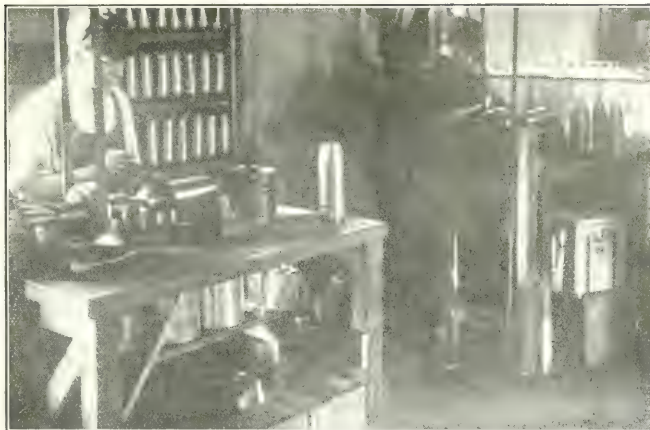


FIG. 11. PAINTING AND DRYING SHELLS

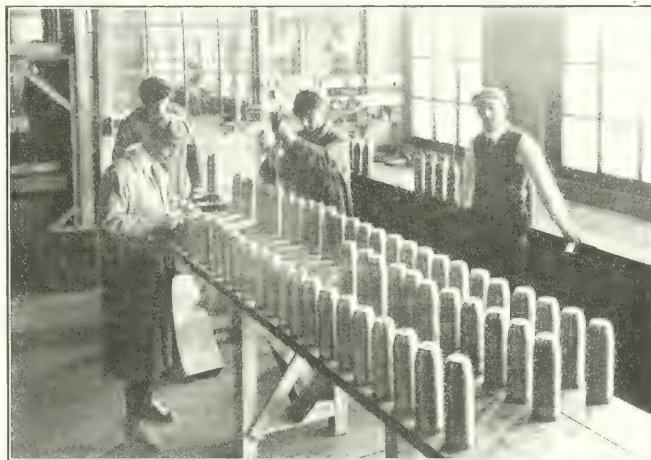


FIG. 15. INSPECTION DEPARTMENT



FIG. 16. SHELL COMMITTEE OF LAMBERTS, MONTREAL
From left to right: Mr. H. J. M. Lavoie, Mr. A. J. M. Lavoie, Mr. J. M. Lavoie, Mr. J. M. Lavoie, Mr. J. M. Lavoie, Mr. J. M. Lavoie, Mr. J. M. Lavoie.

Sheet Metal Elbows: Their Development and Laying Off-II

By J. W. Ross

In order to thoroughly understand the principles involved in the development of cylindrical and other forms, such as are met in sheet metal work, a considerable knowledge of geometry is desirable. Through the medium of these articles, the author places practical examples at the disposal of our readers, and the knowledge to be gained by a close and persistent study of the principles and methods employed will well repay the time spent.

THREE-COURSE ELBOW OF 90 DEGREES

FIG. 10 shows the elevation and cross sectional views of a three-course elbow of 90 degrees. In making these, no matter to what angle of a circle the elbow conforms, it is not necessary to draw out the full elevation view, as has been done here for explanatory purposes. Enough information for constructive purposes can be obtained by calculating the first mitre line and drawing this to the necessary measurements.

To calculate this mitre line, it is the practice to count each end course as one and the intermediate course or courses as two each. The sum of these is divided into the number of degrees of the elbow, the result being the angle of the mitre line. For instance, in the elbow of 90 degrees, as shown in Fig. 10, the courses I and III are each counted as one, the intermediate course as two, the sum being 4. Now, 90 degrees divided by 4 equals 22½ degrees, thus the mitre line BJO is drawn at an angle of 22½ degrees with AO, and the construction ABJK proceeded with.

For the benefit of the student the whole of the elbow will be drawn. As he becomes familiar with elbows he will find it much quicker to work from the calculation of the mitre line just described.

In Fig. 10, measure off AK equal to 1½ inches and KO to 2 inches. With O as centre and radii OK and OA, strike the quadrants KF and AE. Draw EFO at right angles to AKO. As this is a 90-degree elbow and of three courses, then each end course will be counted as one and the centre course as two, which will equal 4. Now divide the quadrant AE into four equal parts. Through these points draw a straight line from O, thus locating the lines OB, OC, and OD, and dividing the angle of 90 degrees into four parts of 22½ degrees each, this being 22½ degrees each for the courses I and III and 45 degrees for the course II.

At right angles to AK draw in the lines AB and KJ, intersecting the mitre line BJ. Similarly draw at right angles to EF the lines DE and GF to the mitre line DG. Connect B to D by a straight line, which will be tangent to the quadrant AE through the point C. Also connect J to G by a straight line. On this construction the outline of the elevation

of the elbow is shown as ABCDEFGHJK, Fig. 10. The sections ABJK, BCHJ, CDGH and DEFG are all equal, the first forming No. I. course, and the second and third sections No. II. course, while the last section forms No. III. course, the reason being readily seen why each end course is counted as one, and intermediate courses as two. Obviously if the complete templet is laid out for course I., it will also be a complete templet for course III and a half templet for course II.

Construct the ½ sectional view A4K, using 4½ as centre and 4A as radius. Divide into the desired number of equal spaces. A4K has six equal spaces, and are numbered as 1, 2, 3, 4, 5, 6, 7. These points are projected up to the mitre line BJ, all the lines being drawn at right angles to AK and parallel to AB and KJ. The intersections of these lines on the mitre line are numbered in relation to their divisions on the semi-circle, as

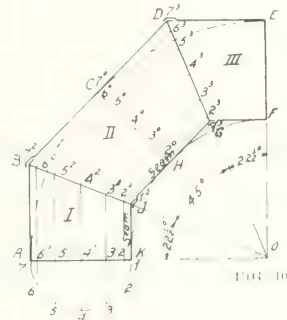


FIG. 10

shown on the mitre line by the numbers, 7, 6, 5, 4, 3, 2, 1. From these points draw in the lines 6'6", 5'5", etc., parallel to the lines BD and JG.

Measure off the stretchout of the neutral diameter AK or CH, Fig. 10. This equals 1½×3.14, which is nearly 4¾ inches. HCH, Fig. 11, is measured off 4¾ inches, and divided into 12 equal spaces, which is twice the spaces in the ½ sectional view A4K, Fig. 10. Parallel perpendiculars are drawn to HCH through these located points shown as 1'1", 2'2", 3'3", etc. Set the dividers to the distances 7'7", or 7'7", Fig. 10, which are equal, and transfer over to 7'7" and 7'7", Fig. 11. Reset the dividers to the distance 6'6" and 6'6", Fig. 10, also transfer

over to Fig. 11. Similarly transfer over the remainder of the distances on Fig. 10 to their allocated positions on Fig. 11.

An even curve drawn through these located points defines the rivet or mitre line. If suitable, these intersecting points may be used for rivet pitch centres, laps being added accordingly. JGDGJBJ, Fig. 11, shows the complete templet—with rivet holes and laps—for the course No. II., Fig. 10. The templates for the courses I. and II. are shown by drawing a line through HCH, Fig. 11, thus halving the templet, each half being the templet for either course.

It will be seen, as previously pointed out, that all the construction lines for the pattern can be obtained from the first calculated mitre line, as BJ, Fig. 10, thus obtaining the pattern for courses I. and III. and the half pattern for course II. It will be also noticed that in the preceding problems the vertical or longitudinal seams of the courses are placed on the inside throat of the elbow, as FE, ED, Fig. 1; LKJ, Fig. 3; CFE, Fig. 5;

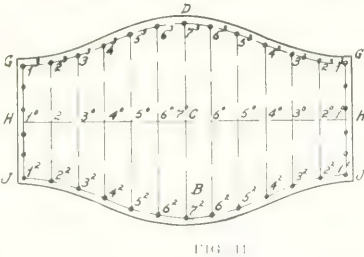


FIG. 11

and also KJ of course I.; JG, course II.; CF, course III., of Fig. 10. This is the usual practice in the lighter gauges of plate.

In the heavier gauges the seams are generally placed on the centre line of the elevation view, as shown in Fig. 12, also in Fig. 14, the seam of alternate courses being in line, whilst the seam of the adjacent courses are diametrically opposite. The seams being placed at these points, naturally change the contour of the templet usual to the preceding problems.

Of course, if the preceding problems are made in the heavy gauges, it would be better to locate the seams, as will be described in the following problems.

Elbow With Inner and Outer Courses

Fig. 12 shows the elevation and cross sectional view of a cylindrical three-

Machine Shop Production of 9.2" High Explosive Shells

In view of the fact that the manufacture of high explosive shells of sizes probably up to and including 12 inches diameter is likely to be undertaken at an early date in Canada, the following data relative to the machining operations on the 9.2 size will doubtless prove both interesting and instructive. We are indebted to Alfred Herbert, Ltd., Coventry, England, for the text and illustrations which give a fair idea of the work involved.

TWO alternative designs of 9.2-inch high explosive shells have been issued. The first, Mark IV/L, is a "closed in" shell of conventional type, while the alternative design, Mark II/L, has a screwed-in base plug similar to the larger naval shells. The latter design enables "block filling" to be used, and as this is now becoming practically universal, it would appear that the Mark IV/L shell will not be used very extensively and need not, therefore, be discussed meantime.

The forging for the Mark II/L body is made with the nose end closed, the bore is forged fairly close to size, and

the nose is designed specially to secure its quality and quantity production.

An outline sequence of the operations is shown in the line drawing (Fig. 1), the shaded portions indicating the work done at each handling. Before commencing machining operations, the nose end of the forging should be roughly squared up with a fettling wheel, to present a fairly true surface for starting the drill, in second operation.

Operation 1.—The cutting off is done on an ordinary engine lathe of suitable size, fitted with a bell chuck and a revolving steady in the tailstock for supporting the forging. In cutting off, the

chuck is designed specially to secure its quality and quantity production. The forging is gripped on a special fixture on a heavy vertical drilling machine, the fixture being of a type which centralizes the forging from the rough bore. A 2¼-in. hole is drilled through the nose and the mouth of the hole coned.

Operation 3.—This consists of rough and finish turning the parallel part of the outside diameter, and is done on an engine lathe. The shell is gripped at the open end by the inside, so as to ensure the rough bore running true, while a running centre fitting in the hole drilled at second operation supports the nose end. Multiple turning tool holders can be used, reducing thereby the turning time considerably.

Operation 4.—Profile turning the nose, finish boring the nose, and threading constitute the fourth operation. This is being done on a simplified "Herbert" No. 9 combination turret lathe, the special equipment of which consists of a bell chuck for gripping by the open end, and a three-point steady. The machine is fitted with a special profile turning attachment, while the screwing is done with a patent chasing saddle. The whole of the machining at this operation is done from the cross slide, therefore the hexagon turret and the quick power traverse are entirely omitted, simplifying the machine considerably.

Operation 5.—This consists of boring the parallel and profiled interior. The machine for this operation is shown in the line drawing (Fig. 2), and is a special turret lathe adapted to the work of shell boring. The headstock has a two-step cone for 6½-in. belt and duplex back gearing. With a two-speed countershaft, 12 spindle speeds are available. The bed length gives sufficient travel for the turret slide, and provides a base for carrying the support for the formers.

The turret slide is of a special form and carries a special turret. The base of the turret forms a circular turntable located in a recess in the slide, and held down by a circular gib. The upper part of the turret consists of two massive bosses with loose caps, which form a long support for the boring bar, in which it can be securely clamped by four nuts. The turret slide carries an indexing bolt arranged to lock the turret in either of two stations 180° apart, and the turret can, in addition, be solidly clamped to the slide by two clamping pads. These are for use with double-ended boring bars not controlled by a former, which

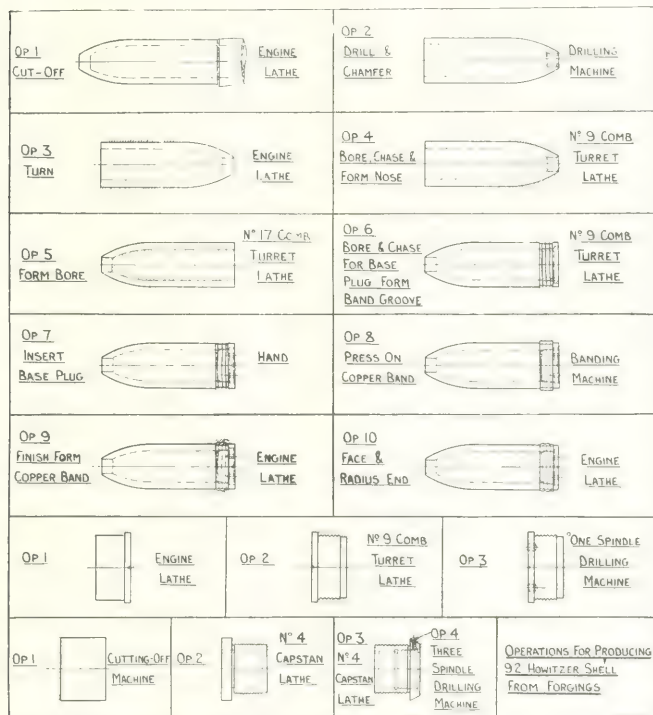


FIG. 1. SHOWING SEQUENCE OF MACHINING OPERATIONS ON 9.2 IN. MARK II L. HIGH EXPLOSIVE HOWITZER SHELL. BODIES, BASES AND NOSE BUSHES. THE HATCHED PORTIONS SHOW WHERE MACHINED AT EACH OPERATION.

the outside has a generous machining allowance to take care of eccentricity in the bore of the forging. Alfred Herbert Co. have given much consideration to the machining processes of this shell, and have in course of manufacture ma-

position of the tool should be carefully measured from the inside of the forging, so as not to leave an excessive amount of metal for removing from the bottom end of the bore.

Operation 2.—The forging is next

would then enable the machine to be used for work, Mark IV, and (if required).

When using former controlled boring bars, the tracing bar is of the good type, and the turret has to rotate under the influence of the former slide. The turret could use an arm of the standard type, and is provided with the usual quick power traverse motion along the bed. There are two automatic and dead stops for the two stations of the turret, which, however, stop the motion of the turret is towards the headstock. The turret has six cutters of reversible tool, by three-step cone, gear change in the apron, and reverse box. Pump and oil supply to the bar for each station of the turret are provided, arrangements being made for accommodating the varying angular positions of the turret when using former controlled bars.

The boring bar is made of steel, and in a bracket at the tail end is carried the tracer roller, which engages with the former. Provision is made for putting on the cut from this end of the boring bar, which thus enables cuts to be started at the nose end of the shell, the turret traversing away from the headstock. This is an advantage, as the chips are more easily carried out of the bore.

A bracket attached to the bed of the machine supports the boring bar rigidly under the cut, and can be easily moved out of the way for taking the shell out of the chuck. The chuck used is of a simple design, and the outward end of the shell is supported in a three-point steady.

Operation 6.—This consists of boring the thread to receive the base plug, counterboring the end, forming the band groove, and the waved ribs. It is done on a combination turret lathe, similar to that used for the fourth operation, except that the profile attachment is not included. The boring, chasing and forming of the

band is attached to the shell itself. The shell is chucked as in the fifth operation.

Operation 7.—This consists of screwing the base plug into the base plug (the machining of which is described later); being a hand operation, it needs no comment.

Operation 8.—The copper band is pressed on by any suitable type of press which may be available.

Operation 9.—The forming of the band is done on engine lathes, the chucking being done by a screwed peg fitted in the nose of the shell, which is locked up by a coned lock nut. The base end may be supported either by a dead centre in the base plug or else by running in a three-point steady on the outside diameter. The latter is probably the better method, as it ensures concentricity between the band and the body of the shell.

Owing to the rather complicated form of the band, a number of tools are required, and these may be carried in a suitable holder, each tool being successively applied to the work, being positioned by suitable stops.

Operation 10.—This consists of facing off the base plug in position, and forming the radius on the end. The operation is performed on an engine lathe, the method of chucking being the same as in the ninth operation.

The Base Plug

Operation 1.—The forging is held in a three-jaw chuck on an engine lathe, and the 7-in. diameter is turned, faced and centred.

Operation 2.—This is performed on a combination turret lathe, similar to that

Operation 3.—The two tommy holes are drilled on a single spindle ball bearing drilling machine, the jig used being of simple design.

The Nose Bush

Although it is permissible to form the nose bush solid with the shell body, we consider it better practice, on a shell of this size, to make a separate nose bush, as it enables a stronger boring bar to be used for the fifth operation on the shell body.

Operation 1.—The blanks are cut off to length on any type of cutting-off machine.

Operation 2.—This is done on a No. 4 capstan lathe, the external thread diameter being turned and chased, and the 1.9-in. hole drilled, bored and coned.

Operation 3.—This is also done on a No. 4 capstan lathe, the bush being held in a special chuck and drawing back by the external thread. The 2-in. thread diameter is finish-bored, recessed and chased, and the outside diameter formed.

Operation 4.—This consists of drilling the hole for the fixing screw, and is done on a three-spindle ball bearing drilling machine, the tools being of a simple design, and calling for no comment.



Sometimes a machine screw breaks off, and then if you don't know just how to remove it you're up against it. Next time this happens go at it in this way: Take a small square chisel and sharpen it to a point. Then drill a small hole in the machine screw you want to take out. Insert the point of the chisel in the hole in the screw and strike the

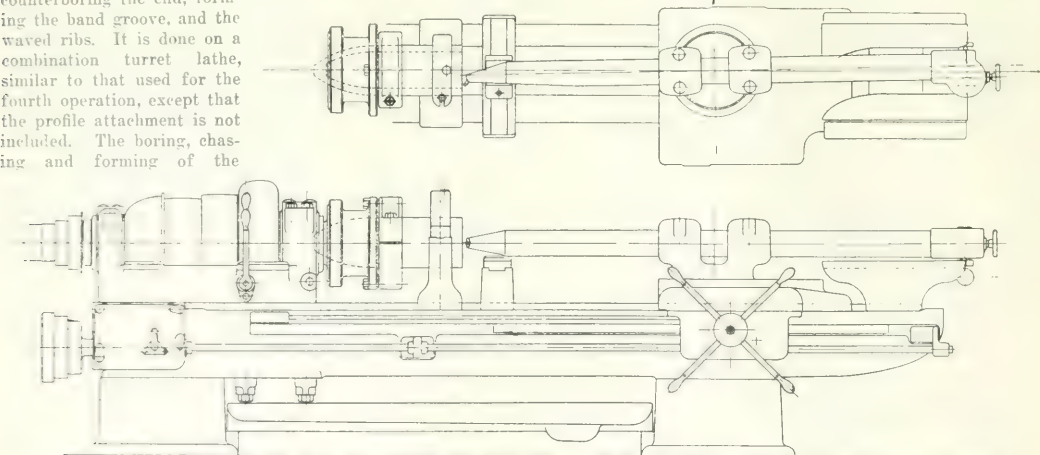


FIG. 2. SIDE AND FRONT DRAWING OF SPECIAL LATHE FOR BORING 92 IN. HIGH EXPLOSIVE HOWITZER SHELL BODIES

band grooves are all done from the square turret, the waving being done from the back of the cross slide by a special slide operated by a former cam.

used on the body in the sixth operation. The threads are rapidly cut with a patent chasing saddle, separate rough and finish chasers being used.

blunt end of the chisel a pretty good blow with a hammer. After that it will be an easy matter, by using a wrench, to turn the screw out.

THREADING DIES AND PIPE-CUTTING TOOLS

By J. E. H.

THE article under the above heading by P. W. Blair in the August issue of *The Power House* is all right so far as it goes. I wish to differ with him on one point, however. With reference to securing good threads, he writes, "The whole secret lies in the proper care taken of the tools and the lubricant used." The lubricant and care used are certainly important points in connection with threading tools, but the proper design of the die or chasers is much more so. Mr. Blair draws attention to several important matters but does not give the information necessary for their proper appreciation. I have had some experience along this line and will endeavor to place the matter before your readers in greater detail.

Getting Good Results

To get good results in threading at one cut the experience of the National Tube Co. shows that a die should have a suitable number of chasers, the approximate number being determined by the size of the die.

Machine or adjustable hand stocks and dies for $\frac{1}{4}$ -inch up to $1\frac{1}{4}$ inches should have at least 4 chasers; $1\frac{1}{2}$ in. to 4 in. should have approximately 6 chasers; $4\frac{1}{2}$ in. to 8 in., say 8 chasers; 9 in. to 12 in., say 12 chasers; 12 in. to 16 in., say 14 chasers, and 17 in. to 20 in., say 16 chasers.

Some readers of this journal may not agree with the above table, but in practice the results obtained have been the best possible after numerous tests. The experience of pipe manufacturers and others who do their own threading by machinery, shows that steel and iron pipe can be threaded equally rapidly and efficiently when the proper form of die is used, and the same may be said for properly designed dies used in ordinary hand stocks.

In order to obtain good results in threading any metal, the die must be made to cut and the pushing effect must be avoided. A chaser which pushes the material off, instead of cutting it freely, causes the threads to break out of the die. A die should be made with the proper consideration for the following points: Lip, chip space, clearance, lead or throat, and sufficient number of chasers.

