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CANADIAN MACHINERY

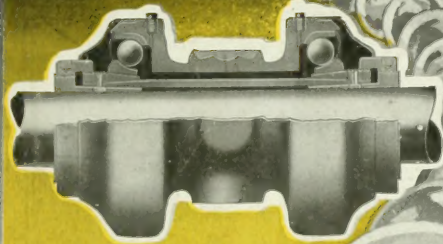
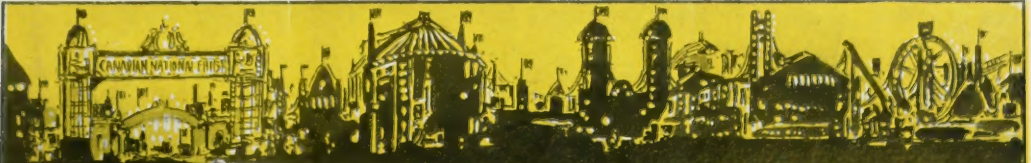
AND MANUFACTURING NEWS

A weekly newspaper 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. XVIII—No. 8

Publication Office: Toronto, August 23, 1917

Subscription Price
\$3.00 per Year



See Our Exhibit in the Machinery Hall, Toronto Exhibition

Come, see and you will be convinced that line shafting which is equipped with Chapman Double Ball-Bearings saves 75% of the friction loads, making an average total saving of power from 15% to 30%.

All shafting in Machinery Hall is equipped with Chapman Double Ball Bearings.

**The Chapman Double
Ball Bearing Co., Limited**

339-351 Sorauren Ave., Toronto

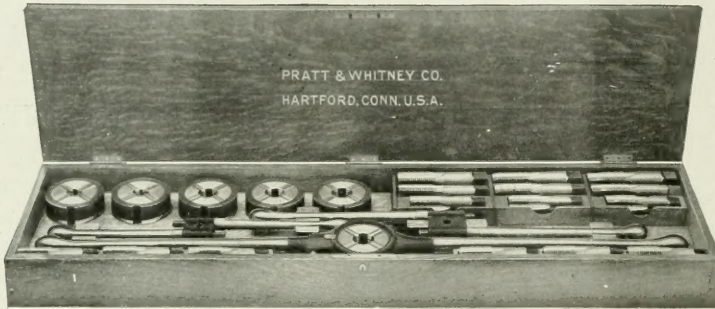
Transmission Ball Bearing Co., Inc.

1050 Military Road

Buffalo, N.Y.

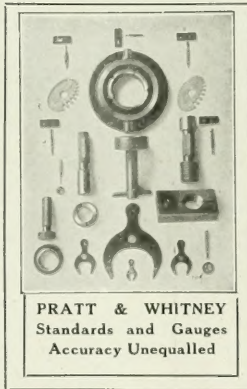
CANADIAN MACHINERY

SMALL TOOLS



P. & W. Die-Stock Set No. 4

These sets are furnished in various capacities for either U. S. Standard, S. A. E. Standard, Whitworth Standard or "V" Form. The Pratt & Whitney Policy of highest quality materials, together with the necessary refinement and accuracy, is maintained in all tools composing these sets.



PROMPT SERVICE

is assured at our nearest store where P. & W. Small Tools are carried in stock. Place your orders there to-day.

PRATT & WHITNEY CO.

of Canada, Limited

Works: DUNDAS, ONTARIO

MONTREAL
723 Drummond Bldg.

TORONTO
1002 C.P.R. Bldg.

WINNIPEG
1205 McArthur Bldg.

VANCOUVER
B.C. Equipment Co.



BERTRAM MACHINE TOOLS

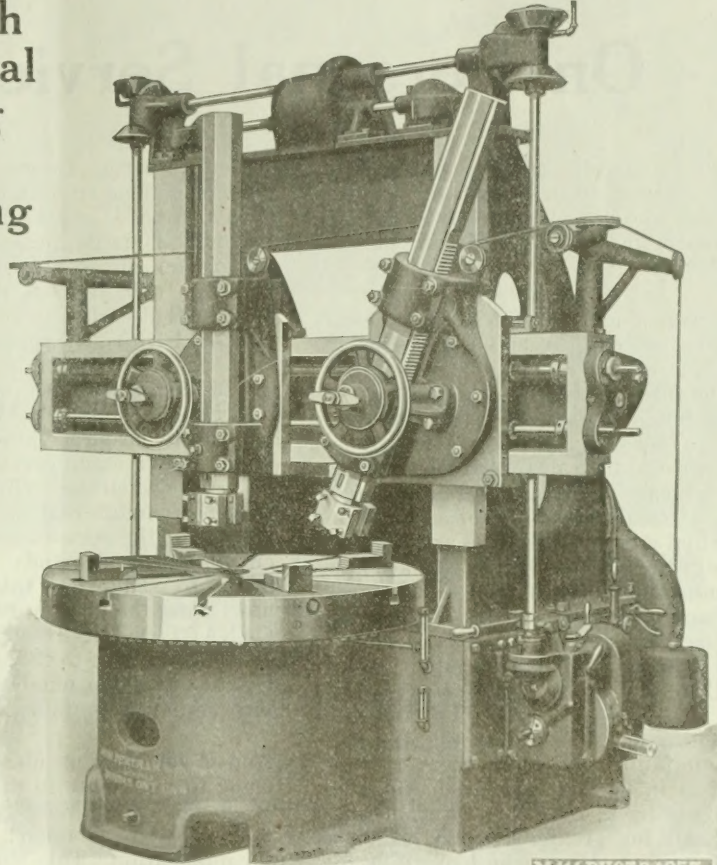
**42-inch
Vertical
Boring
and
Turning
Mill**

**Niles
Type**

Motor-
Driven
Through
Speed Box

Built in
sizes from
42-inch to
100-inch
Swing.

Drop us a
line for
Photo-
graphs
and full
particulars.



MILL PHOTO 1057

The John Bertram & Sons Company Limited

DUNDAS, ONTARIO, CANADA

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723 Drummond Bldg.

TORONTO
1002 C.P.R. Bldg.

VANCOUVER
609 Bank of Ottawa Bldg.

WINNIPEG
1205 McArthur Bldg.



If any advertisement interests you, tear it out now and place with letters to be answered.

The Publisher's Page

TORONTO

August 23, 1917

On Personal Service

WE cannot all wear uniforms and go overseas to fight with the gallant fellows who have voluntarily sacrificed so much for the sake of freedom and civilization.

We cannot all be soldiers, but we all can be servers. A crisis stares us in the face, clearly discernible in the mists of the future, receding day by day, it is true, but ever present—ever threatening. There is a need for individual response to the call for greater service. We who are not in khaki are apt to feel that after all the efforts of a single individual will not affect the world situation in the slightest. It is this attitude of mind in the individual that retards the progress of the whole. Let us first realize this and the seriousness of it and then go to it with a vigor and a will!

The force of example is strong, and just as our failure to render the very best that is in us has influenced others in hanging back, so will our response to the call for greater service result in speeding up others who look to us for guidance and advice.