Lip

This is also known as hook or rake, and is the inclination of the cutting edge of the chaser to the surface of the pipe, as shown diagrammatically in Figs. 1 and 2. This effect may be secured by milling the cutting face of the chaser, or by inclining the latter. The lip angle should be from 15 to 25 degrees, depend-

ing upon the style and condition of the chasers and chaser-holders.

Fig. 1 shows a chaser properly lipped for cutting ordinary steel pipe, the unbroken line showing how the lip should be ground. Care should be taken when sharpening the face of the chaser to maintain a good cutting angle—shown by the dotted line. Grinding back the face of the chaser does no harm if properly done.

Fig. 2 shows a die lipped for cutting open-hearth steel pipe, which requires a long, easy lip on account of the tough character of the material; the angle should be about 25° .

Fig. 3 shows a form of commercial die which is unsuitable for properly threading steel or wrought iron pipe. The dotted line shows how the die is

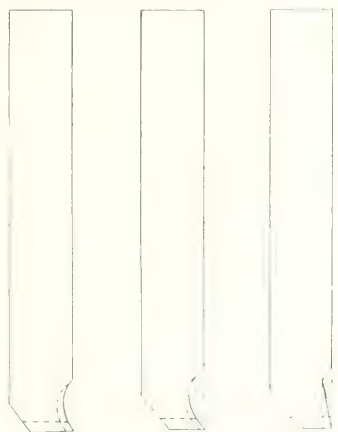


FIG. 1
THREADING
DIES AND
PIPE CUTTING
TOOLS.

usually made, in spite of the fact that this plainly makes a duller cutting edge than when ground as shown by the full lines.

Chip Space

This is the space required in the die-holder in front of the chaser to allow room for the accumulation of chips. "The importance of this feature cannot be too strongly emphasized," says the *National Bulletin*, "for if insufficient space be allowed, the chips will rapidly pack in front of the chaser and will soon begin to tear the thread." If the chip space is too small the die or chaser should project considerably beyond the ring.

Chip space is a particularly important consideration in dies used for cutting open-hearth steel pipe, as ample space is needed to care for the long, tough chips produced in threading this material. The lack of this feature in many commercial dies causes much of the difficulty often experienced in threading this class of pipe.

Clearance

This consists of the angle between the threads of the chasers and the threads of the pipe. When the chaser has been in use for some time, the sides of the threads become polished, brighter at the cutting edge, and gradually shading almost to their original color at the back. The chaser of a die which shows this condition will work freely, cut clean, will not tear the threads and will be durable. When the chasers of a die show a polish from the cutting edge to the back, there is a lack of clearance causing the cutting edge to work hard, heat, and make a rough, torn thread.

Lead or Throat

This is the angle which is machined or ground on the front of each chaser to enable the die to start on the pipe. The proper amount of lead is about three threads. As the heaviest cutting is done by the lead it should have a slightly greater clearance angle than the rest of the threads on the chaser. It should be noted that if the lead on only one chaser requires grinding to sharpen it, the whole set must be gone over in order to make the die cut evenly.

Lubricant

The best die made will not produce good results with poor oil. A lubricant particularly adapted to power machines where there is a steady flow of lubricant and which is also inexpensive, is composed of 30 per cent. cotton seed oil and 70 per cent. light neutral oil.

For hand tools, No. 1 lard oil may be used with success, as cottonseed oils have a tendency to gum up if the dies are not in constant service.

A die made by experienced tool makers with due regard to the points mentioned will thread wrought iron or steel pipe with good results. Much of the pipe on the market is steel, and it is naturally somewhat more difficult to thread with the old form of die.

In a paper by T. N. Thomson, read before the American Society of Heating and Ventilating Engineers, the author said: "The power required to thread mild steel pipe with a properly made die is not much more than that required to thread wrought iron with the same die, and much less than the power required to thread wrought iron pipe with a common die."



Executive ability can doubtless be cultivated by study and experience, but the man who has no natural talent in that direction, will never be a success as a foreman, superintendent or manager. Taet, or a knowledge of human nature, which enables one to treat each workman so as to bring out the best that is in him, is a very essential requirement.

Papers Read at the Recent Foundrymen's Convention

Selected from the more important subjects presented for discussion before the Annual Convention of the American Foundrymen's Association and the American Institute of Metals at Atlantic City, N.J. during September, 1915. The papers cover a wide field of foundry and allied activity, the nature of the results and the completeness of the reports making them of particular interest to all who desire to keep in touch with metallurgical progress.

MANUFACTURE AND USES OF WROUGHT MANGANESE BRONZE

By L. L. Jones*

MANGANESE bronze was introduced into the United States from England about 1891, and its first important application in the manufacturing of propeller blades because of its strength and toughness and the fact that it is practically incorrodible in sea water. The low melting point of the cast manganese bronze and the ease with which it can be cast into the most intricate forms lead to its adoption for many *automotive* parts and numerous other applications where service conditions are extremely severe.

The rolling and forging grades of manganese bronze had at first very few applications. The greater ease of use of the cast manganese bronze, its remarkable uniformity and excellence, and the fact that there was so little difference between it and the hot rolled grades as to physical characteristics, discouraged the use of wrought manganese bronze in many quarters.

As a rule, however, designing engineers consider forgings more reliable than castings, and they ascertained also that wrought manganese bronze has much greater strength and ductility than yellow brass, Muntz metal, Tobin bronze, etc. Hence forged manganese bronze began to be used in various water supply and irrigation projects. Forgings over three and three-quarters inches in diameter, more than twenty feet long and weighing over 900 lbs. have been successfully made. There is no record that any of these forgings have proved unsatisfactory or have failed in service.

Other applications are for piston rods, shafting, axles, etc., for machinery to be used in mines where there is corrosive water, or on shipboard for turret parts in connection with gun mounts, ordnance attachments, etc., where the metal must resist corrosion by sea water. A very soft, tough grade is used for sheet metal which has found application in the hulls of racing yachts, staybolts for locomotives and other parts that must resist shock or the effect of repeated stresses. Extruded manganese bronze blades have found some application in steam turbine construction where the erosive action of the steam is not so severe. A

large amount of wrought manganese bronze is used by powder and explosive manufacturers in situations where strength and non-corrosiveness is demanded, or where the use of steel would be dangerous by reason of its giving off sparks when struck.

Composition

Wrought manganese bronze differs chiefly from the casting grade in being free from aluminum. The addition of aluminum enables the alloy to be cast satisfactorily in sand molds. The following specifications as to composition may be considered as representative of the manganese bronze alloys most generally used:

Grade	No. 1A (for bars)	No. 1B (for sheets)	No. 2 (for rods and castings)
Aluminum	nil	nil	15
Copper	57.35	58.35	56.00
Iron	1.40	75	1.00
Lead	.03	.03	.03
Manganese	.02	.02	.12
Tin	1.20	15	1.05
Zinc	40.00	40.60	41.25

Pure Metals Necessary

In order to secure ductility as well as high tensile strength, extreme purity of the materials used is absolutely essential.

The grade of copper used in England is known as "Best Selected." It is of good quality, except that it contains antimony and arsenic which harden and lower the ductility of any alloy in which the copper is used. In the United States, opinion as to which is the best grade of copper is somewhat divided. Non-arsenical Lake copper is usually preferred for particular work, because of its uniformity in quality, although the best grades of electrolytic copper are of equal analytical purity. The impurities usually present are as follows:

Copper Analysis	"Best selected"	"Lake"
Antimony	nil	nil
Arsenic	.023	nil
Cadmium	50-505	50-505
Copper suboxide	trace	.112
Iron	.056	.004
Tin	nil	trace
Silver	.007	trace
Sulphur	nil	trace

In the manufacture of manganese bronze the selection of a pure grade of zinc is perhaps more important than any other one consideration. Freedom from lead is essential, as lead oxidizes readily and makes drossy brittle metal. Absolutely pure zinc would be an ideal material, and while it can be and has been produced commercially its high cost has militated against its use. Dr. Jos. W. Richards made several tons of electrolytic zinc a few years ago in Phila-

delphia, but no market could be found for it.

A very pure zinc is produced in Eastern Pennsylvania from a willemite or silicate of zinc ore. The concentrate used contains garnet, malachite, red oxide of zinc and franklinite. The ore will average 49.26 per cent. zinc and 3.50 per cent. manganese. The slab zinc is marketed under various names, and it produces a manganese bronze of remarkable strength and ductility.

A zinc of almost equal purity is produced by the double distillation of galvanizer's dross, the slabs being skimmed just before setting so as to remove any impurities that rise to the surface. While there is little difference in the analysis of zinc made from willemite and that made from dross the former has the greater toughness and strength. Perhaps this is due to the manganese in the ore. At any rate, if samples of the two grades of zinc of almost identical analysis are cast into slush molds, the one casting is liable to crack and the other will not. For this reason, makers of intricate slush zinc castings are compelled to use the willemite zinc. A number of the makers of high-grade zinc use the slush mold as a means of testing their product, and it will be found a very satisfactory way of testing zinc to be used for making manganese bronze.

The ordinary grades of spelter known as "Prime Western" are high in lead and for this reason should never be used. Scrap zinc reclaimed from sheet, etc., is also poor material. It may be high in lead and tin because of having been soldered, or it may contain much cadmium, which element has a hardening effect on manganese bronze. The grade of spelter used in England in conjunction with "Best Selected" copper is a French spelter known as Font-d'Art.

Melting

Crucibles are generally used for making forging manganese bronze, the heats being 325 lbs. each and requiring a No. 125 crucible. More recently there has been a tendency to use a No. 300 crucible as the smaller crucibles limit the output. Another reason for using the larger crucibles is that when a number of furnaces are attached to the same stack there are variations in the draft and it is seldom that any two crucibles can be brought out at the same temperature.

The copper is first melted, then superheated, keeping it carefully covered with

*Western Electric & Manufacturing Co., East Pittsburgh, Pa.

charcoal all the while. Next the iron and manganese additions are made from a small crucible in which they have been separately melted. Finally the zinc is added a little at a time with constant stirring and the alloy poured into ingots for melting. The remelting is considered necessary to secure a more uniform distribution of the iron and manganese. If the initial temperature of the copper is not high enough, or if the zinc is added too rapidly, the iron addition is thrown out of solution to a greater or less extent and is found disseminated through the ingots in the form of small shot which are practically high carbon tool steel. These shot will knock the edge from a machining tool in a few minutes and cause cracks in a forging when it is stressed. The composition of these shot is indicated below:

Aluminum	nil
Carbon, combined	4.31
Carbon, graphite	.66
Copper	2.82
Iron	80.44
Manganese	trace
Phosphorus	.010
Silicon	trace
Sulphur	.020
Tin	.110
Zinc	.870

It is not difficult to obtain a uniform alloy, however, if due regard is had to the temperature of the copper. The copper must not only be hot, but very hot, as it is much easier to make bad metal by underheating than by overheating.

Where the ingot metal is remelted for pouring into slabs or billets, reverberatory furnaces can be used if intelligently handled.

The only entirely satisfactory method of melting manganese bronze is in the open-flame, oil-fired type of furnace. The melting loss is low, the additions can be thoroughly alloyed and the metal poked and worked so that remelting is entirely unnecessary and the metal can be poured into billets at once without the usual double melting loss. Large heats up to 20,000 lbs. can be made and the resulting economy is considerable.

Pouring

The removal of dross from manganese bronze that is poured into slabs may be accomplished by skimming the slabs just before the metal solidifies.

In making large ingots, a crucible with a hole in the bottom, may be set on top of the ingot mold, and by keeping the crucible partly filled with molten metal, the entrance of dross is prevented. When the metal is poured, there should be as little drop as possible, for a long drop results in forming much dross. Hence, ingots should be short and thick if possible. Bottom pouring would be a good thing, only it would give cold metal at the top of the ingot and result in the formation of long pipes. With care a discard of only 2 per cent. from the top of the ingots is possible. As the surface

of the ingots is liable to be rough and full of cold-shuts, the ingots must be overhauled or rough turned before forging or rolling in order to avoid blister or slivers in the finished product.

The pouring temperature of the bronze must not be too high or it will eat the molds and become contaminated in the way with cast iron.

In time the ingot molds become coated with a layer of metallic zinc mixed with zinc oxide which has sublimed from the red hot ingots and condensed on the face of the molds. Unless this deposit is removed by scraping the molds or heating them to a red heat in an annealing furnace, the quality of the ingot metal soon deteriorates. The zinc seems to diffuse through the ingot in a remarkable manner, possibly being deposited along the margins of the crystal grains in the form of metallic zinc and makes the bronze less ductile. At times, too, this layer of zinc on the mold will produce such a volume of zinc vapor when the bronze is poured that the ingot is full of blowholes.

Forging

Manganese bronze can be readily forged, drop-forged, rolled or extruded at a red heat. The physical characteristics will depend on the line and temperature. The metal and alloys usually when worked cold, and machinery designed for the cold rolling and drawing of Tobin bronze, Muntz metal and yellow brass is not usually powerful enough to handle manganese bronze properly. This may result in the exterior of an article being overstrained while the interior is soft and comparatively unwrought. Excessive cold work on manganese bronze makes it class hard and it may even become full of hair cracks and incipient fissures invisible to the eye, but capable of being shown by stressing. An infallible test for excessive cold work on material otherwise of good quality is the appearance of the fracture of a test piece. If cup-shaped or lipped like the fracture of a soft steel specimen, assurance may be had that the manganese bronze has been given the proper cold and forging treatment. If, however, the fracture is conchoidal and irregular, excessive cold work without proper annealing is indicated.

Other Grades of Forging Manganese Bronze

As the number of firms making manganese bronze has increased, there has been more or less competition for the business available and the quality of the metals used in the bronze has not always been as high as it should be. This has resulted in lessened ductility. Another cause for this fault is the desire for a higher tensile strength on the part of some designing engineers. To meet this demand, manufacturers have resorted to

various means where some bronze of a higher tensile strength and elastic limit, but always with less ductility.

One manufacturer uses the casting-grade of bronze, melts it in an open flame furnace and poles the metal until a part of the zinc is removed and much of the dross and dirt. This gives an extremely clean and tough metal for sand castings, but it is not especially suitable for forging, as there is always some entangled alumina in the bronze that cannot be removed and which may cause defects. Further, this grade of bronze hardens too rapidly when hammered and hair-cracks are nearly always present in the finished forging unless unusual care is observed.

Another maker uses one-half casting mixture and one-half forging mixture with the addition of a little extra manganese. A tensile strength of over 90,000 lbs. is thus secured, but the objections noted above hold good also for this mixture.

Other manufacturers have increased the aluminum by several per cent. or the manganese or both, and have made additions of vanadium, titanium, etc., obtaining in this way a tensile strength as high as 125,000 lbs. per square inch, but with an elongation that is seldom more than 20 per cent.

Any radical departure from the formulas given in the first part of this paper or the use of any but the purest materials can only result in inferior manganese bronze. Safety is not found in extremely high tensile strength, but in great ductility and in avoiding excessive cold working. A tensile strength of say 70,000 lbs. should not be exceeded. Great ductility allows more leeway in forging, but cold work is always objectionable, as it may result in hidden fractures or later on in the so-called "season cracking." No manganese bronze, however ductile, in fact no wrought non-ferrous alloy whatever, can be said to be able to safely withstand excessive cold work that strains it above the elastic limit.

The future should see a more extended use of wrought manganese bronze. Its physical characteristics warrant a wider field for it. If those who manufacture it make quality the first consideration and if those who use it specify it intelligently, it will find a wide application.



Perhaps not always, but quite often, the skill of a machine operator can be measured by the condition of his machine.

The purpose of labor-saving machinery is generally to take the place of muscular effort; it is presumed the operator will always do the brain work.

PROGRESS IN NEW EQUIPMENT

A Record of New and Improved Machinery and Accessories for the Machine,
Pattern, Boiler and Blacksmith Shops, Planing Mill, Foundry and Power Plant

200 H.P. HIGH COMPRESSION OIL ENGINE

IN large plants, the Nordberg Manufacturing Co., of Milwaukee, Wisconsin, makes Diesel engines of the "Nordberg" type, but for smaller plants, with capacity 50 to 200 horsepower,

Diesel engines (in so far as concerns the method of ignition by the heat of the finely compressed air. The compression pressures are about 450 lbs. A three-stage high pressure air compressor to register 1,000 lbs. is not used for injection and atomizing the fuel. The

the installation in small plants for which these engines are designed.

The engine is of the two-cycle design, and all valves, cams, springs and valve gear have been eliminated, contributing further to the item of simplicity and ease of attendance and inspection. The

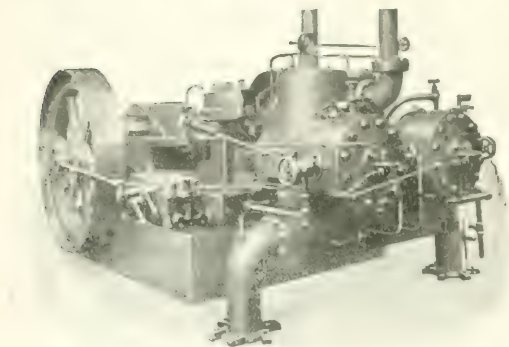


FIG. 1 "NORDBERG" 200 H.P. HIGH COMPRESSION OIL ENGINE, FROM THE FUEL PUMP SIDE

They build a high compression oil engine designed to meet the demand for an engine as simple as a slide valve steam engine.

The accompanying photographs illustrate the 200 horse-power 270 r.p.m. size, "Nordberg" high compression oil engine, also details of starting gear and

fuel is injected mechanically by a small pump and discharges through a new type of atomizing head which successfully subdivides and atomizes the oil. The success of the engine is, we understand, due largely to the effective working of this atomizing head. (See Fig. 4.) The elimination of the high pressure compressor with its intercoolers simplifies

head is a simple symmetrical casting, and is not subject to cracks due to unequal expansion strains. There are no valves in the head. The only valve on the engine is a piston valve for scavenging air located above and between the cylinders in the 200 horse-power illustrated. One valve controls the scavenging air for the two cylinders. Air is

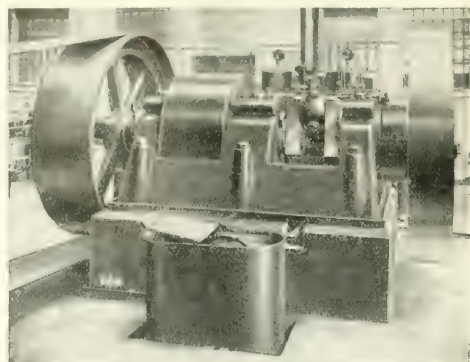


FIG. 2 "NORDBERG" 200 H.P. HIGH COMPRESSION OIL ENGINE WITH ONE CRANK CASE GUARD REMOVED.

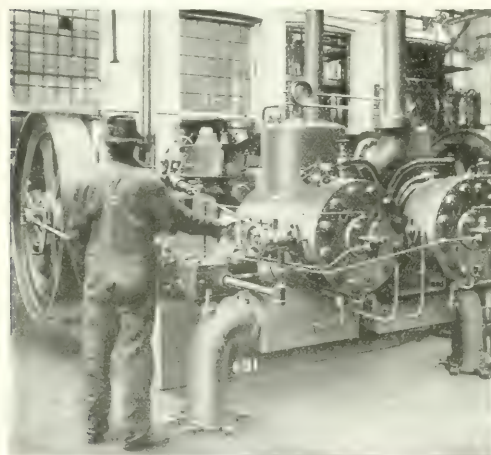


FIG. 3 STARTING "NORDBERG" 200 H.P. OIL ENGINE

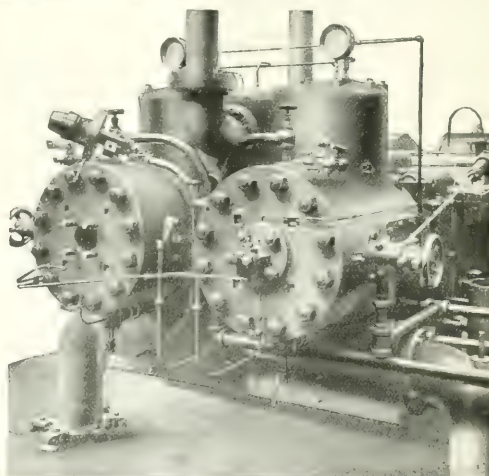


FIG. 4 CYLINDERS OF TWIN 200 H.P. OIL ENGINE

compressed on the crank side of the piston and by-passed to the head end shortly after the uncovering of the exhaust valves. This forces the burnt gases out of the cylinder and fills it with fresh air. Compression and combustion then occur as in any two-cycle engine. The air intake is through the vertical pipes above the engine, and exhaust through the pipes going through the floor.

In the 200 h.p. twin engine, a special automatic starting arrangement has been designed simplifying the operation so that engine may be brought to speed in less than a minute.

Fig. 3 shows the operator starting the engine by rocking an air valve which turns the engine over and at the same time throws in two auxiliary air cams which thereafter admit air at the proper points in the stroke to each of the two cylinders. The starting air is furnished by a steel tank previously charged to 250 lbs. from a small auxiliary compressor. When the engine has come to speed, one of the cams is thrown out by the corresponding finger shown near the top of Fig. 5, and at the same time the corresponding fuel pump is thrown into action by one of two levers on the same side of the engine, which may also be seen in Fig. 5. As soon as this cylinder fires, the air cam for the other cylinder is thrown out and the second fuel pump thrown into gear. The engine is then under control of the governor.