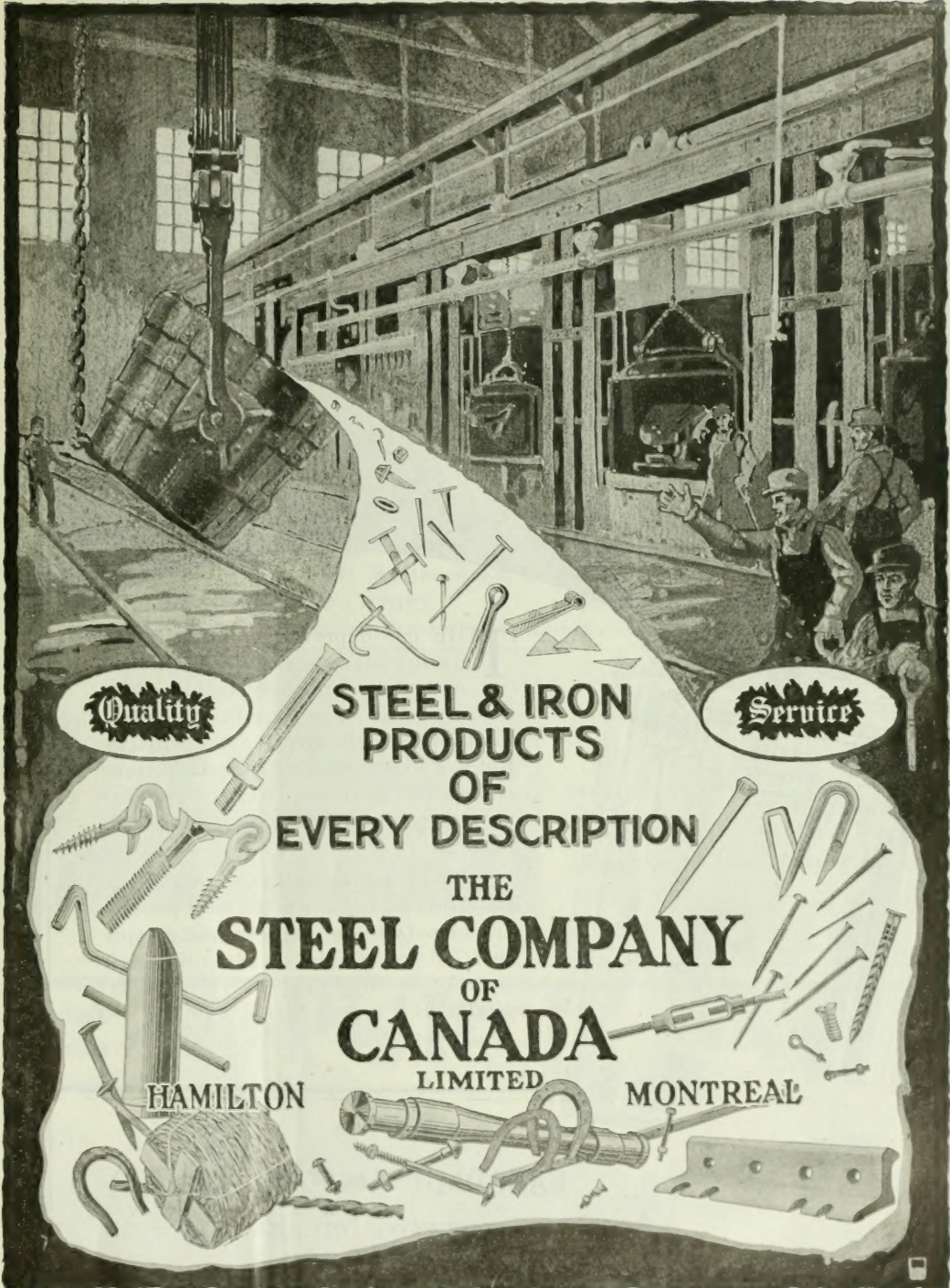
The effect of greater individual effort will be tremendous. Let us practise it and preach it, and practise it more than we preach it.

Greater efficiency on the part of the individual will not only help the allied cause, but it will help the individual. We plead for not only greater effort but

for effort better directed, and to this end recommend an even closer study of CANADIAN MACHINERY and other technical journals, because they make for greater efficiency and better workmanship, and more of it. We would suggest that each copy of CANADIAN MACHINERY be passed on to mechanics who are not already subscribers, first marking any special articles and items of interest. Do everything you can to encourage study on the part of the carefree and careless. The time may come when they will have occasion to be less indifferent as regards their efficiency; the seriousness of the present situation demands that they be made to shake off this indifference **now**. Pass the good word along. Make CANADIAN MACHINERY 100% efficient by bringing to the attention of the greatest possible number the valuable information it contains.

And if **you** have an idea which can be made to contribute to the general plan of efficiency and greater production, do not keep it to yourself! Send it to us for publication. This will multiply the value of your idea several thousand fold.

Let us forget petty selfishness when so great sacrifices are being made. Let us sink individual concerns and pool our interests for the common good. Let us really live and work with the fulness which brings satisfaction and which leaves no regrets or room for reproach. Let us serve, and serve with sacrifice.