Fig. 5 shows the details of the fuel pumps which run in a bath of lubricating oil, the fuel levers and fuel governing mechanism. The oil is drawn from the storage tank to a small strainer box located to the right and behind the pumps from which it flows to the main fuel pumps. A small heating coil, through which heated jacket water circulates, is contained in the main oil compartment of the strainer box to insure free flow of very viscous oils. The pumps are operated by cams driven by an eccentric and deliver a quantity of oil in excess of that required for maximum load, the governor acting to by-pass more or less of the fuel depending on the load obtaining.

The by-passed oil is discharged through the sight glass and gives the operator a quick check on the working of each of the pumps. The governor is of the well-known fly wheel design, and gives a regulation of 2 per cent. from no load to full load. From the fuel pumps the oil is discharged through small pipes to the atomizer heads bolted to the main cylinder heads, as shown in Fig. 3, and also in Fig. 4, where one atomizer head

has been removed and placed on top of a cylinder. This device breaks up the fuel in fine particles and distributes it evenly over the entire section of the cylinder in the same manner as does the fuel valve using highly compressed air in Diesel engines.

The lubricating system of the engines

lubricator. Fig. 2 also shows the frame, bearing and crank construction in these twin engines.

The photographs of the engine shown herewith were taken in the Test Department of the Nordberg Manufacturing Co., where permanent concrete testing blocks have been installed for each of the three sizes of high compression oil engine built. Before shipment these engines are given routine tests for economy and mechanical troubles.

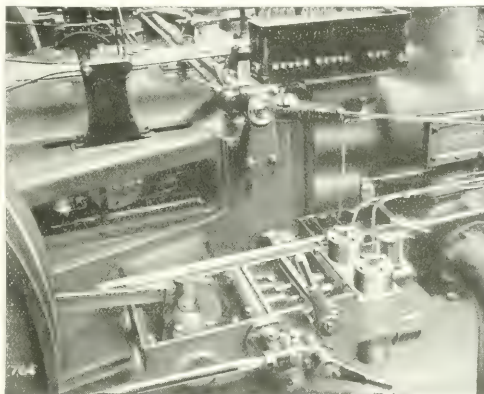


FIG. 5. VIEW OF FUEL INJECTION PUMPS, STRAINER TANK AND AIR STARTING GEAR OF "NORDBERG" OIL ENGINE.

is entirely automatic, oil being fed from a central pump driven from the scavenging valve eccentric, shown in Fig. 5. Cylinder oil is pumped to the scavenging air valve and to the main cylinders. Bearing oil is pumped to all main bearings, to the crosshead pins through trombone oilers and to all auxiliary bearings. The cranks are enclosed by polished iron guards, as shown in Fig. 2, and the oil accumulates in the crank case from various parts of the engine, and is drained to a filter and returned to the



FIG. 1. ORIGINAL "LEA" V-NOTCH INTEGRATOR

"LEA" V-NOTCH METER INTEGRATOR IMPROVEMENT

THE Yarnall-Waring Co. are placing on the market a new and more heavily designed integrator, for use on their well-known "Lea" V-notch recording liquid meter. Figure 1 shows the type which has been used for a number of years, and Figure 2 illustrates the new type.

In the new type, the aluminum dial which drives the integrator counter is in turn driven by means of a pendulum clock movement, built especially by the Seth Thomas Co. for this service. It has a double heavy spring pendulum movement, which is so constructed that vapor and dust do not seriously affect its accuracy.

It has been found advisable in practice to use a clock mechanism for the operation of the integrator separate from the clock mechanism which operates the chart recording mechanism, for the reason that if either clock should be deranged in service the user still has the other clock to depend upon. In addition to this advantage, one clock can be used as a check against the other, and more dependably accurate results be obtained.

The original "Lea" V-notch instruments were built with hand screws for making adjustments. It has been found, however, that in a few instances in power plant service vibration sometimes caused these thumb screws to loosen slightly. Hence, in the new model instrument heavy screws with slotted heads are employed for making adjustments. A screw driver only is needed for making such adjustments, and these when carefully made are found to be more secure than with the old type thumb screw.

In the new type instrument, the pen arm adjustment has been simplified, also the yoke supporting counter dial on the integrator. The case is so designed that the instrument cannot be affected in any

the tool is held against the belt, making practically an air-tight joint. This is valuable, especially for an instrument which is sometimes set in damp or rusty boiler plants.

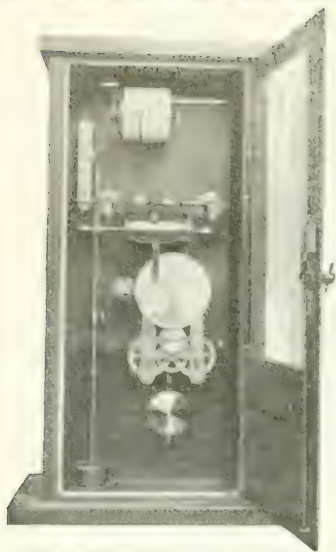


FIG. 2. PORTABLE PNEUMATIC GRINDER

the tool is held against the belt, making practically an air-tight joint. This is valuable, especially for an instrument which is sometimes set in damp or rusty boiler plants.



NEW PORTABLE "CLOSE QUARTER" DRILL

Of special interest to those having portable drilling to do, whether in machine shop, boiler shop, foundry, in the field, on bridge construction, or general structural steel work, is a new pneumatic drill for close quarter drilling, reaming, tapping, etc. This tool shown in the accompanying illustration is a recent addition to the "Little David" line of pneumatic tools, manufactured by the Ingersoll-Rand Co., 11 Broadway, New York. It is particularly adapted for working in cramped or confined positions, where the regular type of four piston reciprocating pneumatic drill cannot be used, the distance from the end



FIG. 3. PORTABLE PNEUMATIC DRILL

of the casing to the centre of the spindle being only 1 5/16 inches.

The motor is of a novel three-cylinder design and operates in a bath of oil. The

drill is of the rotary type, and is driven from the motor of a three-way crank shaft. The crank shaft is operated by the three ratchet levers which directly connect the pistons to the drill spindle.

An important quality of the design is that there is practically no strain on the crank shaft, as the power is transmitted direct from the pistons through the levers to the ratchet spindle. The spindle has a triple ratchet, and a noteworthy feature is that one of the ratchets is engaged on the spindle at all times. This construction is claimed by the manufacturers to develop more power and give a more constant pull on the spindle. The casing is divided in such a way that the loosening of a few cap screws allows easy access to all moving parts.

The drill is fitted with a No. 4 "Morse" taper socket; is rotated for drilling up to 3 ins. and reaming and tapping to 2 ins., and operates at a speed of 150 r.p.m.



PORTABLE PNEUMATIC GRINDER

A NEW portable pneumatic grinding machine has recently been introduced by the Ingersoll-Rand Co., New York. The "Little David" grinder, as this tool has been named, has many novel features, and has been designed with special reference to simplicity and accessibility in all its parts. The motor is of the three-cylinder type. The connecting rods are of one-piece construction, fitted to the crank shaft on roller bearings. The crank shaft and spindle are combined



FIG. 4. PORTABLE PNEUMATIC GRINDER

into a solid piece drop forging, which runs on a triple ball bearing, one bearing being used in the front end of the main body of the casing and two bearing on the end of the spindle. All parts are enclosed in an absolutely dust-proof case and operate in a bath of oil.

To lessen the complication of delicate parts, the valve construction of the rotating type is made a part of the crank shaft, and works in a renewable bronze bushing. No gears or pinions are used. The connections between the piston and connecting rods are of the same general design as those used in the maker's line of pneumatic drills.

The entire operating mechanism is readily accessible, the loosening of six cap screws removing the handle and exposing the entire interior for examina-

tion. The cylinders are renewable without renewing the main body of the casing, and are interchangeable. As may be seen from the illustration, the cylinders are provided with lugs, which take up the wear on the exposed corners.

This grinder is rated to operate up to 3000 r.p.m. diameter emery wheel at a speed of 3,400 r.p.m., and is specially designed for grinding, buffing, polishing or cleaning castings.



THE "COLE" LIFTING TRAP

THE George W. Cole Co., Toronto, Ont., has recently placed on the market a lifting trap designed to raise condensation from a low pressure heating system to a return trap or open

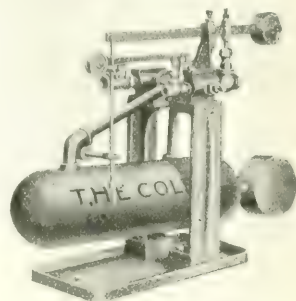


FIG. 5. THE "COLE" LIFTING TRAP

bank. This trap is also designed to remove condensation from steam systems which operate on very low pressures down to atmospheric or even below.

The accompanying illustration gives a general idea of the construction of the apparatus which is entirely different from the ordinary lifting or return trap in that it is turned upside down. By a special arrangement of levers and fulcrums, a full displacement in the receiving chamber is assured, there being a free escape of the air which usually collects in heating systems and is often a source of considerable trouble.

The trap is provided with self-adjusting packing glands which are readily accessible. It is especially suitable for a modulating type of heating system where the steam enters the top of the radiator and discharges through a swing check or similar type of valve.



If you have any old files around your shop that have apparently seen their best days try this: First clean them well with a fine wire brush and then give them a bath in diluted sulphuric acid. You will find that most of them will be almost as good as new after this treatment.

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THE COMMERCIAL ASPECT OF MUNITIONS' PRODUCTION

RECENT events connected with the conduct of the war would seem to indicate the probability of an immediate change in the methods whereby the British Government may avail itself of the efforts of Canadian manufacturers.

Early in the war certain English textile mills were not inclined to devote all their efforts to war contracts, be-

cause of the interruption to their ordinary business. Whether such action was due to indifference or because regular business was more remunerative, does not really matter, but what really does matter is this: Lord Kitchener told these particular firms that their mills would be run on war contracts, if not by themselves, then by the Government. There was no question of a quid pro quo in the form of higher prices or something equivalent. These mills simply had to run on Government work, and they did run.

Since then numerous incidents have occurred which show that many people have not only failed to realize the absolute seriousness of the present struggle, but by their attitude and actions, betray a self interest and indifference, which, if exhibited a few thousand miles nearer the scene of hostilities, would be terminated rather promptly, if not abruptly.

For some considerable time Munitions Tribunals or Courts have been in existence in Britain, their principal sphere of activity being the trial and punishment of employees who are guilty of "slacking" or otherwise retarding the efforts of the nation. These Tribunals have been constituted for dealing with the labor end of the business, and their counterpart for dealing with the employers is found in the action of the Government, whereby factories are taken under control on stated terms, and the utmost possible use made of the plant and equipment. We use the word "possible" because until "slackers" are eliminated, a maximum output will not be obtained.

Owing to stress of circumstances no doubt, the proportion of union labor engaged in munitions manufacture is very much less in this country than in England, consequently, while attempts at slacking may have taken place in some isolated cases, their effect has not been sufficiently noticeable to demand attention.

The resolutions passed recently by certain trades unions affirming their loyalty and disavowing any attempts at restriction, etc., seem rather out of place at this late hour of the day, and in view of the inference which might be drawn, such action seems rather ill-advised. Be that as it may, it is safe to say there will be no necessity for any Munitions Tribunal in Canada.

It may be otherwise, however, as far as our factories administration is concerned. The organization of the Canadian Shell Committee, under the conditions which originally existed, has been repeatedly justified by the success of its efforts in the past. Changed conditions in Europe, and the certainty of a prolonged struggle with its attendant strain on Britain's resources should by this time, however, have prompted the responsible parties in this country to look upon the British Treasury as something better than a milch cow.

Few Canadian enterprises of national magnitude have enjoyed the glory of successful achievement without being accorded the doubtful honor of a commission of inquiry, and Canada's reputation as a loyal and efficient member of the British Empire would suffer immeasurably should the self-sacrifice and effort of the people as a whole be nullified in the slightest by the failure of men in high positions to realize that their main duty now is to the Empire and not to themselves.

Latent selfishness is more dangerous than active opposition, and should compulsion in the guise of controlled factories be brought about, many manufacturers will only have themselves to blame.

SELECTED MARKET QUOTATIONS

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

FIG IRON.

Grey forge, Pittsburgh ..	\$14 70
Lake Superior, char-	
coal, (Pittsburgh) ..	15 75
Ferro Nickel pig iron	
(Soo) ..	25 00

	Montreal	Toronto
M. I. ..	\$24 00	
Castile, Spain ..	25 00	
Carroll, soft ..	25 00	
Cleveland, No. 1 ..	24 00	
Clarence, No. 3 ..	24 50	
Glenbrook ..	28 00	
Saginaw, No. 1 ..	30 00	
Saginaw, No. 2 ..	29 00	
Malaga, charcoal iron ..	28 00	
Victoria, No. 1 ..	24 00	21 00
Victoria, No. 2A ..	24 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 ..	2.35
Steel bars, f.o.b., Toronto ..	2.35
Common bar iron, f.o.b., Montreal ..	2.35
Steel bars, f.o.b., Montreal ..	2.35
Pressed reinforcing bars ..	2.65
Bessemer rails, heavy, at mill ..	1.25
Steel bars, Pittsburgh ..	1.40
Tank plates, Pittsburgh ..	1.40
Beams and angles, Pittsburgh ..	1.40
Steel hoops, Pittsburgh ..	1.60
F.O.B., Toronto Warehouse ..	Cents.
Steel bars ..	2.40
Small shapes ..	2.65
Warehouse, Freight and Duty to Pay ..	Cents.
Steel bars ..	1.90
Structural shapes ..	1.95
Plates ..	1.95

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 25
Heads, per 100 lb.	2 55	2 45
Tank plates, 3-16 in.	2 60	2 45

OLD MATERIAL.

Dealers' Buying Prices.	Montreal	Toronto
Copper, light ..	\$12 25	\$12 25
Copper, crucible ..	14 25	14 00
Copper, unch-bled, heavy ..	14 25	13 50
Copper, wire, unch-bled ..	14 25	14 00
No. 1 machine compos'n ..	11 50	11 50
No. 1 compos'n turnings ..	10 00	10 00
No. 1 wrought iron ..	10 00	9 50
Heavy melting steel ..	8 00	9 50
No. 1 machin'y cast iron ..	13 50	12 00
New brass clippings ..	11 00	11 00
No. 1 brass turnings ..	9 00	9 00
Heavy lead ..	4 50	4 50

Iron lead ..	\$ 3 50	\$ 3 50
Scrap zinc ..	10 50	9 50

W. I. PIPE DISCOUNTS.

Following are Toronto jobbers' discounts on pipe in effect Aug. 27, 1915:

	Buttwell Black Gal.	Standard	Lapweld Black Gal.
1 1/2 in.	63	38 1/2	
1 1/2 in.	68	47 1/2	
3/4 to 1 1/2 in.	73	52 1/2	
2 in.	73	52 1/2	60
2 1/2 to 4 in.	73	52 1/2	72
4 1/2, 5, 6 in.			70
7, 8, 10 in.			67
	X Strong P. E.		
1 1/2 in.	56	38 1/2	
1 1/2 in.	63	45 1/2	
3/4 to 1 1/2 in.	67	49 1/2	
2, 2 1/2, 3 in.	68	50 1/2	
2 in.		63	45 1/2
2 1/2 to 4 in.		63	48 1/2
4 1/2, 5, 6 in.		66	48 1/2
7, 8 in.		59	39 1/2
	Genuine Wrot Iron.		
3/8 in.	57	32 1/2	
1/2 in.	62	41 1/2	
3/4 to 1 1/2 in.	67	46 1/2	
2 in.	67	46 1/2	63
2 1/2, 3 in.	67	46 1/2	66
3 1/2, 4 in.			66
4 1/2, 5, 6 in.			63
7, 8 in.			60
	Wrought Nipples.		
4 in. and under ..			77 1/2%
4 1/2 in. and larger ..			72 1/2%
4 in. and under, running thread ..			57 1/2%
	Standard Couplings.		
4 in. and under ..			60%
4 1/2 in. and larger ..			40%

MILLED PRODUCTS.

Sq. & Hex. Head Cap Screws, 60 & 10% ..	
Sq. Head Set Screws ..	65 & 10%
Rd. & Fil. Head Cap Screws ..	45%
Flat & But. Head Cap Screws ..	40%
Finished Nuts up to 1 in.	70%
Finished Nuts over 1 in. N.	70%
Semi-Fin. Nuts up to 1 in.	70%
Semi-Fin. Nuts over 1 in.	72%
Studs ..	65%

METALS.

	Montreal	Toronto
Lake copper, earload ..	\$20 00	\$19 50
Electrolytic copper ..	20 00	19 25
Castings, copper ..	19 25	19 00
Tin ..	37 00	37 00
Spelter ..	18 00	17 50
Lead ..	6 15	6 25
Antimony ..	35 00	35 00
Aluminum ..	60 00	60 00

Prices per 100 lbs.

BILLETS.

	Per Gross Ton
Bessemer, billets, Pittsburgh ..	\$24 50
Openhearth billets, Pittsburgh ..	25 00
Forging billets, Pittsburgh ..	34 50
Wire rods, Pittsburgh ..	32 00

NAILS AND SPIKES.

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

BOLTS, NUTS AND SCREWS.

	Per Cent.
Catch and lag screws ..	70-10
Stove bolts ..	80
Plate washers ..	40
Machine bolts, 3/8 and less ..	65-10
Machine bolts, 7-16 and over ..	57 1/2
Blank bolts ..	57 1/2
Bolt ends ..	57 1/2
Machine screws, iron, brass ..	35
Nuts, square, all sizes ..	4c per lb. off
Nuts, hexagon, all sizes ..	4 1/2c 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 in. \$.32
1/4 in. .06	1/4 in. .07 1/2	3/4 in. .35
3/8 in. .06	3/8 in. .07 1/2	1 in. .37
1/2 in. .08 1/2	1/2 in. .11	1 1/4 in. .52 1/2
3/4 in. .11 1/2	3/4 in. .15	1 1/2 in. .65
1 in. .17 1/2	1 in. .22	2 in. .91
1 1/4 in. .23 1/2	1 1/2 in. .30	2 1/2 in. 1.37
1 1/2 in. .27 1/2	1 1/2 in. .36 1/2	3 in. 1.86
2 in. .37	2 in. .50 1/2	3 1/2 in. 2.30
2 1/2 in. .58 1/2	2 1/2 in. .77	4 in. 2.76
3 in. .76 1/2	3 in. 1.03	4 1/2 in. 3.26
3 1/2 in. .92	3 1/2 in. 1.25	5 in. 3.86
4 in. 1.09	4 in. 1.50	6 in. 5.32
4 1/2 in. 1.27	4 1/2 in. 1.80	7 in. 6.35
5 in. 1.48	5 in. 2.08	8 in. 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		

COKE AND COAL.

Solvay Foundry Coke	\$5.75
Connellsville Foundry Coke	5.00
Yough, Steam Lump Coal	3.83
Penn. Steam Lump Coal	3.63
Best Slack	2.99

Net ton f.o.b. Toronto.

COLD DRAWN STEEL SHAFTING.

At mill	30 $\frac{1}{2}$
At warehouse	35 $\frac{1}{2}$

Discounts off new list. Warehouse price at Montreal and Toronto.

MISCELLANEOUS.

Solder, half-and-half	0.22 $\frac{1}{2}$
Putty, 100-lb. drums	2.70
Red dry lead, 100-lb. kegs, per cwt.	9.65
Glue, French medal, per lb.	0.15
Tarred slaters' paper, per roll ..	0.95
Motor gasoline, single bbls., gal.	0.20
Benzine, single bbls., per gal.	0.18 $\frac{1}{2}$
Pure turpentine, single bbls.	0.70
Linseed oil, raw, single bbls.	0.77
Linseed oil, boiled, single bbls.	0.80
Plaster of Paris, per bbl.	2.50
Plumbers' Oakum, per 100 lbs.	4.25
Lead Wool, per lb.	0.11
Pure Manila rope	0.16
Transmission rope, Manila	0.20
Drilling cables, Manila	0.17
Lard oil, per gal.	0.73
Union thread cutting oil	0.60
Imperial quenching oil	0.35

POLISHED DRILL ROD.

Discount off list, Montreal and Toronto ..	40%
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PROOF COIL CHAIN.

1 $\frac{1}{2}$ in.	\$9.00
5-16 in.	5.90
3 $\frac{1}{2}$ in.	4.95
7-16 in.	4.65
1 $\frac{1}{2}$ in.	4.40
9-16 in.	4.05
5 $\frac{1}{8}$ in.	4.30
3 $\frac{1}{4}$ in.	4.15
7 $\frac{1}{8}$ in.	3.65
1 inch	3.45

Above quotations are per 100 lbs.

TWIST DRILLS

Carbon up to 1 $\frac{1}{2}$ in.	55
Carbon over 1 $\frac{1}{2}$ in.	25
High Speed	55
Blacksmith	55
Bit Stock	60 and 5
Centre Drill	20
Ratchet	20
Combined drill and e.t.s.k.	15

Discounts off standard list.

REAMERS.

Hand	%
Shell	25
Bit Stock	25
Bridge	65
Taper Pin	25
Centre	25
Pipe Reamers	80

Discounts off standard list.

IRON PIPE FITTINGS.