Quality

Service

**STEEL & IRON
PRODUCTS**

**OF
EVERY DESCRIPTION**

**THE
STEEL COMPANY
OF
CANADA**

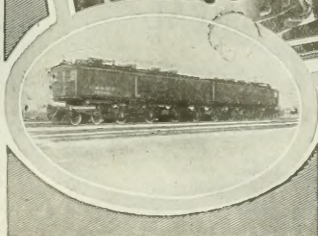
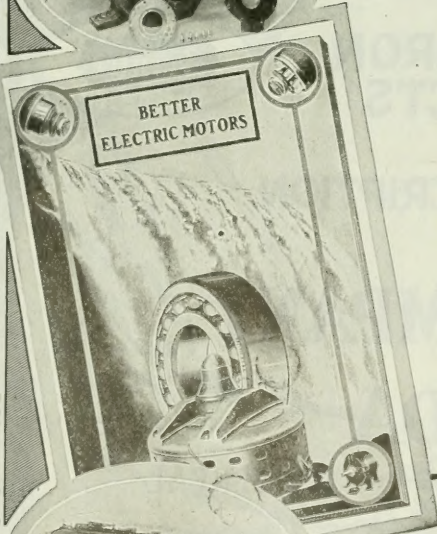
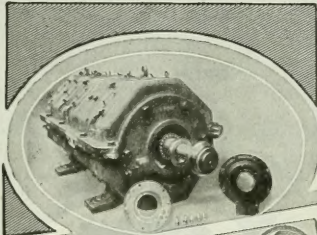
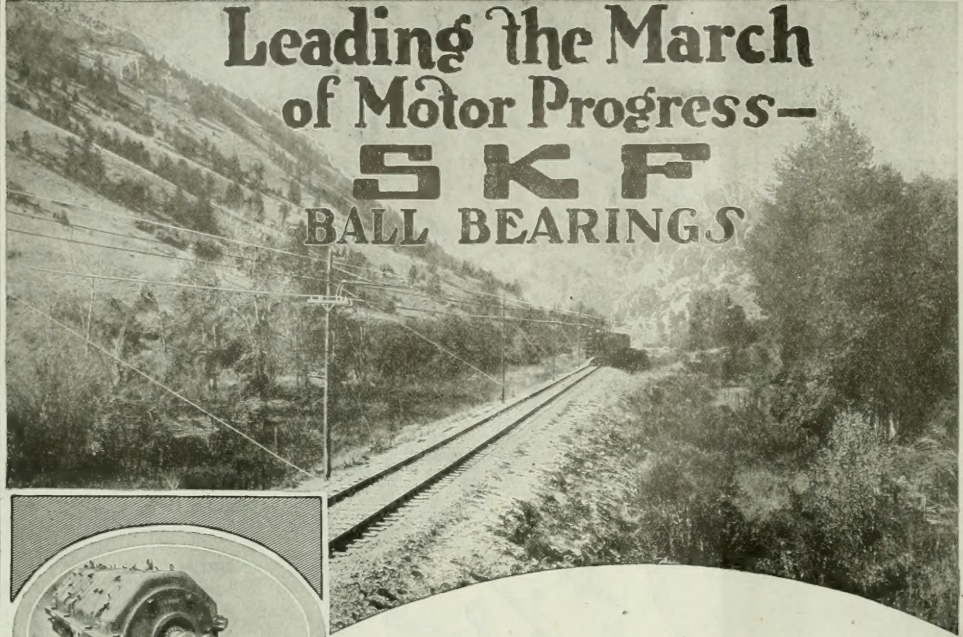
HAMILTON

LIMITED

MONTREAL

If any advertisement interests you, tear it out now and place with letters to be answered.

Leading the March of Motor Progress— **SKF** BALL BEARINGS



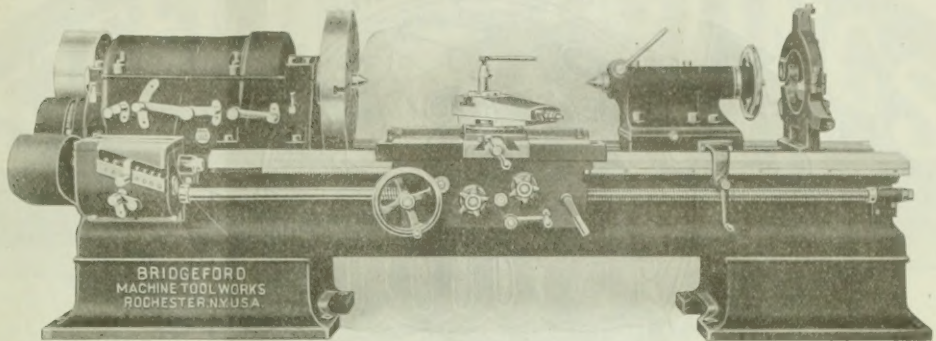
THE one improvement made in the mechanical design of electric motors is the use of the ball bearing. First it was scoffed at, as were the telegraph, the telephone, the airplane, the wireless. But now every progressive manufacturer realizes that motors are tremendously improved by the use of a high grade ball bearing.

SKF equipped motors are supplied as standard by a number of the most prominent manufacturers. Others will supply them if you simply specify SKF Ball Bearings. "BETTER ELECTRIC MOTORS," our new book, will tell you more. Send for it.

CANADIAN SKF CO., LIMITED

TORONTO, ONT., CANADA

WHICH WAY DO YOU LOOK AT IT?