Canadian malleable, A, 25 per cent ;
B and C, 35 per cent.; cast iron, 60;
standard bushings, 60 per cent.; headers,
60; flanged unions, 60; malleable bush-
ings, 60; nipples, 75; malleable, lipped
unions, 65.

TAPES.

Chesterman Metallic, 50 ft.	\$2.00
Lufkin Metallic, 603, 50 ft.	2.00
Admiral Steel Tape, 50 ft.	2.75
Admiral Steel Tape, 100 ft.	4.45
Major Jun., Steel Tape, 50 ft.	3.50
Rival Steel Tape, 50 ft.	2.75
Rival Steel Tape, 100 ft.	4.45
Reliable Jun., Steel Tape, 50 ft. ..	3.50

SHEETS.

	Montreal	Toronto
Sheets, black, No. 28.	\$3 00	\$2 85
Canada plates, dull,		
52 sheets	3 15	3 15
Canada Plates, all bright.	4 75	4 50
Apollo brand, 10 $\frac{3}{4}$ oz.		
galvanized	5 50	5 30
Queen's Head, 28 B.W.G.	6 00	5 95
Fleur-de-Lis, 28 B. W. G.	5 75	5 75
Gorbal's Best, No. 28	6 00	6 00
Viking metal, No. 28	5 25	5 25
Colborne Crown, No. 28.	5 70	5 80
Premier No. 28	5 10	5 00

BOILER TUBES.

Size	Seamless	Lapwelded
1 in.	\$14 25	.....
1 $\frac{1}{2}$ in.	14 25	.....
1 $\frac{1}{2}$ in.	14 25	.....
1 $\frac{3}{4}$ in.	14 25	.....
2 in.	14 25	9 25
2 $\frac{1}{2}$ in.	15 50	10 50
2 $\frac{1}{2}$ in.	16 50	11 50
3 in.	21 00	12 25
3 $\frac{1}{2}$ in.	24 00	14 50
4 in.	29 50	18 50

Prices per 100 feet, Montreal and Toronto.

WASTE.

	WHITE.	Cents per lb.
XXX Extra	0 11	
X Grand	0 10 $\frac{1}{2}$	
XLGR	0 09 $\frac{3}{4}$	
X Empire	0 09	
X Press	0 08 $\frac{1}{4}$	

COLORS

Lion	0 07 $\frac{1}{2}$
Standard	0 06 $\frac{3}{4}$
Popular	0 06
Keen	0 05 $\frac{1}{2}$

WOOL PACKING.

Arrow	0 16
Axle	0 11
Anvil	0 08
Anchor	0 07

WASHED WIPERS.

Select White	0 08 $\frac{1}{2}$
Mixed Colored	0 06 $\frac{1}{4}$
Dark Colored	0 05 $\frac{1}{4}$

This list subject to trade discount for quantity.

BELTING RUBBER.

Standard	50%
Best grades	30%

BELTING—NO. 1 OAK TANNED.

Extra heavy, sgle. and dble.	50%
Standard	50 & 10%
Cut leather lacing, No. 1	\$1.20
Leather in sides	1.10

ELECTRIC WELD COIL CHAIN B.B.

3-16 in.	\$9.50
1 $\frac{1}{2}$ in.	6.55
5-16 in.	5.20
3 $\frac{1}{8}$ in.	4.25
7-16 in.	4.00
1 $\frac{1}{2}$ in.	4.00

Prices per 100 lbs.

PLATING CHEMICALS.

Acid, boracic	\$.15
Acid, hydrochloric .....	.05
Acid, hydrofluoric .....	.06
Acid, Nitric .....	.10
Acid, sulphuric .....	.05
Ammonia, aqua .....	.08
Ammonium carbonate .....	.15
Ammonium chloride .....	.11
Ammonium hydrosulphuret .....	.35
Ammonium sulphate .....	.07
Arsenic, white .....	.10
Copper sulphate .....	.10
Cobalt Sulphate .....	.50
Iron perchloride .....	.20
Lead acetate .....	.16
Nickel ammonium sulphate .....	.10
Nickel carbonate .....	.50
Nickel sulphate .....	.15
Potassium carbonate .....	.40
Potassium sulphide (substitute) ..	.20
Silver chloride .....	.65
Silver nitrate .....	.45
Sodium bisulphite .....	.10
Sodium carbonate crystals .....	.04
Sodium cyanide, 127-130% .....	.35
Sodium hydrate .....	.04
Sodium hyposulphite (per 100 lbs.) ..	3.00
Sodium phosphate .....	.14
Tin chloride .....	.45
Zinc chloride .....	.20
Zinc sulphate .....	.08

Prices Per Lb. Unless Otherwise Stated.

ANODES.

Nickel .....	.47 to .52
Cobalt	1.75 to 2.00
Copper .....	.22 to .25
Tin .....	.45 to .50
Silver .....	.55 to .60
Zinc .....	.22 to .25

Prices Per Lb.

PLATING SUPPLIES.

Polishing wheels, felt.	1.50 to 1.75
Polishing wheels, bullneck. ....	.80
Emery in kegs	4 $\frac{1}{2}$ to .06
Pumice, ground .....	.05
Emery glue .....	.15 to .20
Tripoli composition .....	.04 to .06
Crocus composition .....	.04 to .06
Emery composition .....	.05 to .07
Rouge, silver .....	.25 to .50
Rouge, nickel and brass. ....	.15 to .25

Prices Per Lb.

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., Oct. 25, 1915.—The situation in the iron and steel market is a substantial advance in many respects. While the demand for steel is still strong, the production of steel is also strong, and the market is generally well supplied. The demand for steel is still strong, and the production of steel is also strong, and the market is generally well supplied. The demand for steel is still strong, and the production of steel is also strong, and the market is generally well supplied.

Metals

Metals are generally holding firm, and quotations show little change from the previous week. A few export inquiries have been received for copper, but the market for copper has a tendency to shade prices.

Iron reflects some of the same quotations.

Spelter shows some improvement, and producers are refusing to sell futures as freely as they were a week ago.

Quotations on lead are unchanged, the market showing a slight increase in activity. Antimony is being contracted for in considerable quantities for future delivery.

Machine Tools and Supplies

The situation as regards machine tools is unchanged. Delivery of long ordered equipment still lags and, of course, causes more or less inconvenience. In many cases, where it was impossible to secure the desired machinery, acceptance was made of tools that were considerably larger than those required for current needs. This may ultimately turn out to have its compensations, for, while fulfilling the present requirements, they may also supply those of the future if the opportunity offers of manufacturing here, which is not true of all that is produced.

Supplies naturally are also in active demand, and prices of most items

Sheets

The slight increase in the demand for steel sheets is being met by the mills. The supply is considerably below normal, but an improvement in this respect is anticipated in the near future.

Old Material

A steady improvement is shown in the demand for scrap metals, and, while prices are meantime little more than steady, indications point to an advance shortly, due to some mills requiring ad-

ditional scrap metal than they can expect.

There is little demand for foundry scrap, and prices are weak.

Toronto, Ont., Oct. 26.—The general improvement in trade continues and an optimistic spirit prevails in business circles. The crops, which are an important factor in the development of this country, have been so bountiful this year that they will add materially to the wealth of the community generally and inspire a greater feeling of confidence in manufacturing circles. In addition, the large volume of war orders will contribute to place many of our industries on a very satisfactory basis. The trade returns for six months ending Sept. 30 are very encouraging. The figures show a

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; Hermidas Laporte, Montreal; A. E. Kemp, Toronto. Thomas Hilliard is secretary, and the commission headquarters are at Ottawa.

satisfactory advance over the corresponding period of last year. The export of manufactured goods for September was very heavy, reaching a total of over nine million dollars compared with a total of a little over five millions for Sept., 1914. Imports also showed an improvement. The duties collected on imported goods show an increase of approximately one and one-half million dollars for the six months compared with the corresponding period of 1914.

Developments in the shell industry are being watched with the greatest interest. A new system of placing contracts for the large calibre shells will be introduced. Canadian naval vessels are being asked to submit tenders for 6-in., 8-in. and 9-in. shells, thus placing the business on a competitive basis. It is reported that orders amounting to \$80,000,000 for the larger shells are about to be placed by the British Government through the Shell Committee.

Steel Market

A general advance in prices is the chief feature of the steel market

week. The heavy demand has had a natural effect. All indications point to a still heavier demand and also to higher quotations. Canadian mills have raised their quotations on iron and steel bars to \$2.35 base per 100 lbs., reflecting an advance of 10c. over the previous week. Steel bars are now quoted at \$2.55 base, plus extras for twisting. Warehouse prices are higher in proportion. Pittsburgh bars, plates and shapes for Canadian consumption are now being quoted at 1.40c and steel hoops at 1.60c, Pittsburgh.

Wire has advanced 1c and is now quoted at \$2.75 base. Wire nails are up 10c and are quoted at \$2.55 per keg. Quotations on proof coil chain and electric weld coil chain are higher. Prices on wrought iron pipe are very firm and are expected to advance any time. With the market in the present uncertain condition, prices are liable to fluctuate, and in some cases orders can only be accepted subject to immediate acceptance. The enormous demand for steel for munitions has been chiefly responsible for the present conditions in the market. Steel plants are working to capacity to meet the demand, and this will increase as the steel industry expands and as orders for domestic steel products increase in volume.

Prices of high-speed tool steel continue to advance and the situation is becoming more acute. The most serious feature is the difficulty of obtaining supplies in anything like the quantity required. The demand has practically doubled, owing principally to the necessity of having high-speed tool steel for machining shells. Some producers have withdrawn from the market, while others are only able to supply their customers with comparatively small quantities. The scarcity of tungsten, which shows no improvement, is the cause of all the trouble. Other alloys have advanced in price, as have also the cost of crucibles, labor, etc.

The galvanized sheet market is quiet, there being only a moderate demand, but prices are being maintained. Black sheets are advancing and softer is too high in price to create much interest among galvanizers. Bessemer black sheets have advanced \$2 a ton, and No. 28 gauge are now being quoted at 2.10c Pittsburgh.

The heavy demand for steel products in the States continues, and prices of finished iron and steel are steadily advancing. There is no abatement in the heavy demand for large rounds of steel, munitions, and the steel mills are sold up for the remainder of the year. Prices of steel bars, plates and shapes have advanced to 1.45c Pittsburgh. There is a continued heavy demand for open-hearth and forging billets on which prices are very strong in the advance. Forging billets are now quoted at \$24.70, open-hearth billets at \$25 and Bessemer billets

Thread Milling Machines For High Explosive Shells

Designed for the purpose of milling the thread in the base and nose of high explosive shells.

Shell is placed inside a revolving spindle and is self centering. A perfect thread is produced in base of shell in approximately $2\frac{1}{2}$ minutes.

Milling Cutter is made from best high speed steel, by Brown & Sharpe, from special design by Holden-Morgan Co., and is so shaped that it can be sharpened without changing the form. Cutter is designed to mill the top of thread as well as the depth.

Machines are fully equipped for work, including oil pump. Fitted with automatic stop motion, which stops machine when thread is completed. One operator can run several machines. Eliminates all risk of having shells rejected on account of thread being stripped, as is liable to be the case when tapped by the old method.

Write for complete particulars, prices, etc.

THE HOLDEN-MORGAN CO., Limited

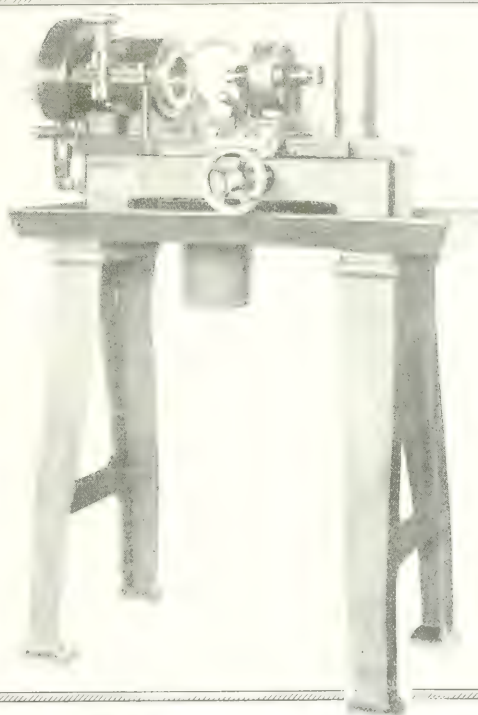
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SALES AGENTS:

The A. R. Williams Machinery Company, Limited

Toronto, Ontario

IF IT'S MACHINERY—WRITE "WILLIAMS."



Thousands of Threaded Pieces Each Day with a Geometric Threading Machine

RAPID AND PERFECT DUPLICATION

Takes floor space 2 ft. x 3 ft., and is complete with countershaft, change speed gear for adapting speed of spindle to diameter to be threaded; adjustable stop for gauging length of work.

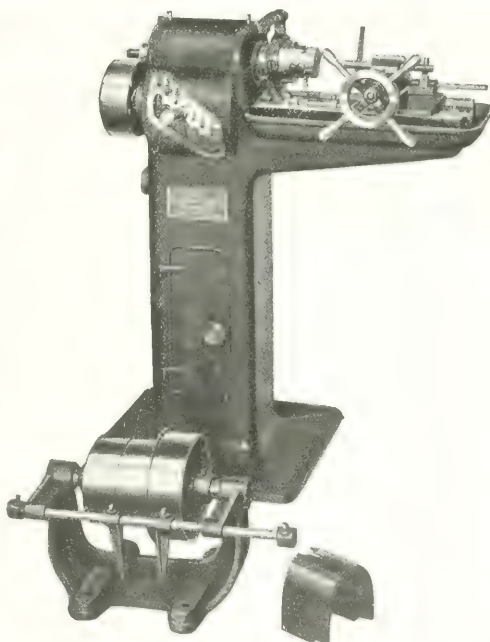
No rough threads with the Geometric. They are as true and clean as can be produced by any screw machine.

Note the range:—Regularly, $\frac{1}{4}$ -in. to $\frac{3}{4}$ -in. Specially, $\frac{1}{2}$ -in. Std. pipe threads; $\frac{7}{8}$ -in. S.A.E. Std. Spark Plug threads, and up to 2-in. Diam. threads where the pitch is fine. Internal threads, $\frac{1}{8}$ -in. to 2-in.

Send in your Specifications and learn what we can do for you.

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.

at \$24.75, and phosphorus is quoted at \$2.15.

Pig Iron

A large volume of pig iron is being produced in the United States, and the price is advancing. Hamilton and Victoria are quoted at \$10.00 per ton. Toronto, Standard low phosphorus is quoted at \$10.00.

Old Material

The market is dull, there being little demand for domestic material with the exception of aluminum, which is very scarce. Buying is of a speculative order and consumers are slow in taking deliveries. Prices are firmer and higher for some materials. Scrap copper has advanced 20¢ to \$10.00 per ton. Heavy melting steel is quoted at \$10.00, while machinery cast iron is also quoted at \$10.00.

Machine Tools

There is little change in the machine tool situation although there will be considerable activity when the orders for the larger calibre shells have been placed. Tenders are being submitted by manufacturers for these shells and the orders will no doubt be placed with as little delay as possible. The shells will be 6-in., 8-in. and 9-in., and heavy lathes will be required to machine them. There is still a steady although lighter demand for tools for 18-pdr. shells, together with a fair movement in second-hand equipment.

Supplies

There is a general upward tendency in prices, and a number of changes have to be noted this week. Discounts on twist drills have been revised. Carbon drills up to 1½ in. are now 55 p.c. and blacksmith 55 p.c. French medal glue is lower at 15¢ per pound. Gasoline has advanced 2¢ and is now quoted at 20¢ per gallon in barrel lots, while benzine is also higher at 18½¢ per gallon. Owing to a shortage in supplies, turpentine has advanced 5¢ and is now quoted at 70¢. Linseed oil is higher at 77¢ for raw and 80¢ for boiled oil. Plumbers' oakum is being quoted at \$4.25 per 100 lbs., and lead wool is now 11¢ per pound. Business in supplies for shell plants continues active.

Metal Market

The metal market is dull, but prices are keeping steady. The sterling exchange situation, although somewhat easier, continues to have a depressing effect on the metal market. The New York market has been more active recently and is showing a tendency to react in an

upward direction. The London market is quiet and steady. The scarcity of aluminum continues and prices have an upward tendency. Spelter is a little lower than a month ago. London and New York. The copper market is easier but, with the recent large new orders for munitions, a heavy movement is expected with a possible advance in price. The tin market is firm but unchanged. Antimony and lead are also unchanged.

Tin.—The market is firm but quiet. The uncertainty of the British export-tax question has restrained activity and probably prevented a good movement. Tin is unchanged at 37¢ per pound.

Copper.—The market is dull and easier but prices are unchanged. The copper position, however, is a strong one as large orders for munitions continue to be

Aluminum.—Prices are nominally unchanged, but the scarcity of this metal is rather more apparent, and holders are inclined to ask higher prices. Local quotations are nominal at 60¢ per pound.

St. John, N.B., October.—Industrial conditions in the Eastern provinces appear to be of a satisfactory nature, holding out much promise for the approaching winter, although there is no effort at expansion in any particular line. The only new extensions being instituted by established companies are for the manufacture of war supplies, and it is hoped that before next spring more orders will be received, if orders are still necessary for the success of the allied arms. The foundries in which shell manufacture is going on are for the most part working night and day in their efforts to expedite the output.

A new lumber mill at Nelson, on the Miramichi River, is to be erected this fall by Frasers, Ltd., according to a recent announcement. It is understood that the firm plans to expend between \$80,000 and \$100,000 on the new plant.

A new steel bridge at Grand Falls, the gully near the C. P. R. station, is to be erected. Plans and specifications are to be made this winter.

Local manufacturers and members of industrial concerns were instrumental in the success of a big endeavor recently held here—"a \$50,000 patriotic auction" in the interests of the patriotic fund. They donated freely towards the movement, the gifts being sold and the profits going to the fund. Among the more interesting articles offered for sale were a number of nickel-plated shrapnel shell electric table lamps, these having been donated by the Phoenix Foundries.

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 Ministère de la Guerre, Bordeaux, France; M. De la Chaume, 28 Broadway, Westminster, London.

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

placed which will result in a heavy demand for this metal. Consumers are buying on a hand-to-mouth basis, but may be forced to cover their requirements in a rising market. Producers seem to be in control of the situation, and, as copper must be had by munition manufacturers, higher prices are therefore more probable than otherwise. Locally copper is unchanged at 19½¢ per pound.

Spelter.—The market is higher both in London and New York, and the situation has improved. Spelter has advanced 1¢ locally and is now quoted at 17½¢ per pound.

Lead.—The market is firm with the "Trust" price at \$4.75 New York. Local quotations are unchanged at 60¢ per pound.

Antimony.—The market is very firm, and there is a scarcity of spot metal. Quotations are unchanged at 35¢ per pound.

CANADIAN CROP REPORT

THE immensity of Canada's wheat crop this year is shown by the report sent out on October 15. For wheat, oats, rye and flax the yields are even higher than those reported a month ago, but in the case of barley and oats the present estimate is less than that of August 31st.

The total wheat crop of Canada is now placed at 336,258,000 bushels from 12,986,400 acres, representing an average yield per acre of 25.89 bushels. This total is 174,978,000 bushels more than last year's inferior yield of 161,280,000 bushels, the crop this year being, therefore, more than double, or 108 per cent. more than that of last year. It is 104,541,000 bushels, or 45 per cent. in excess of the previous highest yield of 231,717,000 bushels in 1913, and 140,232,000 bushels or 72 per cent. in excess of the annual average yield of 196,026,000 bushels for the five years, 1910 to 1914.



JOHNS-MANVILLE stands for a new order of Service, service that concerns itself with your problems and their solution, a service that is as responsible in fact as it is in name because it is backed up by J-M Responsibility.

The oldest genuine asphalt street in your town will show you how J-M Mastic Flooring lasts



U.S. Express Room, La Salle St. Station, Chicago, J-M Mastic Flooring, Greenham & Co., Architects, Chicago.

J-M Waterproof Mastic Flooring wears because its basic material is Trinidad Lake Asphalt, which has stood the test of city street traffic for nearly fifty years. There is practically no wear-out to it in shop floor service.

J-M Mastic Flooring is as "springy" as wood. It can be laid in any consistency from hard-as-oak to soft-as-pine, according to requirements. It wears like iron, but is unlike flooring made of perfectly rigid material. It is absolutely dry, easy under foot, slip-proof and noiseless.

This flooring originates no dust to damage goods or injure machinery and, as it is waterproof, it can be cleaned and kept in sanitary condition by flushing. Acids and alkalis have no effect on it. Easily patched when resetting of machinery makes patching necessary. Can be applied over any stable foundation, anywhere, or over flooring now in place.

Let our flooring specialists see you about *your* floors.

J-M Asbestos Built-up Roofing is weather-proof, fire-resistant, non-corrosive and time-defying

This is not mere "selling talk," it is a statement of fact backed up by the performance of hundreds of J-M Asbestos Built-up Roofs in effective service for many years and still good for as many more.

The base of our built-up roofing is J-M Asbestos Ready-Roofing, even one ply of which would be practically as permanent as the brick walls or any other masonry part of a building except for wind pressures, roof movement, damage from rough usage, etc.