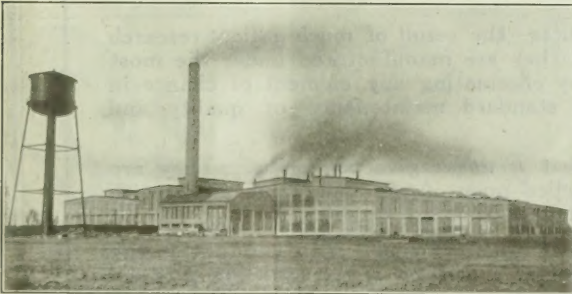
Do you want to speed up your production? Or, do you want to reduce present costs?
 Why not do both?
 Actual results with Bridgeford Lathes have proven that one-third to one-half the time can be saved in the lathe department.
 Your lathe department—perhaps?
 Anyway, you ought to be willing to be convinced—we can do it.
 Why not write—now, while you think of it?

BRIDGEFORD MACHINE TOOL WORKS

161 Winton Road, Rochester, N. Y.

HEAVY ENGINE LATHES

HEAVY AXLE LATHES



Works: LONGUEUIL, QUE.

CANADIAN MANUFACTURERS are you using Steel MADE IN CANADA?

We are manufacturing at our works at
 LONGUEUIL, QUE.
**STEEL HIGH SPEED AND CARBON
 TOOL STEELS, MISCELLANEOUS
 SHOP TOOLS, GAUGES, Etc.**

ARMSTRONG WHITWORTH of CANADA LIMITED

HEAD OFFICE: 298-300 St. James St., Montreal
 27 King William Street, HAMILTON
 Branches: Dominion Bank Bldg., TORONTO
 McArthur Bldg., WINNIPEG, MAN.

**Coal
 Coke
 Iron Ore**

Pig Iron

Victoria FOUNDRY & MALLEABLE

Made by The Canadian Furnace Co.
 Port Colborne, Ontario, Canada.

M.A. HANNA & Co.

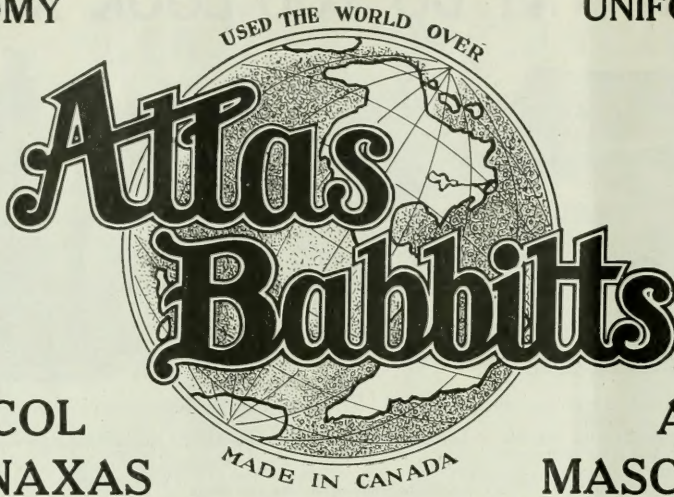
Sales Agents, CLEVELAND

Canadian Office:
 703 C.P.R. Bldg., Toronto

If any advertisement interests you, tear it out now and place with letters to be answered.

ECONOMY

UNIFORMITY



AMACOL

ATLAS

TENAXAS

MASCOT

TIN TOUGHENED



W. E. W. BABBITT

HAVE A WORLD-WIDE REPUTATION FOR UNIFORMITY

A TLAS Alloys are scientific products—the result of much patient research and long years of experience. They are manufactured under the most modern scientific conditions, thereby eliminating any element of chance in their composition and ensuring a standard maintenance of quality and uniformity.

A TLAS Brands are not alloys that *sometimes* give *satisfaction*. They are alloys that can be implicitly relied upon *always*. They are alloys with our *prestige* and *reputation* always behind them.

DO not let prejudice stand between *you* and *profit*. You can obtain the *maximum efficiency* from your plant at a *minimum of cost* by using ATLAS BABBITTS.

THERE IS AN ATLAS BRAND TO MEET ANY NEED

NO SHOCK TOO SEVERE

NO WEIGHT TOO HEAVY

NO SPEED TOO GREAT

Atlas Metal and Alloys Company of Canada, Limited

MONTREAL

Sales Agents:

The Canadian B. K. Morton Co., Limited

MONTREAL

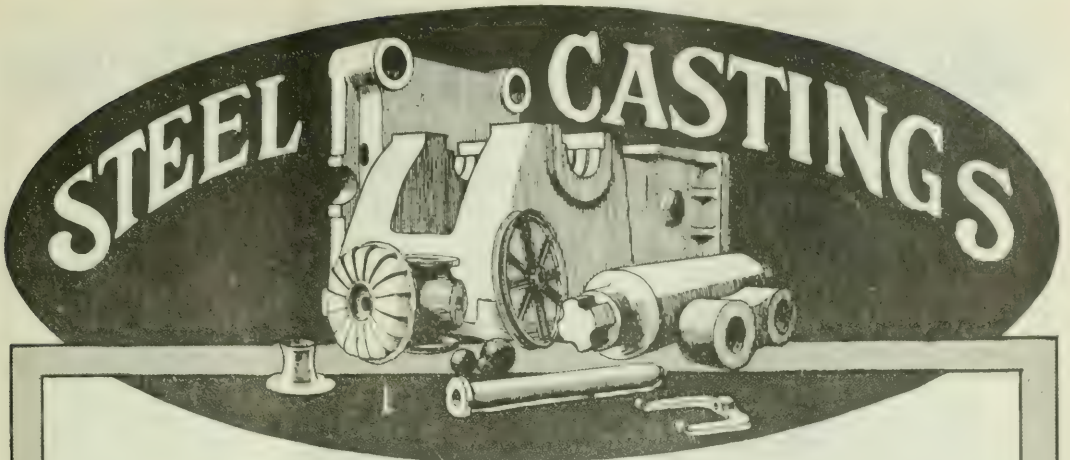
49 Common Street

Phone M. 3206

TORONTO

86 Richmond Street East

Phones M. 1472-1473



Manganese, Vanadium, Titanium, Chrome, Nickel Castings made in sizes from 1 lb. to 50 tons. Made to specifications and true to pattern. You can thoroughly depend on our products.

CANADIAN STEEL FOUNDRIES, Limited

MONTREAL

WELLAND



We guarantee shipment
within 24 hours of
receipt of order

"Extra"
"Special"
"High
Speed"

Tool Steels

SISCO

Made in Sweden from selected Dannemora Ore

We also carry in stock Solid and Hollow Drill Steel, Die Blocks, "SISCO" Welding Wire, Drill Rod and Swedish Iron.

Swedish Steel & Importing Co., Ltd.
MONTREAL, QUE.

The Life of a Thread Miller

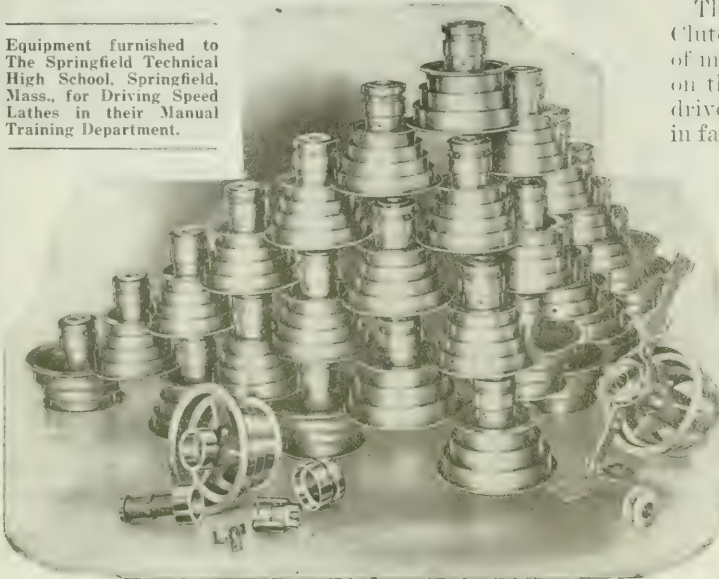
Depends not upon the amount of work it does, but the ease and thoroughness with which the work is done. These Thread Millers are noted for these qualities. Its quality of work is unrivalled. Our Service Department will give you all the particulars. *Write us!*

THE WILLIAMS MACHINERY CO., Limited
64-66 Front Street West
Toronto
Ontario

THE JOHNSON FRICTION CLUTCH

Is particularly adapted for use in Manual Training Department of Technical High Schools or Universities and so easily lends itself for use with cone pulleys that it makes an ideal drive for speed lathes.

Equipment furnished to The Springfield Technical High School, Springfield, Mass., for Driving Speed Lathes in their Manual Training Department.



The Johnson Friction Clutch can be used as a part of machinery of all kinds, or on the overhead shafting to drive such machinery with, in factories or in the Manual Training Departments of Technical High Schools or Universities. Write for list of Schools and Factories we have equipped with our Direct Line Shaft Drive. It may lead you to save considerable in power.

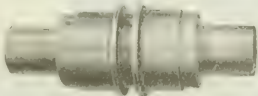
Ask for Our Booklet Entitled "Clutches as Applied in Machine Building."