When built up by three- and four-ply laminations into thicknesses capable of resisting such strains, it furnishes a strong, light-weight, smooth-surface, practically fireproof roofing that never needs painting or any other attention and is bound to give perfect roofing service for a maximum period under the rule of J-M Roofing Responsibility. J-M Asbestos Built-up Roofing is examined, approved and labelled by the Underwriter's Laboratories, Inc., under the direction of the National Board of Fire Underwriters. It is given class "A" rating when laid over non-combustible roof decks having inclines not exceeding 3 inches to the foot and secures class "B" rating when laid over non-combustible roof covers having inclines not exceeding 6 inches to the foot.



Canadian Pacific Railway, Train Sheds, Windsor, Ont., 1906, Roofed J-M Asbestos Roofing. The Hon. John B. A. McLean and Geo. V. Fuller Construction Co., Contractors.

The Canadian H. W. Johns-Manville Co., Limited

Toronto

Montreal

Winnipeg

Vancouver

On June 1st, 1915, the output of the Ontario mines was 1,174,000 tons, as compared with 1,174,000 tons in 1914.

The output of the Ontario mines for the first four months of 1915 was 4,680,000 tons, as compared with 4,680,000 tons in 1914.

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ONTARIO MINES OUTPUT

The output of the Ontario mines for the first four months of 1915 was 4,680,000 tons, as compared with 4,680,000 tons in 1914.

	1915	1914
Gold	\$3,570,072	\$2,011,069
Silver	5,188,763	7,053,418
Copper	1,229,894	1,197,059
Nickel	3,393,528	2,872,843
Iron Ore	288,296	118,119
Pig iron	2,856,040	4,429,664
Cobalt	34,443	22,581
Cobalt oxide (including oxide)	6,812	379,152



PAPER TRADE EXPANSION

The Canadian pulp and paper industry is evidently prospering. Since the opening of the current fiscal year exports to

the United States especially have grown. July Government returns show exports of newsprint to the United States of \$1,274,000. The export business of Canadian mills for the first four months, April to July, aggregated \$5,098,799, of which the United States accounted for \$4,589,444.

While the total compares with \$1,245,000 in 1914, only \$2,176,000 went across the border that year. As an indication of recent growth, this year's business so far is almost equal to eight months' business in 1913, and surpasses eight months' business in 1912, the total then being only \$3,110,000. While the United States is Canada's best customer, the statement points out that another encouraging feature of the trade is the growing trade within the Empire.

For the fiscal year 1913-14 the total exports were \$8,030,000, for 1914-15, \$12,600,000, while the rate of the four months this year is between \$15,000,000 and \$16,000,000 per annum.

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, Barbados, agent also for the Bermudas and British Guiana. Cable address, Canadian.

China.

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

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 R. 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. 4. 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 Himes, Medellin, Colombia. Cables to Marmato, Colombia. Cable address, Canadian.

Norway and Denmark.

C. E. Sontum, Grubbeget No. 4, Christiansa, 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

ACCURACY



You are always cutting costs in your factory.

Ever stop to figure the loss on misfit Screws and Nuts?

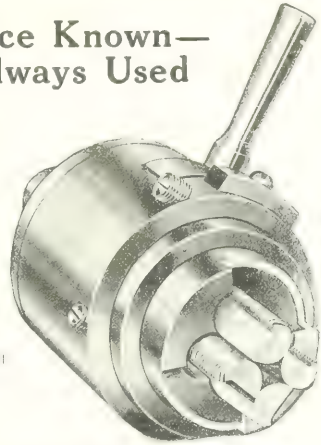
Better try "GALT" and save time and money.

We ship from stock—Cap Screws, Set Screws and Semi-finished Nuts.

Specialists in Cap and Set Screws.

THE
GALT MACHINE SCREW CO.,
GALT, ONTARIO LIMITED

**Once Known—
Always Used**



M. E. C. Collapsible Taps

are giving extraordinary service on Shrapnel and Cartridge SHELL work.

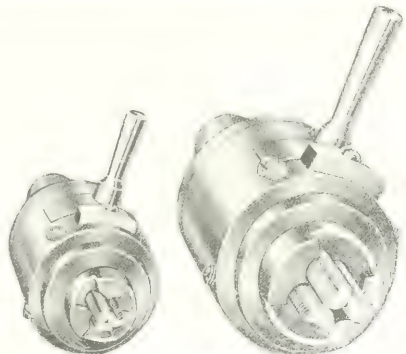
It will be Greatly to your interest to get a line on the value of this tap.

WRITE SOME USERS — we'll gladly send names and addresses.

Full particulars and details of our liberal proposition on request.

Manufacturers Equipment Co.
175 North Jefferson St., CHICAGO, U.S.A.

Canadian Agents:
FOSS & HILL MACHINERY CO., Montreal
A. R. WILLIAMS MACHINERY CO., Winnipeg



HIGH SPEED HAMMERS

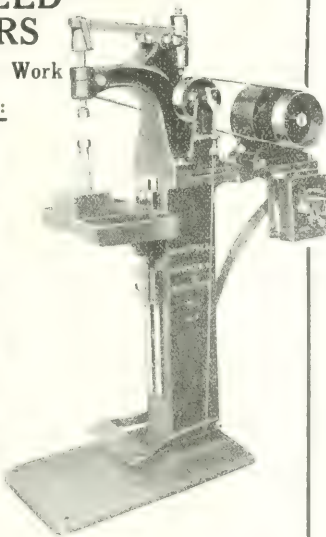
For High Speed Work

FEATURES:

Economy in floor space, elimination of weight and a guaranteed saving of from 15% to 20% on any class of work. The life of the machine is practically indefinite as phosphor bronze bushes are used throughout.

No riveting too intricate for us; no riveting where our machine cannot accomplish.

Send for our High Speed Hammer Book.



THE HIGH SPEED HAMMER CO.

Rochester, N.Y.

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

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INDUSTRIAL ^{AND} CONSTRUCTION NEWS

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

Engineering

St. Mary's Ont.—The Machinery Works are erecting a new building for the purpose of manufacturing machinery.

Vancouver, B.C.—The British Columbia Electric Railway Co. will make excavations for the new line.

Port William, Ont.—The Canadian Car and Foundry Co. have started construction work on a new factory.

London, Ont.—The George H. Belton Lumber Co. are considering installing electric motors for driving the machinery.

Sarnia, Ont.—The Imperial Oil Co. are installing several new steel tanks. The largest will have a capacity of 40,000 barrels of oil.

Chatham, Ont.—Bids will be called for shortly by the city council for a boiler to replace the present electric light plant boiler. W. G. Merritt is clerk.

London, Ont.—E. Leonard & Sons contemplate the installation of electrical drive in its plant for operating lathes, planing machines, etc.

Montreal, Que.—The Canadian Gas Co. are in the market for a large quantity of 6-in. pipe line in connection with the natural gas development at St. Hilaire.

Victoria, B.C.—The Imperial Oil Co., which has a plant at Burrard Inlet, B.C., is building an island headquarters plant at Victoria, B.C. Work is going ahead on a new oil storage tank, a boiler house, warehouse, etc.

Montreal, Que.—The Nicholson Construction Co. are building machine shops on St. Patrick Street for the Canadian Tube & Iron Co. and the Colonial Wire Manufacturing Co. The cost is estimated at \$13,000.

Hamilton, Ont.—A temporary heating plant, to cost about \$5,000, will be installed at the Mountain Hospital by the city council. Later a permanent plant will be constructed at a cost of \$30,000. Plans will be prepared at once.

Walkerville, Ont.—The Dominion Stamping Co. are erecting an additional plant here. The building will be of steel construction and will comprise a die shop, hammer shop and machine shop. The cost is estimated at \$100,000.

Vancouver, B.C.—It is reported that a large quantity of bonds will be sold for the purpose of raising a street. The Vancouver Engineering Works will distribute 300,000. The Vancouver Machinery Depot will sell 200,000, and 140,000 will be made at New Westminster.

Sherbrooke, Que.—The contract for the proposed gas plant has been awarded to the Western Gas Construction Co., for \$30,980. The specifications, however, will be revised and submitted to Mr. Mann, of the Montreal Light, Heat & Power Co., for approval and further suggestion before the work is proceeded with. Abt. Beaudet is chairman of the Gas and Electric Committee.

Port Moody, B.C.—The clearing of the nine and one-half acre site on which the plant of the Port Moody Steel Works is to be erected has already been commenced. The site of the plant is approximately three-quarters of a mile north of the business centre of the town, at the head of the Inlet and adjacent to the North Arm line of the C. P. R. The city will guarantee the bonds of the company to the extent of \$100,000.

Chatham, Ont.—At a meeting of the directors of the Dominion Sugar Co., of Wallaceburg, held here on Oct. 21, it was decided to start at once the erection of a million-dollar beet sugar factory in this city. The directors have been assured by representative citizens of Chatham that the city will pass a by-law granting the company a free site worth \$18,000 and annex the property to the city and provide other minor inducements.

Electrical

Attwood, Ont.—The Elma Township Council are considering installing a hydro-electric system.

Weston, Ont.—Plans for the extension of the local Hydro system to Thistle-town were completed at the meeting of the Weston Water, Power & Light Commission held on Oct. 19. The scheme has received the approval of the Etobicoke Township Council, and the work will start within a few days.

Municipal

Kingston, Ont.—The Board of Works has decided to call for tenders for a concrete and asphalt mixing plant

Beverley Township, Ont.—The township council have decided to build an electric power plant to cost \$5,000.

Watrous, Sask.—A by-law will be voted on shortly to authorize the expenditure of \$3,000 on water main extensions.

Montreal, Que.—The erection of a transformer building at the Low Level pumping station is being considered by the City Council. Tenders will probably be called shortly.

Sarnia, Ont.—At a recent meeting of the City Council a communication was read from the Sarnia Gas & Electric Light Co., offering to sell their electric light plant to the city for \$175,000.

Port Moody, B.C.—The ratepayers have carried a by-law to guarantee the debentures of the Port Moody Steel Works to the extent of \$100,000. The construction of the company's plant and rolling mills will be commenced shortly.

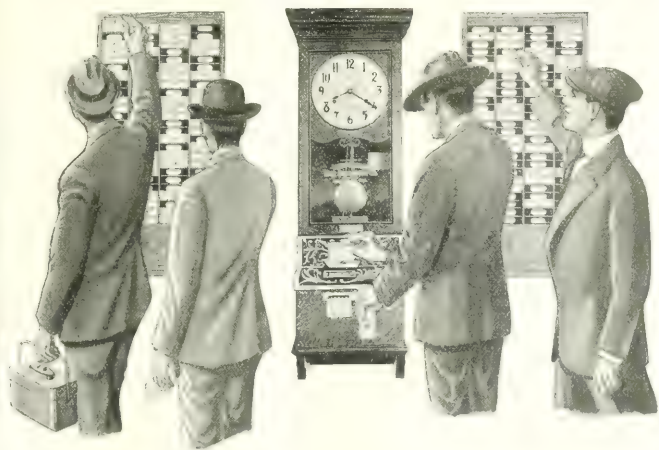
Welland, Ont.—A by-law will be submitted to the ratepayers on November 3rd providing for the purchase of power from the Hydro-Electric Commission and for the issue of debentures to the amount of \$14,000 for machinery and equipment for the town electric station.

Windsor, Ont.—A company is being formed to build a waterworks system at Tecumseh at a cost of about \$25,000. Part of the cost has been subscribed and the Government will be asked to issue a charter under the name of the Tecumseh and District Waterworks Corporation.

Midland, Ont.—The eastern end of James Playfair & Co. lumber yard at the waterfront, containing about 10,000,000 feet of lumber, was burned on Oct. 24. The fire also burned the coal dock underneath the coal for about 100 feet, the coal sliding into the bay. The estimated loss is \$325,000.

Orillia, Ont.—The Town Council have decided to submit a by-law to the people on November 17 to raise by debenture \$50,000 for the purpose of reconstructing the municipal building recently destroyed by fire. The new building will cost approximately \$70,000, of which \$20,000 is on hand from insurance.

Sarnia, Ont.—At a meeting of the City Council, held recently, the hydro-electric by-law and the by-law to provide for the purchase of the Electric Light Co.'s



**Save the
minutes, and
save your
profits —**

The individual time card each employee is using shows in plain figures the exact time each employee comes in or goes out. The late arrivals and early leavings are printed in RED. This RED record stands out so prominently, it has proven itself very effective. This is the only original payroll entry in the world that the employee makes himself which he can see at time of making.

The International Time-Card Recording System

gives the employee confidence in his firm's methods. He knows that his time figures are correct. The employer saves on the hundreds and thousands of lost minutes that slip away when the employees' time is not properly recorded. Don't throw away time, for time is money! International Time Recording Systems are the result of thirty years' experience. The International Time Recording Company supplies complete Time Recording Systems throughout the world. The reason—MERIT!

Montreal Representative:

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Telephone Uptown 6333

The International Time Recording Co.
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F. E. Melton, Manager

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We also make highest
quality Dial Time Recorders.
Prices \$85 and up.

MALGAMATED AMMUNITION- MACHINERY

**Does the work fast and beautifully
Quick deliveries guaranteed**

A complete line of machinery in two sizes for all roughing and finishing operations in the manufacture of all sizes of High Explosive and Shrapnel shells from forgings or bar stock. Amalgamated Ammunition machines are especially designed for their purpose, but will be found of permanent value in any shop which handles repetition work.

Owing to the ingeniously simple and strong design of our machines and the special provision which has been made by our fine organization for quantity production, we can guarantee attractively quick deliveries.

**TO FACILITATE FULL RESPONSE TO INQUIRIES, PLEASE
GIVE ALL POSSIBLE DETAILS OF YOUR REQUIREMENTS.**

Amalgamated Machinery Corporation

72 West Adams Street, Chicago, U.S.A.

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

Rumely-Wachs Machinery Co.

121 N. JEFFERSON ST.

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ILLINOIS

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

AUTOMATIC SCREW MACHINES

10" & 12" S. N. 1000
12" & 14" S. N. 1000
14" & 16" S. N. 1000
16" & 18" S. N. 1000
18" & 20" S. N. 1000
20" & 22" S. N. 1000
22" & 24" S. N. 1000
24" & 26" S. N. 1000
26" & 28" S. N. 1000
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96" & 98" S. N. 1000
98" & 100" S. N. 1000

LATHES

12" x 14" Pattern
14" x 16" Pattern
16" x 18" Pattern
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98" x 100" Pattern

PLANERS AND SHAPERS

36" x 36" x 8' Planer
48" x 36" x 15' Planer
14" x 14" x 10' Shaper
15" x 15" x 10' Shaper
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94" x 94" x 10' Shaper
96" x 96" x 10' Shaper
98" x 98" x 10' Shaper
100" x 100" x 10' Shaper

DRILL PRESSES

20" Machine, 10" strokes (20)
21" Cincinnati (2)
26" Sanyo & Warr
28" Dapco
28" Shiley & Ware
31" Barnes
Barnes No. 1, horizontal
Avery 2-speed, counter-rotating
Prentice 5' Plain Radial

MILLING MACHINES

No. 2 Fox, hand
No. 3 Standard tool power
No. 4 Brown & Sharp
No. 5 Newell
No. 6 Brown & Sharp, universal
No. 7 Ricker, Lincoln
No. 8 Vanner & Sisson, Tool Sinker
No. 9 Worcester & Sisson, Tool Sinker
No. 10 Pratt & Whitney Die Sinker

PRESSES

Bliss No. 18 o.h.l.
Bliss No. 19 o.h.l.
Bliss No. 42 o.h.l.
Rockford No. 2 o.h.l.
American Can No. 3 o.h.l.
Walsh No. 4 o.h.l.
American Can No. 4 1/2 o.h.l.
Bliss No. 60-N Double Acting
Adriance No. 12-A Double Acting
Bliss No. 14 H. H. H.
Toledo No. 94-A Double Crank

MISCELLANEOUS

12" x 12" x 10' Grinding
12" x 12" x 10' Grinding
Gisholt 21" Turret Chucking Lathe
Acme 12" Bolt Cutter
Acme 24" Bolt Cutter
No. 2 x 1/2" N. & M. M. K. Sinker
No. 2 x 1/2" N. & M. M. K. Sinker
table

with water after first and second runs.
It was also decided that the vote
of the taxpayers of the hydroelectric
by law is taken at the municipal elec-
tion in January.

General Industrial

Victoria, B.C.—The Victoria Cement Co. will build an addition to their plant at the Quai wharf.

Redcliff, Alta.—The Alberta Pacific Grain Elevator Co. of Calgary, has built a new elevator here.

At Ann's, C. B.—The Cape Breton Pipe Co., whose plant was recently destroyed by fire, will rebuild immediately.

Windsor, Ont.—The National Spring & Wire Co., are considering the erection of a new plant adjoining the present building. The firm make coil springs for automobiles.

Hespeler, Ont.—A Buffalo, N.Y., concern propose establishing a plant here for making refrigerators. The company will occupy part of the plant of the Stamped Enamelled Ware Co.

Verdun, Que.—J. P. Cote, of Maison neuve, will build a shoe factory here at a cost of \$25,000, exclusive of the site. A by-law will be voted on to grant exemption of taxes and a low rate for power.

Picton, Ont.—The apple evaporator owned by L. K. Shourds at the Village of Wellington, was destroyed by fire on Oct. 18. The building and nearly all the contents were a total loss, with no insurance.

Brantford, Ont.—The Brantford Cordage Co. has commenced building operations on an addition, which will double the present capacity. The entire plant will be operated by electric power. The company will also erect a plant at Wainipeg.

Personal

W. B. Redfern, town engineer of Steelton, Ont., has resigned.

John C. MacDonald, former president of the MacDonald-Godson Co., iron founders and structural steel, died on Oct. 5 at the age of 66.

Capt. Thomas C. Irving, of the 2nd Field Company of Canadian Engineers, and vice-president of the Robert W. Hunt Co., Toronto, has been promoted to the rank of major.

D. M. Medcalf, chief inspector of boilers for the Province of Ontario, has returned to Toronto from an extended visit to the West, and also to the Panama-Pacific Exhibition at San Francisco, Cal.

Tenders

Toronto, Ont.—Tenders for lead covered cable, addressed to the chairman of the Toronto Electric Commissioners, will be received until Tuesday, November 16, 1915. Specifications and form of tender can be obtained at the office of the purchasing agent, 15 Wilton avenue.

Toronto, Ont.—Tenders will be received, addressed to the Chairman, Board of Control, City Hall, up to Tuesday, November 9, 1915, for the supply of a radial drill for machine shop, Danforth Avenue car barns. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Toronto, Ont.—Tenders will be received, addressed to the Chairman, Board of Control, City Hall, Toronto, up to Tuesday, November 9, 1915, for the supply and erection of valves, steam piping, special steel castings and lagging, for main pumping station. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Ottawa, Ont.—Tenders will be received until Wednesday, November 10, 1915, for the construction of steel gates, towers and operating machinery for the regulating dam, Big Chaudiere Falls, French River, Ont. Plans and form of contract can be seen and specification and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the District Engineers, Confederation Life Building, Toronto, and Shaughnessy Building, Montreal.

Ottawa, Ont.—Tenders will be received up to Tuesday, November the 23rd, for the unmentioned items for delivery to H.M.C. Dockyards at Halifax, N.S., and Esquimalt, B.C.: Steel and iron bolts, nuts and rivets, electric cable and wire, mineral grease, castile soap, hard soap, turpentine, chemicals, cleansing powder, bunting. Forms of tender and all information may be obtained by application to the Naval Store Officer at H.M.C. Dockyards at Halifax, N.S., or Esquimalt, B.C., or to G. J. Desbarats, Deputy Minister of the Naval Service, Ottawa.

Contracts Awarded

Montreal, Que.—Masson Co., of Quebec, will supply the steel work for the Star Boiler and Radiator Co.'s new factory.

Esquimalt, B.C.—The contract for the construction of an oil storage plant for the Imperial Oil Co. has been let to the Taylor Engineering Co., Vancouver, at \$40,000.



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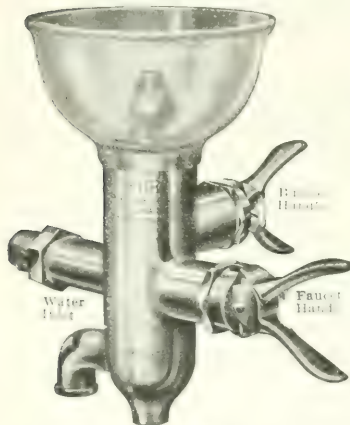
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St. Lambert, Que. The Town Council has awarded the contract for ornamental street lighting to G. M. Gest, of Montreal, at \$4,700. L. Drinkwater is town engineer.

London, Ont. The contract for the new shops for the new shops for the London and Port Stanley Railway was awarded to McGinnis & McIntyre. Estimated, \$10,000.

Markham, Ont.—The contracts for the new waterworks system have now all been awarded. The National Iron Works have been given the contract for the pipes, by main and valves. The Pittsburg and Des Moines Steel Co. are to supply the coated tanks at a cost of \$67,000. The contract for pipe valves has not yet been awarded.

Trade Gossip

Welland, Ont.—The Electric Steel & Metals Co. will install a 6-ton Heroult furnace for making steel castings.

St. Thomas, Ont.—The local plant of the Canada Iron Corporation has received an order for a large number of iron plugs for shells.

The Morgan Engineering Co., Alliance, Ohio, have sold a 60-ton double trolley ladle crane to the Algoma Steel Corporation, Sault Ste. Marie, Ont.