The Modern Method

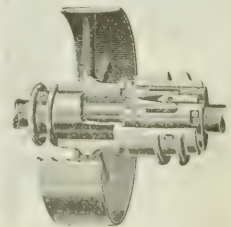
of running groups of machines, dispensing with counter-shafts, overhead belts, drive pulleys, etc. This method has been adopted by the following TECHNICAL HIGH SCHOOLS:
CLEVELAND ROCKWELL STREET TECHNICAL HIGH SCHOOL, CLEVELAND, OHIO.
THE STUYVESANT HIGH SCHOOL, NEW YORK CITY
THE COLLEGE OF THE CITY OF NEW YORK, NEW YORK CITY.
THE SPRINGFIELD TECHNICAL HIGH SCHOOL, SPRINGFIELD, MASS.
THE FAIRHAVEN HIGH SCHOOL, FAIRHAVEN, MASS.
THE MINNEAPOLIS SCHOOLS (Manual Training Dept.), MINNEAPOLIS, MINN.
THE YONKERS HIGH SCHOOL, YONKERS, N.Y.
THE CENTRAL HIGH SCHOOL, GRAND RAPIDS, MICH.
THE BUSHWICK HIGH SCHOOL, BROOKLYN, N.Y.

These CLUTCHES are also being used in the following UNIVERSAL SCHOOLS:
THE UNIVERSITY OF PENNSYLVANIA, PHILADELPHIA, PA.
THE MECHANICS ARTS HIGH SCHOOL, BOSTON, MASS.
THE UNIVERSITY OF TEXAS, AUSTIN, TEXAS.
THE UNIVERSITY OF TENNESSEE, KNOXVILLE, TENNESSEE.
THE UNIVERSITY OF MINNESOTA, MINNEAPOLIS, MINN.
MONTANA AGRICULTURAL MECHANICAL COLLEGE, BOZEMAN, MONTANA.
NEW HAMPSHIRE COLLEGE, DURHAM, N.H.
WEST VIRGINIA UNIVERSITY, MORGANTOWN, W. VA.

Our largest stock of clutches with cone pulleys is in the Dundas Iron Works, Dundas, Ontario, Canada.



The Advantages of the Johnson Clutch are found in its Great Power, Compactness, Light Weight, Smooth Surface and Simple Adjustment.

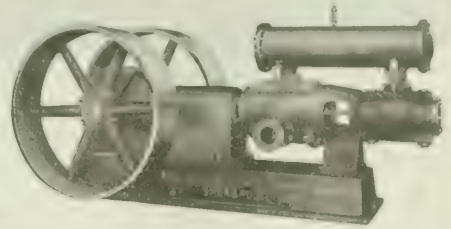
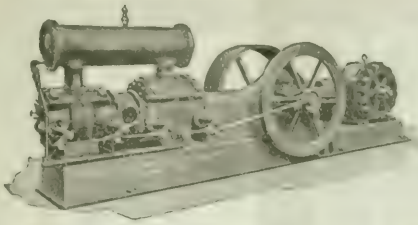


Let it figure on your requirements. Johnson Clutches will save you money.

Send for our YELLOW DATA SHEETS.

Carlyle Johnson Machine Co., 201 E. 4th St., Montreal, The Canadian Friction-Clutch Co., Ltd., Toronto, England - The Efadem Co., Ltd., 150 Gt. Portland St., London, W., Sole Agents for British Isles.
Australia - E. J. Wood, Pty., Hardware, Charlton, 281 Elizabeth St., Melbourne, Victoria.

THE CARLYLE JOHNSON MACHINE CO. MANCHESTER CONN.



Compressor Problems Vanish

In a comparative test the quality of a machine will then be judged fairly. We invite your comparison. Our confidence that these machines excel is not only based on our knowledge

of their construction, but also because of the manner in which they appeal to our customers. We know they are built right. Our patrons have proved it. Let us get together.

Jenckes Machine

Works: ST. CATHARINES, ONT.
Works: SHERBROOKE, QUE.



Company, Limited

Sales Offices: 26 C.P.R. Bldg., Toronto, Ont.
1-11 King Bldg., Montreal, West, Quebec Ave., St.
Catharines.