The Northern Crane Works, of Walkerville, Ont., report the sale of several electric traveling cranes to the Consolidated Mining & Smelting Co., at Trail British Columbia.

The Canadian Bridge Co. has been incorporated at Ottawa with a capital of \$2,000,000 to take over the structural steel business of the Canadian Bridge Co. of Walkerville, Ont., a provincial corporation.

The Canadian Fairbanks-Morse Co. will conduct their machine tool department from the Toronto office on Front Street. F. W. Evans has been transferred from Montreal, and will continue in charge of this department.

Galt, Ont.—The Galt Machine Screw Co., are about to commence the construction of a new factory. The building will be of mill construction with brick walls, and concrete basement and floors. The plant will be one of the best equipped in the province, and will be completed about the end of this year. Mr. Jansen is the general manager.

Chippawa, Ont.—The Norton Co. will erect a new electric furnace abrasive plant for the manufacture of alundum adjacent to their crystolon plant. The plant will consist of an office building, a

building for housing the electric furnaces, mixing and storage bins, etc., and a reinforced concrete storage building. Six electric furnaces will be installed at once with a 15-ton overhead travelling crane, hoists and other electrical equipment.

Building Notes

Montreal, Que.—The Canadian Iron Tube Co., have obtained a permit for the erection of a building in Hamilton to cost \$2,000.

Montreal, Que.—A permit has been issued to the Thos. Davidson Mfg. Co., for the erection of a factory extension to cost \$1,000.

Toronto, Ont.—The public school which will be erected on Sydenham street, will cost about \$182,000. Tenders have been opened.

Toronto, Ont.—The Pharmaceutical Co., has applied to the city architect for a permit to build an addition to their factory on Brockton Ave., to cost \$7,000.

Montreal, Que.—The Marcell Trust Co. purpose erecting an office building on St. James street. Edward & W. S. Maxwell, of this city, are the architects.

Orillia, Ont.—The town council have accepted the plans for the proposed municipal buildings, prepared by Burke, Horwood & White, architects of Toronto. The cost is estimated at \$70,000.

Quebec, Que.—A building permit has been issued to the Public Service Corporation for an extension to the power house to cost \$1,800, and the construction of a warehouse to cost \$2,500.

Toronto, Ont.—Work will begin shortly on the Imperial Oil Co.'s new building at the corner of Court and Church streets. The structure will be 115 ft x 76 ft., and ten stories high. It will be of steel construction with limestone exterior.

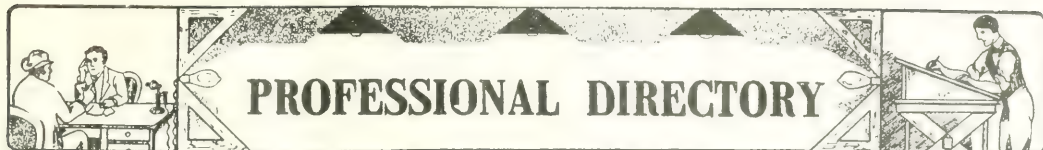
Wood-Working

Bury, Que.—L. H. Martin will build a sawmill to cost about \$10,000.

Vancouver, B.C.—A. B. Cahoon, Cedar Rapids, Mich., is contemplating building a furniture factory here.

Montreal, Que.—Fire destroyed the carriage factory owned by S. H. Chapleau, on Oct. 18, doing several thousand dollars damage.

Baie Verte, N.B.—Fire on Oct. 5 destroyed Capt. E. R. Woods' coooperage. The damage is estimated at \$1,500, inclusive of machinery.



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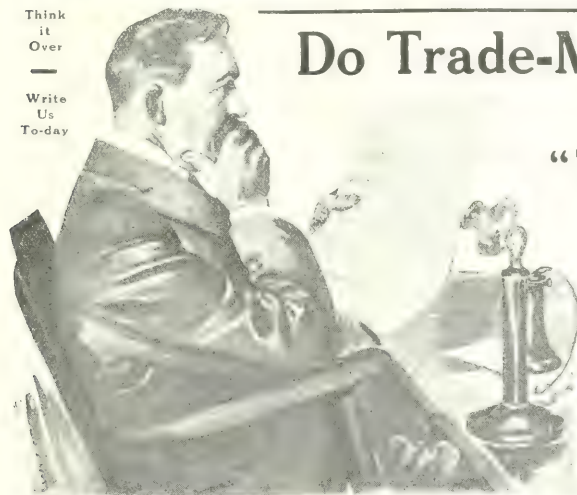
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Ottawa, Ont. Engineers who have been at work on the Toronto harbor situation have completed their report for submission to the Minister of Public Works. The work will be made good and construction will be proceeded with without delay.

Montreal, Que.—The Dominion Coal Co. has abandoned hope for the safety of its colliers, Kron Prinz Olav and Eastington, which left Sydney, N.S., on Sept. 20, the former for Montreal and the latter for St. John, N.B. The two ships ran into a hurricane on Sept. 26. The Kron Prinz Olav had a crew of 23 men and the Eastington carried 20 men.

Canada Steamship Lines.—J. W. Norcross, vice-president and managing director Canada Steamship Lines, states that the record rates for transport of grain on the Great Lakes and Transatlantic will have a favorable influence on the result of the company's earnings this year. Arrangements have been made, Mr. Norcross said, for the chartering of seventeen of the company's steamers for the entire winter, but would not state what rates had been secured except to say that the charters were favorable.

The Newfoundland Naval Reserve.—The total registration for the Newfoundland Royal Naval Reserve to date is 1,200. Of these, 63 have laid down their lives for the Empire in active service, while others have died through natural causes and more invalidated home. The total loss since the war began is approximately 100, so that the present fighting strength of the unit can be estimated at 1,100 men. Of these, 75 are in training on H.M.S. "Calypso" at St. John's, and the remainder on active service in the North Sea doing their duty by King and country.

Trinity, Newfoundland.—It is proposed to make this the winter shipping port of the Anglo-Newfoundland Development Co., whose pulp and paper-making works are situated at Grand Falls. It is highly probable that will be carried to a successful termination, as the commercial people and others of the district have petitioned the Government to have the stub railway leading into the town completed and suitable piers erected. It will mean much, financially and otherwise, to all parties concerned. Mr. Scott, the company's manager, approves of the scheme, viewing it as he does that during the past few years their shipping port in Notre Dame Bay has during winter time been practically closed, inconveniencing as a result their shipment of products. Trinity is an ice free port all year round, besides a town of

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considerable commercial standing in the district, of which it is the capital.

New Incorporations

The Dominion Brake Shoe Co., has obtained a Provincial license at Toronto to carry on business at St. Thomas, Ont., with a capital not to exceed \$200,000.

The Circle Bar Knitting Co. has been incorporated at Ottawa with a capital of \$100,000 to carry on a general knitting mill business at Kincairdine, Ont. Incorporators: William Mitchell, James Malcolm and Walter G. Keebler, all of Kincairdine, Ont.

The Morse Porcupine Syndicate has been incorporated at Toronto, Ont., with a capital of \$35,000 to acquire and develop mines, mineral lands and deposits. Head office at Toronto: Incorporators: Elmer McLeod Rowand and Oscar Heuman King, of Toronto.

The Standard Steel Co., has been incorporated at Ottawa, with a capital of \$200,000, to manufacture corrugated steel pipes, culverts, etc., at Montreal, Que. Incorporators: Louis Athlase David, Louis D'Argy Mailhot and H. R. Bush, all of Montreal.

The Canadian Chadwick Metal Co. has been incorporated at Toronto with a capital of \$40,000, to carry on the business of brass foundries, iron foundries, mechanical engineers, at Dundas, Ont. Incorporators: Arthur Burgess Turner and George Alexander Young, of Hamilton, Ont.

The Neely Rotary Engine Co. of Canada has been incorporated at Ottawa with a capital of \$200,000 to manufacture engines, automobiles, trucks, machine tools, etc., at Toronto, Ont. Incorporators: William Fetherly Neely, John Whitfield and Arthur T. Lawson, all of Toronto.

The Laurentide Power Co. has been incorporated at Ottawa with a capital of \$10,500,000 to carry on the business of an electric light, heat and power company. Head office at Montreal. Incorporators: Winward Fishery, Leonard Walter Robert Smith and F. G. Bass, all of Montreal.

St. Catharines Steel & Metal Co., has been incorporated at Toronto, Ont., with a capital of \$50,000 to carry on the business of manufacturers of machinery, tools, ammunition of all kinds at St. Catharines, Ont. Incorporators: Harry Shortt and Henry H. Collier of St. Catharines, Ont.

The O'Brien Munitions, has been incorporated at Ottawa with a capital of \$2,000,000 to carry on the business of mechanical, electrical and chemical en-

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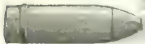
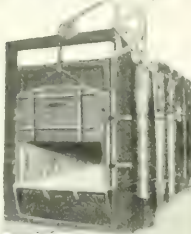
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Barritt and Erwin C. Pixley, all of Ot-
tawa, Ont.

The Specialty Machine Co. has been
incorporated at Toronto, Ont., with a
capital of \$150,000 to carry on the busi-
ness of iron foundries, mechanical en-
gineers and manufacturers of munitions,
specialties, tools, etc., at Toronto. Incor-
porators: George McClure Willoughby,
James Henry Fraser and Francis H.
Hurley, all of Toronto.

Catalogues

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 cov-
ering the construction and method of
operation is given, accompanied by sec-
tional views.

The Cowan Trucking System is the
title of a catalogue issued by the Cowan
Truck Co., Holyoke, Mass. This cat-
alogue contains principally a number of
testimonials with full-page half-tones
showing the Cowan truck being used in
a number of plans and for a variety of
purposes. The concluding pages contain
illustrations of the various types of this
truck or transveyor, together with di-
mensions and descriptions, and also a list
of replacement parts.

**The Union Twist Drill Co., Athol,
Mass.,** have published a "Book of Infor-
mation" catalogue G, dealing with an ex-
tensive line of twist drills, reamers,
gear and milling cutters, and machine
tools which the company manufacture.
The catalogue is divided into six sections
each being devoted to a different pro-
duct; there being also a separate index
for each section. All the tools listed are
illustrated and are accompanied by a
brief description and dimensions. No. 1
or cutter section contains a lot of valu-
able information on gear cutters with
formulae for determining the dimen-
sions of gears by diametral pitch, cut-
ting mitre and bevel gears, calculating
diameters of sprocket wheels for block
centre chains and cutting involute teeth,
etc. The formulae are accompanied by
diagrams of gear sections. The sixth and
last section, in addition to matter relat-
ing to arbors, contains several useful
mechanical tables on cutting speeds,
decimal equivalents, tap drills, screw
threads, etc. The catalogue is pocket
size and contains 380 pages. It is a use-
ful publication to have on file for ref-
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- One 30" throat Perkins heavy punch and shear, capacity 1" hole
in 1" plate.
- One 72" K. vertical boring mill with two heads.
- One 72" Niles vertical boring mill with two heads.
- One 48" Bement car wheel borer with crane.
- Two 36" Snyder upright drills, power feed, etc., heavy duty.
- Two 5" Bickford radial drills.
- One 24" American turret machine, 2 1/2" hole through spindle.
- One 18" double head Cincinnati shaper with two tables on 12' bed.
- One 36" x 36" x 12" New Haven planer.
- 48" and 36" Dreeses radial drills.
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Book Reviews

Products and By-products of Coal.—

The Department of Mines, Ottawa, has issued Bulletin No. 323, dealing with products and by-products of coal. The object of this report is to satisfy, as far as possible, the increasing need for a monograph on fuel products and by-products. The subject, however, is so comprehensive that it is impossible—within the limits of a bulletin—to treat it other than in outline.

The subject matter of the present report is divided into two parts—(1) the production of coke, gas, ammonia, and tar from bituminous coal; (2) the properties and uses of these products and by-products. In setting forth the results of these investigations, the aim has been to give prominence to the commercial rather than to the scientific aspect of the subjects treated, especially as regards their bearing on existing conditions in Canada.

The present time is particularly opportune for discussing the question of establishing new lines of trade and commerce, for, on account of the deplorable war conditions in Europe, all industries are more or less dislocated as regards supply and demand, and manufacturers everywhere are taking stock of current conditions and future possibilities. The trade possibility, that would naturally occur to most people interested in the commercial development of Canada, is the establishment of a coal-tar dye industry; since here, as in other countries, factories using dyes are being seriously inconvenienced, owing to the fact that Germany—by a combination of scientific research, technical ability, and commercial energy—has for years had practically a monopoly in the manufacture and supply of coal-tar dyes; and consequently since the opening of the war importation of this commodity from Europe has almost ceased. Conditions, however, show that the importation of dyes into Canada is not large, and that the prospect of developing a flourishing coal-tar dye industry is not encouraging.

Nevertheless, there are other important by-products from coal which, although not figuring so prominently in the public eye, are of much greater importance commercially, and are also particularly suited for production in Canada.

Processes, plants, and methods are comprehensively described, such subjects as coke ovens, etc., with the resulting products, coke, gas, ammonia, and tar, being considered.

Concise information is given regarding the commercial products of coal tar, the first products from this substance and their field of industrial application being

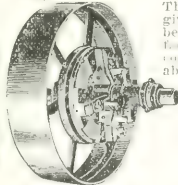
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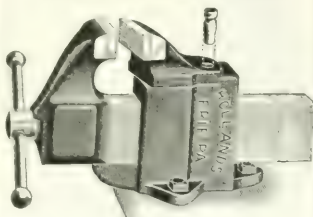
of particular interest in the present economy.

Experience in Efficiency, by R. B. A. Holland, Jr., is published by the Engineering Magazine Co., New York, Price \$1.00. This book is an addition to the Works Manual of Lehigh University, the famous appearing originally in the Engineering Magazine. The book has been written as a reply to numerous inquiries for specific examples of efficiency methods. The author takes as a basis the conditions prevailing in a modern factory, and after a close study of the situation proceeds to ex-

plain what was right or wrong and if the latter case it was corrected. He also explains how greater profits were effected and other profits made without any change of organization or personnel. The book contains ten chapters. The first four are devoted to a description of methods for increasing both the output and quality of direct production, which is largely connected with the handling of labor. The fifth chapter extends the same principles to the treatment of clerical or as it is usually termed non-productive labor. The sixth chapter covers similar ground with the same applied ideas only on a larger

scale so as to include the entire force. Organization rather than individuals is the theme of the next chapter while chapter eight deals with the reduction of factory expenses. An efficient cost system is outlined and developed in chapter nine while the concluding chapter dwells on the necessity of efficiency will. In this chapter it will be found that all the preceding measures are connected to and based upon the fundamental necessity of "efficiency will" as a driving force in the establishing of efficiency practice. The subject has been treated in a logical manner and shows clearly the character of the problem attacked and the nature of the solution found.

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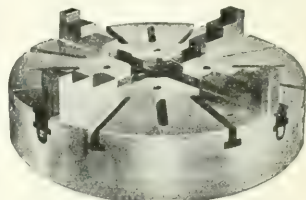
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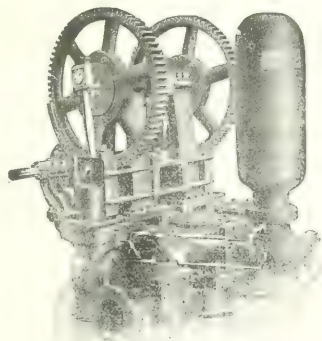
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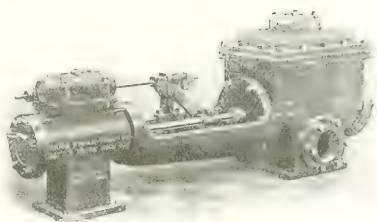
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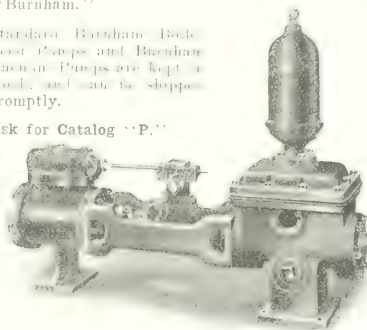
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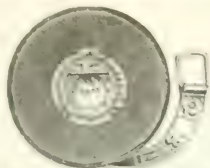
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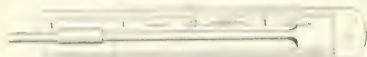
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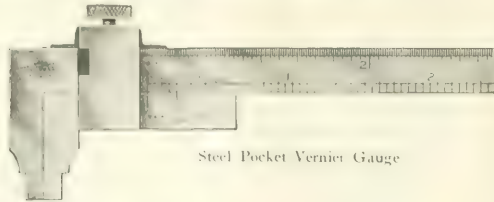
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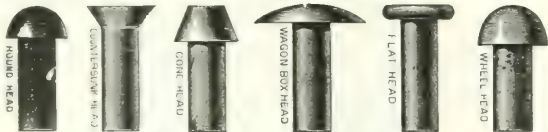
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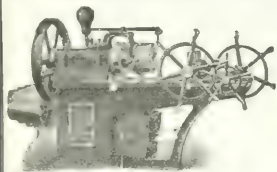
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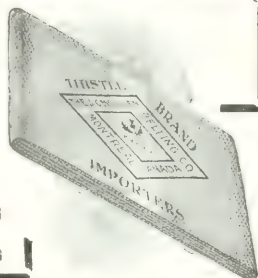
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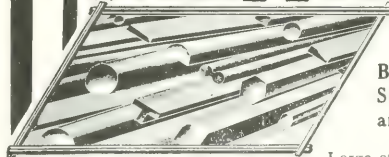
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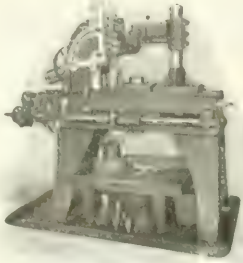
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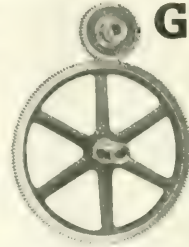
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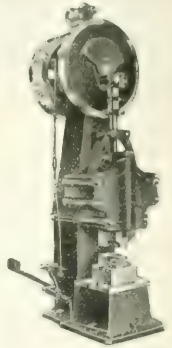
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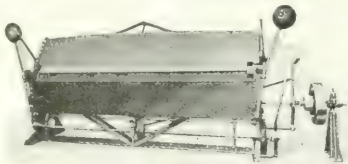
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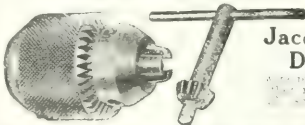
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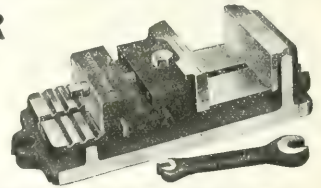
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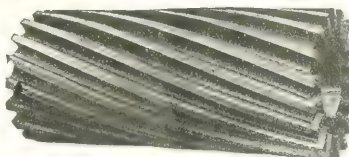
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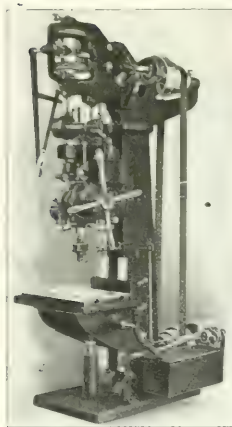
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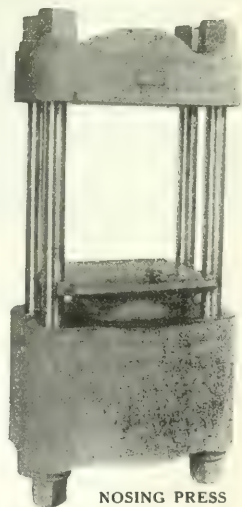
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Can. H. W. Johns-Manville Co., Limited, Toronto.

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Can. Buffalo Forge Co., Montreal.

Watson-Stillman Co., Aldene, N.J.

Bending Machinery.

John Bertram & Sons Co., Dundas.

Berrams, Limited, Edinburgh, Scot. land.

Riles, E. W., Co., Brooklyn, N.Y.

Brown, Rogers Co., Ltd., Hamilton, Canada.

Can. Buffalo Forge Co., Montreal.

Can. Machinery Corporation, Galt, Ont.

Charles F. Elmes Eng. Works, Chicago.

Jardine, A. R. & Co., Hespeler, Ont.

National Machinery & Supply Co., Hamilton.

Niles-Bement-Pond Co., New York.

Owen Sound Iron Works Co., Owen Sound.

Toledo Machine & Tool Co., Toledo, O.

Steel Bending Brake Works, Chatham, Ont.

Watson-Stillman Co., Aldene, N.J.

Bins, Steel.

Dennis Wire & Iron Works Co., Ltd., London, Canada.

Toronto Iron Works, Ltd., Toronto.

Bit Brass Tools.

Wells Bros. Co., Greenfield, Mass.

Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Blast Gauges, Cupola.

Can. Buffalo Forge Co., Montreal.

Sheltons, Ltd., Galt, Ont.

Whiting Foundry Equipment Co., Harvey, Ill.

Blocks, Lifting.

Northern Crane Works, Walkerville.

Blowers.

Can. Buffalo Forge Co., Montreal.

Can. Sirocco Co., Ltd., Windsor, Ont.

Chicago Flexible Shaft Co., Chicago, Ill.

Grand Machine & Tool Co., Philadelphia, Pa.

Sheltons, Ltd., Galt, Ont.

Southwick Foundry & Machine Co., Philadelphia.

Blow Pipes and Regulators.

L'Air Liquide Society, Montreal, Toronto.

Lever Bros., Toronto.

Bluing Ovens.

Oven Equipment & Mfg. Co., New Haven, Conn.

Boilers.

Can. Locomotive Co., Kingston, Ont.

National Machinery & Supply Co., Hamilton.

Owen Sound Iron Works Co., Owen Sound.

Pleasantville Foundry, Pleasantville, Que.

Boiler Compounds.

Can. H. W. Johns-Manville Co., Limited, Toronto.

Boiler Graphite.

Dixon Crucible Co., Jersey City, N.J.

Boiler Makers' Supplies.

Jno. F. Allen Co., New York.

Boiler Cutters and Nut Tapers.

Wells Brothers Co., Greenfield, Mass.

Bolts.

Galt Machine Screw Co., Galt, Ont.

London Bolt & Hinge Works, London, Ont.

Bolt and Nut Machinery.

A. R. Williams Machy. Co., Toronto.

John Bertram & Sons Co., Dundas, Ont.

Owen Sound Iron Works Co., Owen Sound.

Gardner, Robt. & Son, Montreal.

Landis Machine Co., Weymouth, Pa.

National Machinery Co., Tiffin, O.

National Machinery & Supply Co., Hamilton.

Wilt & Russell Co., Greenfield, Mass.

Books.

MacLean Publishing Co., Toronto.

Boring Machines, Upright and Horizontal.

John Bertram & Sons Co., Dundas.

Colburn Machine Tool Co., Franklin, Pa.

Garlick-Machinery, Toronto.

Grand Machine & Tool Co., Philadelphia, Pa.

Hill Placke & Co. of Chicago, Chicago, Ill.

Motch & Merryweather Machy. Co., Cleveland, O.

National Machinery & Supply Co., Hamilton.

Niles-Bement-Pond Co., New York.

Stow Mfg. Co., Binghamton, N.Y.

Boring Machines, Pneumatic.

Cylinder.

Baker Brothers, Toledo, O.

Cleveland Pneumatic Tool Co. of Canada, Toronto.

Can. Fairbanks-Morse Co., Montreal.

Can. Ingersoll-Rand Co., Montreal.

Independent Pneumatic Tool Co., Chicago, Ill.

Stow Mfg. Co., Binghamton, N.Y.

Boring and Turning Mills.

John Bertram & Sons Co., Dundas.

Grand Machine & Tool Co., Philadelphia, Pa.

National Machinery & Supply Co., Hamilton.

Niles-Bement-Pond Co., New York.

Boxes, Annealing, Charging.

Mesta Machine Co., Pittsburg, Pa.

Box Triflers.

Jardine, A. R. & Co., Hespeler, Ont.

Boxes, Steel Shop.

Cleveland Wire Spring Co., Cleveland.

Boxes, Tote.

Cleveland Wire Spring Co., Cleveland.

Brakes.

Brown Bogen & Co., Hamilton, Can.

Whiting Foundry Equipment Co., Harvey, Ill.

Brakes, Heavy Plate Bending and Cornice.

Steel Bending Brake Works, Ltd., Chatham, Ont.

Brass Working Machinery.

A. R. Williams Machy. Co., Toronto.

Gardner, Robt. & Son, Montreal.

Grand Machine & Tool Co., Philadelphia, Pa.

National Machinery & Supply Co., Hamilton.

Warner & Swasey Co., Cleveland.

Niles-Bement-Pond Co., New York.

Brick Cars.

Can. Buffalo Forge Co., Montreal.

Sheldons, Ltd., Galt, Ont.

Brick Dryers.

Can. Buffalo Forge Co., Montreal.

Can. Sirocco Co., Ltd., Windsor, Ont.

Sheldons, Ltd., Galt, Ont.

Brick Machinery.

Eastern Machinery Co., New Haven.

Sheldons, Ltd., Galt, Ont.

Bridges, Railway and Highway.

Can. Bridge Co., Walkerville, Ont.

Buckets, Clam Shell, Crab and Dump.

Whiting Foundry Equipment Co., Harvey, Ill.

Buffing and Polishing Machinery.

Canadian Hart Wheels, Ltd., Hamilton, Ont.

Ford-Smith Machine Co., Hamilton.

Grand Machine & Tool Co., Philadelphia, Pa.

Gray Mfg. & Machine Co., Toronto.

New Britain Machine Co., New Britain, Conn.

Bulldozers.

John Bertram & Sons Co., Dundas.

E. W. Riles Co., Brooklyn, N.Y.

Canada Mach. Corporation, Galt, Ont.

National Machinery & Supply Co., Hamilton, Ont.

Watson-Stillman Co., Aldene, N.J.

Burners, Enclosed Flame Gas.

Oven Equipment & Mfg. Co., New Haven, Conn.

Burners, Fuel, Oil and Natural Gas.

Whiting Foundry Equipment Co., Harvey, Ill.

Burring Reamers.

Castings, Aluminum

Cunningham & Son, St. Catharines, Ont.
Owen Sound Iron Works Co., Ltd., Owen Sound, Ont.
St. Lawrence Foundry, Ltd., Hamilton
Tallman Brass & Metal Co., Hamilton

Castings, Air Engines

Wm. Tol Company, Youngstown, O.

Castings, Brass

Cunningham & Son, St. Catharines, Ont.
Alexander Mack, Ltd., Ottawa, Ont.
T. C. Lawrence Foundry, Ltd., Hamilton
Wm. Tol Company, Youngstown, O.

Castings, Bronze

Cunningham & Son, St. Catharines, Ont.
Mesta Machine Co., Pittsburg, Pa.
Tallman Brass & Metal Co., Hamilton
Wm. Tol Company, Youngstown, O.

Castings, Copper

Cunningham & Son, St. Catharines, Ont.
Tallman Brass & Metal Co., Hamilton, Ont.

Castings, Gray Iron

Brown, Boggs Co., Ltd., Hamilton, Canada
Erie Foundry Co., Erie, Pa.
Alexander Mack, Ltd., Ottawa
Gardner, Robt., & Son, Montreal
Hull Iron & Steel Foundries, Ltd., Hull, Quebec
Mesta Machine Co., Pittsburg, Pa.
Owen Sound Iron Works Co., Owen Sound
Pleasville Foundry, Pleasantville, Que.
Wm. Tol Company, Youngstown, O.

Castings, Steel Chrome and Manganese Steel

Hull Iron & Steel Foundries, Ltd., Hull, Quebec
Mesta Machine Co., Pittsburg, Pa.
Wm. Tol Company, Youngstown, O.

Castings, Malleable

Galt Malleable Iron Co., Galt

Castings, Nickel Steel

Hull Iron & Steel Foundries, Ltd., Hull, Quebec
Mesta Machine Co., Pittsburg, Pa.

Cement, Disc Wheel

Gardner Machine Co., Beloit, Wis.

Cement, Iron

Can. H. W. Johns-Manville Co., Ltd., Hamilton, Ont.
Shelton Metallic Filler Co., Derby, O.

Cement Machinery

Can. Fairbanks-Morse Co., Montreal
Gardner, Robt., & Son, Montreal
National Machinery & Supply Co., Hamilton, Ont.
Owen Sound Iron Works Co., Owen Sound

Centre Reamers

Wells Brothers Co., Greenfield, Mass.

Centering Machines

John Bertram & Sons Co., Dundas
Gardner, Robt., & Son, Montreal
Grant Machine & Tool Co., Philadelphia, Pa.
Hurlbut, Rogers Machinery Co., South Sudbury, Mass.
National Machinery & Supply Co., Hamilton
Niles-Bement-Pond Co., New York
Pratt & Whitney Co., Dundas, Ont.

Centrifugal Pumps

Can. Buffalo Forge Co., Montreal
Pratt & Whitney Co., Dundas, Ont.
Southwest Foundry & Machine Co., Philadelphia, Pa.
Smart-Turner Machine Co., Hamilton, Ont.

Chain Blocks

Can. Fairbanks-Morse Co., Montreal
National Machinery & Supply Co., Hamilton

Chains, Silent and Transmission

Jones & Glasco, Montreal
Morse Chain Co., Ithaca, N.Y.
Pleasville Foundry, Pleasantville, Que.

Chemists

Chem. Inspection & Testing Laboratory, Toronto
Toronto Testing Laboratory, Ltd., Toronto

Chucks, Aero, Automatic

Gardner Machine Co., New York

Chucks, Drill, Lathe and Universal

John Bertram & Sons Co., Dundas, Ont.
Buffalo Forge Co., Buffalo, N.Y.
Can. Fairbanks-Morse Co., Montreal

Cleveland Twist Drill Co., Cleveland, Ohio
Cushman Chuck Co., Hartford, Conn.
Gardner, Robt., & Son, Montreal
Grant Machine & Tool Co., Philadelphia, Pa.
Wells Brothers Co., Greenfield, Mass.
James Mfg. Co., Hartford, Conn.
Kee & Glasco, Montreal
Mason Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford
National Machinery & Supply Co., Hamilton
Skinner Chuck Co., New Britain, Conn.
D. E. Whiton Machine Co., New London, Conn.
Wells Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Chucks, Drill, Automatic and Keyless

Buffalo Forge Co., Buffalo, N.Y.

Chucks, Ring Wheel

Gardner Machine Co., Beloit, Wis.

Chucking Machines

Gavin Machine Co., New York
Grant Machine & Tool Co., Philadelphia, Pa.
New Britain Machine Co., New Britain, Conn.
Niles-Bement-Pond Co., New York
Turner Machine Co., Danbury, Conn.
Warner & Swasey Co., Cleveland, O.

Clocks, Time and Watchman's

Lantz-Porter Co., Toronto

Cloth and Wool Dryers

Canada Wire & Iron Goods Co., Hamilton, Ont.
Sheltons, Limited, Galt

Clutches

Eastern Machinery Co., New Haven, Conn.
Jones & Glasco, Montreal
Owen Sound Iron Works Co., Owen Sound
Positive Clutch & Pulley Works, Ltd., Toronto

Coal Handling Machinery

Whiting Foundry Equipment Co., Harvey, Ill.

Coke and Coal

Hanna & Co., M. A., Cleveland, O.

Collectors, Pneumatic

Can. Buffalo Forge Co., Montreal
Sheltons, Limited, Galt

Compressors, Air

Cleveland Pneumatic Tool Co. of Canada, Toronto
Independent Pneumatic Tool Co., Chicago
Mesta Machine Co., Pittsburg, Pa.
National Machinery & Supply Co., Hamilton
Southwest Foundry & Machine Co., Philadelphia, Pa.
The Smart-Turner Machine Co., Hamilton

Concentrating Plant

Gardner, Robt., & Son, Montreal

Concrete Mixers

A. R. Williams Machy. Co., Toronto
Can. Fairbanks-Morse Co., Montreal
National Machinery & Supply Co., Hamilton

Concrete Reinforcement

Canada Wire Goods Mfg. Co., Hamilton, Ont.

Condensers

Can. Buffalo Forge Co., Montreal
Mesta Machine Co., Pittsburg, Pa.
The Smart-Turner Machine Co., Hamilton
Southwest Foundry & Machine Co., Philadelphia
Wm. Tol Company, Youngstown, O.

Contracting Engineers, Electrical

Lantz-Porter Co., Toronto

Controllers and Starters

Electric Motor
A. R. Williams Machy. Co., Toronto
Toronto Hamilton Electric Co., Hamilton, Ont.

Conveyor Machinery

Can. Fairbanks-Morse Co., Montreal
National Machinery & Supply Co., Hamilton, Ont.
Pleasville Foundry, Pleasantville, Que.
The Smart-Turner Machine Co., Hamilton

Coping Machines

Can. Buffalo Forge Co., Montreal
John Bertram & Sons Co., Dundas
National Machinery & Supply Co., Hamilton, Ont.
Niles-Bement-Pond Co., New York

Cornice Brakes

Brown Boggs Co., Ltd., Hamilton, Canada
Steel Bending Brake Wks., Chatham

Counting Machines

W. N. Duggan Co., Milwaukee, Wis.
National Scale Co., Chicago Falls, Mass.
C. J. Root Co., Bristol, Conn.

Counterbores and Countersinks

Cleveland Twist Drill Co., Cleveland
Morse Twist Drill & Machine Co., New Bedford
Pratt & Whitney Co., Dundas, Ont.
Wells Bros. Co., Greenfield, Mass.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Countershafts

Raind Machine Co., Bridgeport, Conn.
Wells Bros. Co., Greenfield, Mass.

Country House Lighting and Cooking

Can. Blaugas Co., Montreal

Couplings

Can. H. W. Johns-Manville Co., Ltd., Toronto
Eastern Machinery Co., New Haven, Conn.
Gardner, Robt., & Son, Montreal
Owen Sound Iron Works Co., Owen Sound, Ont.

Couplings, Air Hose

Cleveland Pneumatic Tool Co. of Canada, Toronto

Crabs, Travelling

Owen Sound Iron Works Co., Owen Sound

Cranes, Locomotive

Northern Crane Works, Walkerville

Cranes, Gantry

Northern Crane Works, Walkerville
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Goliath

Herbert Morris Crane & Hoist Co., Ltd., Toronto
Northern Crane Works, Walkerville
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Hydraulic

Southwest Foundry & Machine Co., Philadelphia
Watson-Stillman Co., Aldene, N.J.

Cranes, Pneumatic

Northern Crane Works, Walkerville
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Post Jib

Northern Crane Works, Walkerville
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Portable

Northern Crane Works, Walkerville
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Swing Jib

Northern Crane Works, Walkerville
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

Northern Crane Works, Walkerville
Smart-Turner Machine Co., Hamilton, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cranes, Travelling Electric and Hand Power

Dominion Bridge Co., Montreal
Niles-Bement-Pond Co., New York
Northern Crane Works, Walkerville
Whiting Foundry Equipment Co., Harvey, Ill.

Crane, Chain

Northern Crane Works, Walkerville

Cranes, All Kinds

Northern Crane Works, Walkerville
Owen Sound Iron Works Co., Owen Sound, Ont.
Southwest Foundry & Machine Co., Philadelphia
Whiting Foundry Equipment Co., Harvey, Ill.

Crank Pin Turning Machine

Niles-Bement-Pond Co., New York

Crimps, Leather

Gration & Knight Mfg. Co., Montreal

Cupolas

Can. Buffalo Forge Co., Montreal
Northern Crane Works, Walkerville
Sheltons, Ltd., Galt, Ont.
Whiting Foundry Equipment Co., Harvey, Ill.

Cupola and Blast Gas Blowers

Can. Sirocco Co., Ltd., Windsor, Ont.
Cupola Blast Granges & Blowers
Sheltons, Ltd., Galt, Ont.

Cutters, Angle, Tee Iron and Burr

Can. Buffalo Forge Co., Montreal

Cutters, Flue

Independent Pneumatic Tool Co., Chicago
Cleveland Pneumatic Tool Co. of Canada, Toronto

Cutters, Pipe

Can. Fairbanks-Morse Co., Montreal
A. B. Jarline & Co., Hesper, Ont.
Trimont Mfg. Co., Roxbury, Mass.

Cutting Compound & Cutting Oil

Can. Economic Lubricant Co., Montreal
Can. Oil Companies, Toronto
Catacatt Refining Co., Buffalo, N.Y.
Crecent Oil Co., New York
Racine Tool & Machine Co., Racine, Wis.

Cutter Grinders and Attachments

Cincinnati Milling Machine Co., Cincinnati
Gavin Machine Co., New York
Grant Machine & Tool Co., Philadelphia, Pa.

Cutters, Milling

A. R. Williams Machy. Co., Toronto
Can. Fairbanks-Morse Co., Montreal
Cleveland Twist Drill Co., Cleveland
Gavin Machine Co., New York
Morse Twist Drill & Machine Co., New Bedford
Taylor Mfg. Co., Philadelphia, Pa.
Pratt & Whitney Co., Dundas, Ont.
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Cutting-off Machines

Armstrong Bros. Tool Co., Chicago
John Bertram & Sons Co., Dundas
Can. Fairbanks-Morse Co., Montreal
Eschen-Lucas Machine Wks., Philadelphia, Pa.
Euse & Hill Machy. Co., Montreal
Garlock Machinery, Toronto
Gavin Machine Co., New York
Grant Machine & Tool Co., Philadelphia, Pa.
Geo. Gorton Machine Co., Racine, Wis.
Hurlbut, Rogers Machinery Co., South Sudbury, Mass.
John H. Hall & Sons, Branford, Ont.
Nutter & Barnes Co., Hindsdale, N.B.
Pratt & Whitney Co., Dundas, Ont.
L. S. Starnett Co., Philadelphia, Pa.
T. S. Starnett Co., Athol, Mass.

Damper Regulators

Can. Fairbanks-Morse Co., Montreal

Derricks

Dominion Bridge Co., Montreal
Wilt Twist Drill Co. of Canada, Ltd., Walkerville, Ont.

Designers, Special Machinery

Baird Machine Co., Bridgeport, Conn.

Dies and Die Stocks

Armstrong Mfg. Co., Bridgeport, Conn.
Bundell, W. H. & Son, Toronto
Butterfield & Co., Rock Island, Que.
Brown, Boggs & Co., Hamilton, Ont.
Can. Fairbanks-Morse Co., Montreal
Duncan Electrical Co., Montreal
Gardner, Robt., & Son, Montreal
Greendell Tap & Die Corporation, Greenfield, Mass.
A. B. Jarline & Co., Hesper, Ont.
Modern Tool Co., Erie, Pa.
Morse Twist Drill & Machine Co., New Bedford
Pratt & Whitney Co., Dundas, Ont.
Wiley & Russell, Greenfield, Mass.

Dies for Bit Brace Use

Wells Brothers Co., Greenfield, Mass.

Dies Sinks

Gavin Machine Co., New York

Dies for Machines

Wells Brothers Co., Greenfield, Mass.

Die Sinking Presses, Hydraulic

Charles F. Elmes Eng. Works, Chicago
Watson-Stillman Co., Aldene, N.J.

Dies, Self-opening

Duncan Electrical Co., Montreal
Geometric Tool Co., New Haven, Conn.
Greendell Tap & Die Corporation, Greenfield, Mass.
Landa Machine Co., Weynesboro, Pa.
Modern Tool Co., Erie, Pa.
Munroe Machine & Tool Co., Detroit

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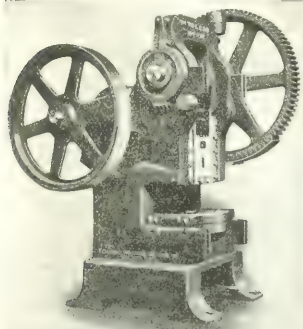
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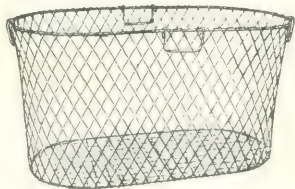
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 Greenfield, Pa. & Erie Corporation
 Greenfield, Pa.
 A. R. Williams & Co., Hespeler, Ont.
 Canada Machine Co., Warrensville, Pa.
 Motion Tool Co., Erie, Pa.
 Wm. Todd Company, Youngstown, O.
 Pratt & Whitney Co., Dundas, Ont.

Dies for Screw Plates.

Wells Brothers Co., Greenfield, Mass.

Dies, Sheet Metal Working.

W. H. Bliss Co., Brooklyn, N.Y.
 Brown, Ingersoll & Co., Hamilton, Can.
Dies, Serrated and Thread.
 Armstrong Mfg. Co., Bridgeport, Conn.
 Greenfield, Pa. & Erie Corporation
 Greenfield, Pa.
 James Watson Co., Warrensville, Pa.
 Motion Tool Co., Erie, Pa.
 Wm. Todd Company & Tool Co., Phila-
 delphia, Pa.

Dies, Leather.

Graton & Knight Mfg. Co., Montreal.

Draughtsmen's Tools.

Emmett Mfg. Co., Warrensville, Pa.

Draft Machinery.

A. B. Jandine & Sons, Toronto.
 Bridgeport & Co., Rock Island, Que.
 Can. Buffalo Forge Co., Montreal.
 Can. Sirocco Co., Ltd., Windsor, Ont.
 A. B. Jandine & Co., Hespeler, Ont.
 Pratt & Whitney Co., Dundas, Ont.
 Sheldon, Limited, Galt, Ont.

Drum Roll Cutters.

Cleveland Pneumatic Tool Co., of
 Canada, Toronto.

Drill Presses.

Baker Bros., Toledo, O.
 W. F. & John Barnes Co., Rockford,
 Ill.
 Can. Buffalo Forge Co., Montreal.
 Foss & Hill Mfg. Co., Montreal.
 Hill, Chase & Co. of Chicago, Chi-
 cago, Ill.
 Garvin Machine Co., New York.
 Girard Machine & Tool Co., Phila-
 delphia, Pa.
 Niles-Bement-Pond Co., New York.
 A. R. Williams Machinery Co., Toron-
 to.

Drilling Machines, Locomotive

and Multiple Spindle.

Armstrong Mfg. Co., Bridgeport, Conn.
 Baker Bros., Toledo, O.
 Barker Drill Co., Rockford, Ill.
 John Bertram & Sons Co., Dundas.
 Can. Buffalo Forge Co., Montreal.
 Can. Fairbanks-Morse Co., Montreal.
 Garvin Machine Co., New York.
 Girard Machine & Tool Co., Phila-
 delphia, Pa.
 A. B. Jandine & Co., Hespeler, Ont.
 Niles-Bement-Pond Co., New York.

Drilling Machines, Radial

and Turret.

Baker Bros., Toledo, O.
 Barker Drill Co., Rockford, Ill.
 John Bertram & Sons Co., Dundas.
 Can. Fairbanks-Morse Co., Montreal.
 Motch & Merryweather Machy. Co.,
 Cleveland, O.
 Niles-Bement-Pond Co., New York.
 Turner Machine Co., Danbury, Conn.

Drilling Machines, Sensitive.

Baker Bros., Toledo, O.
 W. F. & John Barnes Co., Rockford,
 Ill.
 Can. Fairbanks-Morse Co., Montreal.
 Niles-Bement-Pond Co., New York.
 Rockford Machine Tool Co., Rockford,
 Ill.

Drilling Machines, Upright

and Horizontal.

Armstrong Mfg. Co., Bridgeport, Conn.
 Baker Bros., Toledo, O.
 Barker Drill Co., Rockford, Ill.
 Colburn Mach. Tool Co., Franklin, Pa.
 A. R. Williams Machinery Co., Toronto.
 W. F. & John Barnes Co., Rockford,
 Ill.
 Can. Fairbanks-Morse Co., Montreal.
 Garvin Machine Co., New York.
 Girard Machine & Tool Co., Phila-
 delphia, Pa.
 A. B. Jandine & Co., Hespeler, Ont.
 Rockford Machine Tool Co., Rockford,
 Ill.
 Motch & Merryweather Machy. Co.,
 Cleveland, O.
 Niles-Bement-Pond Co., New York.

Drilling Posts.

Keystone Mfg. Co., Buffalo, N.Y.

Drills, Bench.

W. F. & John Barnes Co., Rockford,
 Ill.
 Can. Buffalo Forge Co., Montreal.
 Can. Fairbanks-Morse Co., Montreal.
 Pratt & Whitney Co., Dundas, Ont.
 United States Electrical Tool Co.,
 Cincinnati, O.

Drills, Blacksmith and Bit Stock.

Can. Buffalo Forge Co., Montreal.
 Cleveland Twist Drill Co., Cleveland.
 A. B. Jandine & Co., Hespeler, Ont.
 Morse Twist Drill and Machine Co.,
 New Bedford.
 WBT Twist Drill Co., of Canada, Ltd.,
 Walkerville, Ont.

Drills, Centre.

Cleveland Twist Drill Co., Cleveland.
 Morse Twist Drill and Machine Co.,
 New Bedford.
 Pratt & Whitney Co., Dundas, Ont.
 W. F. & John Barnes Co., Rockford,
 Ill.
 WBT Twist Drill Co., of Canada, Ltd.,
 Walkerville, Ont.

Drills, Corner (Pneumatic).

Cleveland Pneumatic Tool Co., of
 Canada, Toronto.

Drills, Electric and Portable.

A. R. Williams Machy. Co., Toronto.
 Can. Buffalo Forge Co., Montreal.
 Niles-Bement-Pond Co., New York.
 Stow Mfg. Co., Binghamton, N.Y.
 United States Electrical Tool Co.,
 Cincinnati, O.

Drills, High Speed.

Baker Bros., Toledo, O.
 Cleveland Twist Drill Co., Cleveland.
 Can. Fairbanks-Morse Co., Montreal.
 Morse Twist Drill and Machine Co.,
 New Bedford.
 W. F. & John Barnes Co., Rockford,
 Ill.
 Pratt & Whitney Co., Dundas, Ont.
 Whitings & Barnes Mfg. Co., St.
 Catharines, Ont.
 WBT Twist Drill Co., of Canada, Ltd.,
 Walkerville, Ont.

Drills, Multiple Spindle.

Pratt & Whitney Co., Dundas, Ont.

Niles-Bement-Pond Co., New York.

Drills, Oil Tube.

Cleveland Twist Drill Co., Cleveland.
 Morse Twist Drill and Machine Co.,
 New Bedford.

Drills, Pneumatic.

John F. Allen Co., New York.
 Cleveland Pneumatic Tool Co., of
 Canada, Toronto.
 Independent Pneumatic Tool Co.,
 Chicago, Ill.
 Niles-Bement-Pond Co., New York.

Drills, Ratchet and Hand.

Armstrong Bros. Tool Co., Chicago.
 Can. Buffalo Forge Co., Montreal.
 Can. Fairbanks-Morse Co., Montreal.
 Cleveland Twist Drill Co., Cleveland.
 A. B. Jandine & Co., Hespeler, Ont.
 Morse Twist Drill and Machine Co.,
 New Bedford.
 Pratt & Whitney Co., Dundas, Ont.
 WBT Twist Drill Co., of Canada, Ltd.,
 Walkerville, Ont.

Drills, Rock.

A. R. Williams Machy. Co., Toronto.
 Cleveland Pneumatic Tool Co., of
 Canada, Toronto.

Drills, Track.

Cleveland Twist Drill Co., Cleveland.
 Morse Twist Drill and Machine Co.,
 New Bedford.
 WBT Twist Drill Co., of Canada, Ltd.,
 Walkerville, Ont.

Drills, Twist.

Armstrong, Whitworth of Canada,
 Ltd., Montreal.
 Can. Fairbanks-Morse Co., Montreal.
 Cleveland Twist Drill Co., Cleveland.
 John Morrow Screw Co., Ingersoll,
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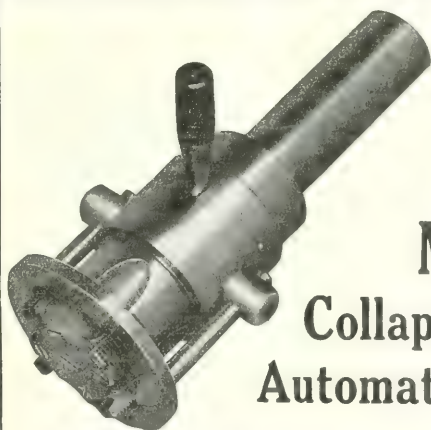
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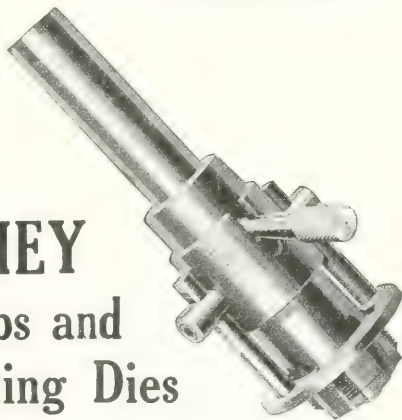
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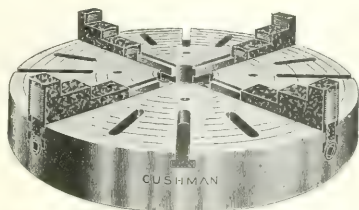
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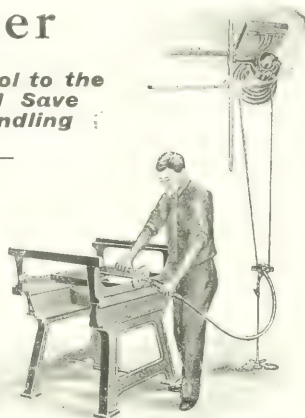
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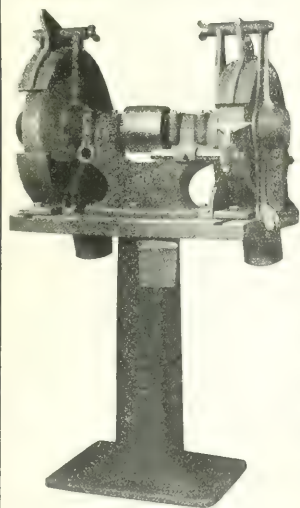
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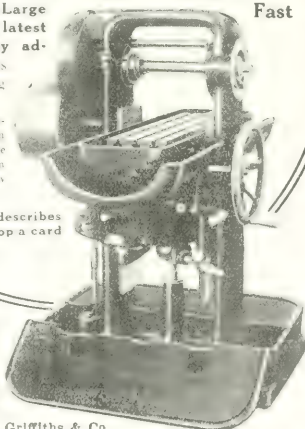
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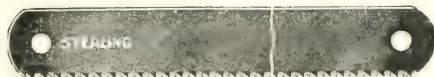


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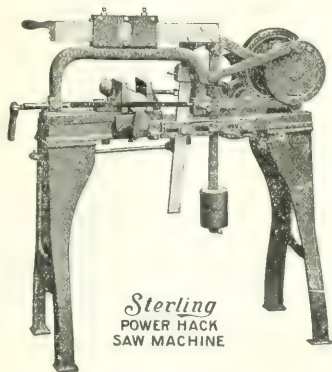
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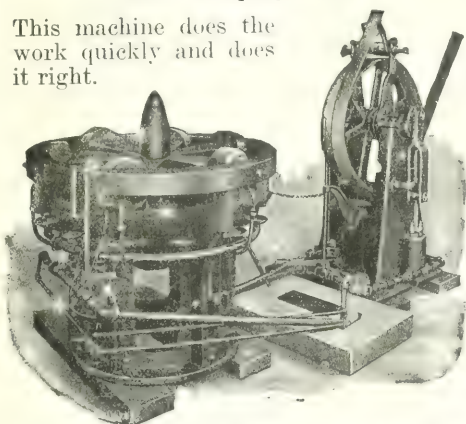
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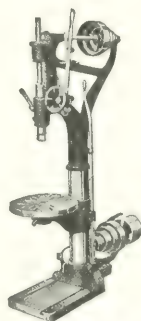
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Watson-Stillman Co., Aldene, N.J.

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 S. F. Bowser & Co., Fort Wayne, Ind.

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 Darling Brothers, Montreal.

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 Wm. Tool Company, Youngstown, O.

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E. W. Bliss Co., Brooklyn, N.Y.
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Can. Buffalo Forge Co., Montreal.
 Can. Fairbanks-Morse Co., Montreal.

Scott Bros., Halifax, Eng.
 Gardner, Robt. & Son, Montreal.

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 A. B. Jardine & Co., Hespeler, Ont.

Pratt & Whitney Co., Dundas, Ont.
 Toledo Machine & Tool Co., Toledo, O.

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 John Bertram & Sons Co., Dundas.

Bliss, E. W. Co., Brooklyn, N.Y.
 Brown, Boggs Co., Ltd., Hamilton, Canada.

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 Watson-Stillman Co., Aldene, N.J.

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 John Bertram & Sons Co., Dundas.

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 Wells Brothers Co., Greenfield, Mass.

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 Canada Wire & Iron Goods Co., Hamilton, Ont.

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 Niles-Bement-Pond Co., New York.

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 Can. Fairbanks-Morse Co., Montreal.

Niles-Bement-Pond Co., New York.

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 Watson-Stillman Co., Aldene, N.J.

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 Stevens, F. B., Detroit, Mich.

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 Keystone Mfg. Co., Buffalo, N.Y.

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Reamers, Bridge, Expanding and High Speed.
 Butterfield & Co., Rock Island, Que.

Butterfield & Co., Rock Island, Que.
 Cleveland Twist Drill Co., Cleveland.

Morse Twist Drill & Machine Co., New Bedford.
 Pratt & Whitney Co., Dundas, Ont.

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 Garrison Machine Co., New York.

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 Butterfield & Co., Rock Island, Que.

Can. Fairbanks-Morse Co., Montreal.
 Cleveland Twist Drill Co., Cleveland.

Morse Twist Drill & Machine Co., New Bedford.
 Pratt & Whitney Co., Dundas, Ont.

Reamer Fluting Machines.
 Garrison Machine Co., New York.

Reamers, Pipe, Cylinder and Concomitive.
 Butterfield & Co., Rock Island, Que.

Can. Fairbanks-Morse Co., Montreal.
 Cleveland Twist Drill Co., Cleveland.

Morse Twist Drill & Machine Co., New Bedford.
 Pratt & Whitney Co., Dundas, Ont.

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Can. Fairbanks-Morse Co., Montreal.
 Cleveland Twist Drill Co., Montreal.

A. B. Jardine & Co., Hespeler, Ont.
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Pratt & Whitney Co., Dundas, Ont.
 Wilt Twist Drill Co. of Canada, Ltd.

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 Baird Machine Co., Bridgeport, Conn.

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 Hamilton & Hamilton Electric Co., Hamilton, Ont.

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 Buffalo Forge Co., Buffalo, N.Y.

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Toronto and Hamilton Electric Co., Hamilton.

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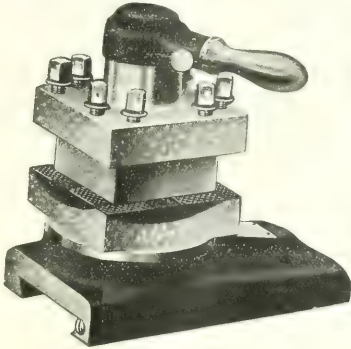
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Making SHRAPNEL ?

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.



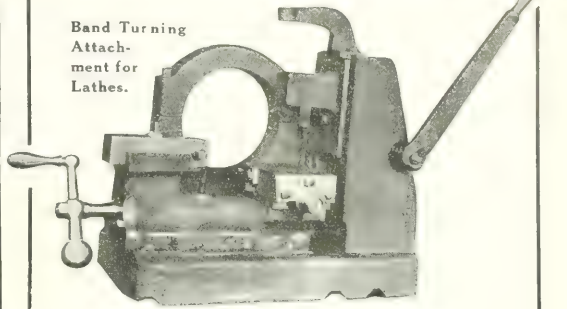
Style G

Catalog and full details on request

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A Time-Saver for Turning Copper Band on Shells

Band Turning
Attachment for
Lathes.



This attachment will fit any engine lathe, and with its use you can turn the copper band on Shrapnel Shells down to size required and finish them *all in one operation*.

With this device we will guarantee an output of

50 Turned Copper Bands per Hour

Used with a specially constructed steel chuck, casting of which can be finished on the lathe on which the attachment will be used.

Castings are supplied by us.

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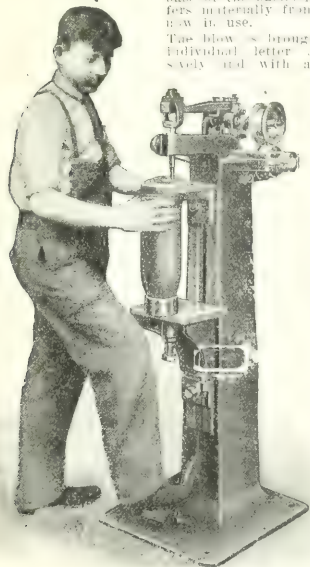
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Marking High Explosive Shells

The device employed in marking the base of the shells in this machine differs materially from any other method now in use.

The blow is brought to bear on each individual letter and figure successively and with absolute uniformity.

Adjustable to give shallow or deep impression. FIFTEEN SECONDS' TIME for marking perfectly one Shell. For 18-pound, 45" and 60-pound Shells.



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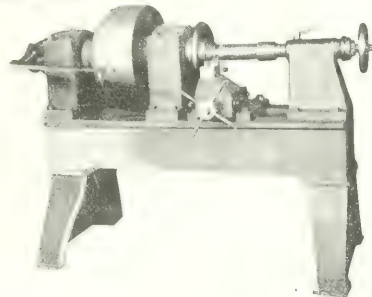
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Mfg. and
Machine Co.**

Bridgeport, Conn.

SPEED and ACCURACY

The two most important factors in the machining of shrapnel and 4.5 shells, speed and accuracy, can be achieved when turning copper bands by using this machine. The cut below shows our band lathe with Collet chuck tail stock, which we have manufactured for one of the largest shell makers in the United States. Its daily output averages 40 to 45 shells per hour.



This lathe was designed and built by us especially for this work. It is of sufficiently heavy construction to enable it to stand up under the strenuous work demanded of shell-making machinery.

Most of the largest manufacturers have found it profitable to adopt it. Let us tell you why. We invite your inquiry.

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National Machy. Co., Tiffin, Ohio.

National Mach. & Sup. Co., Hamilton.

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Shears, Lever, Hydraulic.

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Shelving Chambers, Ltd., Toronto.

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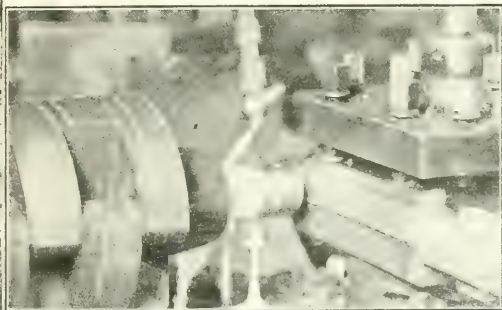
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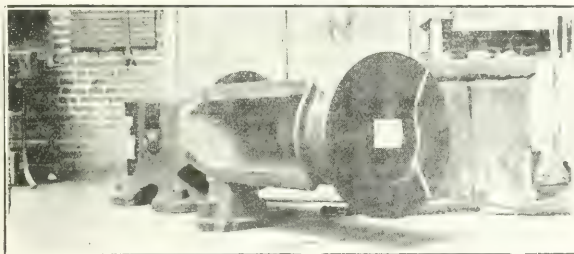
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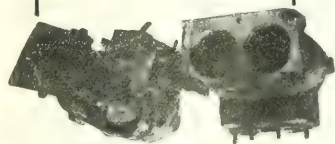
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Armstrong Bros. Tool Co., Chicago, Ill.
- Tool Room Partitions.**
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- Tool Posts, Lathe.**
Armstrong Bros. Tool Co., Chicago, Ill.
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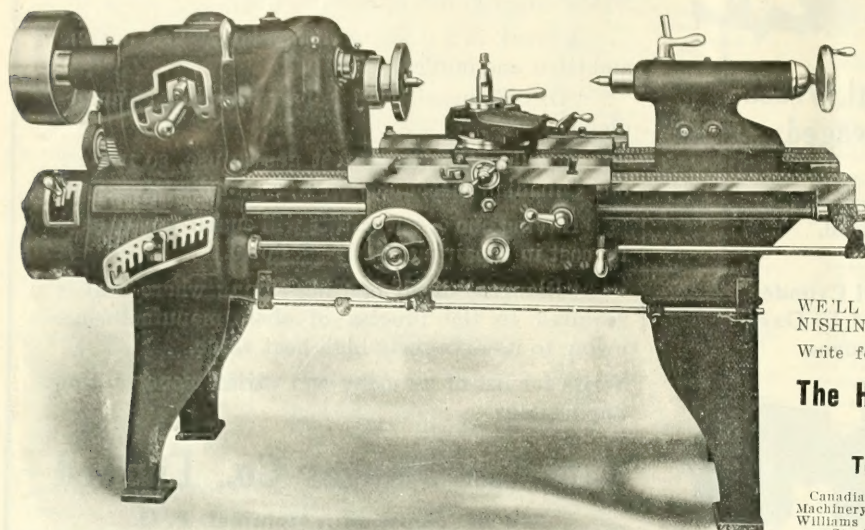
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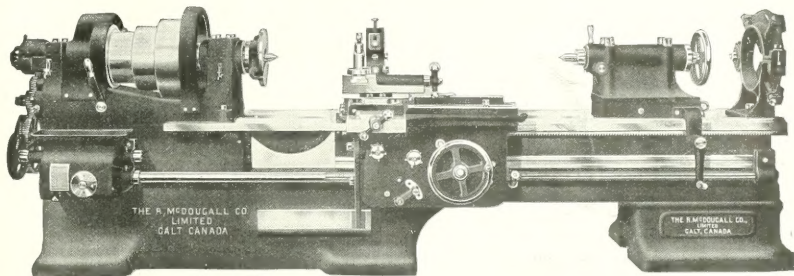
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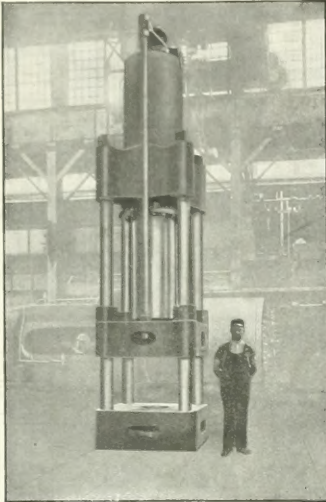
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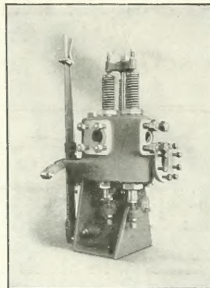


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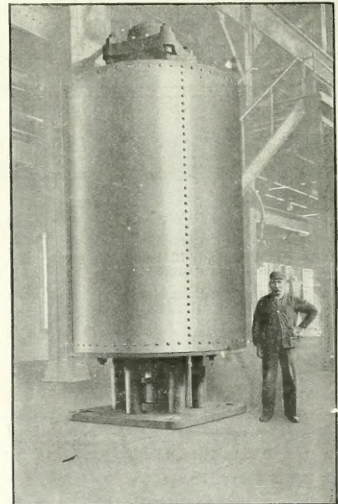
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