DOUBLE MUSHET

High Speed Steel

Carbon Steel

Gauge Steel

Alloy Steels

SOLE MAKERS
Samuel Osborn & Co. Ltd.
SHEFFIELD

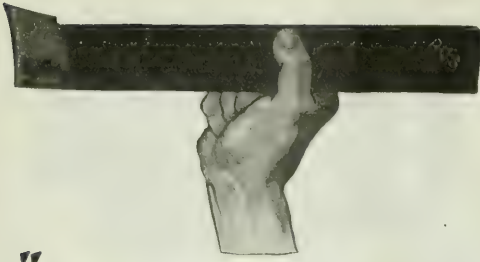


*Twist Drills and
Reamers, Milling
Cutters and Slit-
ting Saws*



Sam'l Osborn (Canada)
Limited

Head Office and Works: Montreal, P.Q.
Branch Office: Toronto, Ontario



"Red Cut Superior"

HIGH SPEED STEEL

YOU have thought of many qualities you would like to have in High Speed Steel Tools—such as cutting edges with long life, freedom from brittleness, great reserve strength and toughness to resist shocks and strains, tools that would not require special heat treatment, tools that would take deep roughing cuts or fine smooth finishing cuts, and in addition, could be worked at higher speeds than you ever dreamed of. All these virtues and many more are contained in "Red Cut Superior", a First Quality High Speed Steel. Furnished in Annealed Bar Stock, Discs, and Treated Tool Holder Bits.

Are your tools made of **Red Cut**?

Send for folder

VANADIUM - ALLOYS STEEL COMPANY

Pittsburgh, Pa.

Works at Latrobe, Pa.

STEEL

FOR
SHRAPNEL
SHELLS
AND SHELL BLANKS

We are the only company in Canada producing steel ingots by the "HARMET" Liquid Process, a process that makes these ingots vastly superior to the ordinary kind, improving the physical properties and reducing the 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.

Nova Scotia Steel and Coal Company Limited

Head Office: NEW GLASGOW, N.S.

Western Sales Office:

Room 14, Windsor Hotel, MONTREAL

ESTABLISHED 1870

W^{M.} ATKINS & C^{O.}, L^{TD.}

TRADE MARK



Reliance Steel Works
SHEFFIELD, ENG.

TRADE MARK



TRADE MARK

of the Famous

“WACO”

Brand

High Speed Steel and Twist Drills

“DOUBLE WACO” Quality

Specially Adapted for all kinds of
MUNITION WORK

“Turtle” Brand
High Class Tool Steel, Files, etc.
of all descriptions.

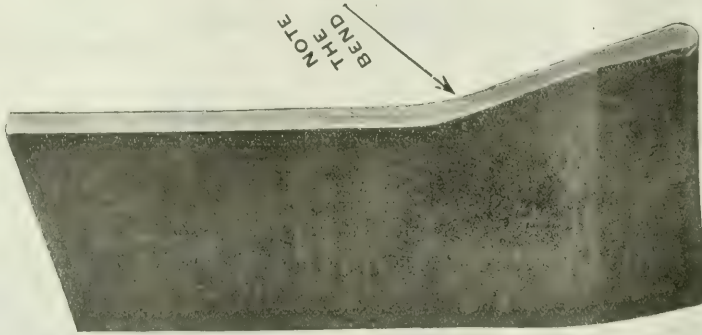
*For particulars apply to our
Sole Representatives for Canada*

GEO. A. MARSHALL & CO.

70 Lombard Street Toronto, Ontario



Cutting Off Tool



URANIUM High Speed Steel

NOTE THE BEND

This tool bent in severe service — the two companion tools which were not Uranium broke. The tool shown above did three times as much work as the regular tool.

“Uranium Tools Stand Up On The Job”

SEE YOUR TOOL STEEL MAN OR WRITE US

Standard Alloys Company

FORBES AND MEYRAN AVENUES

PITTSBURGH

--

--

--

PENNA.



STELLITE

Canadian National Exhibition

*“Meet Me at Machinery Hall
Opposite Stellite Booth”*

The greatest annual fall fair in the world has this year an added attraction in a unique display of “Stellite,” under actual working conditions, as well as a display of the various uses to which it can be put, its adaptability to welding by the oxy-acetylene torch and by brazing.

Be sure and look us up

DELORO SMELTING & REFINING CO., LIMITED

Head Office

DELORO, ONTARIO

TORONTO
200 King Street West

MONTREAL
315 Craig Street West

IF YOU WANT THE

**BEST
BASE PLUGS,
BUY
BANFIELD'S**

Have in stock for immediate shipment either threaded or bevel Plugs for 4.5", 5" and 6" High Explosive Shells. These are shipped subject to acceptance of Government inspector at your plant.

Capacity, 3,000 per day. Write for prices.

EDWIN J. BANFIELD
STAIR BLDG. ∴ TORONTO, ONT.

Manufacturer of Plug Milling Machines for above size shells. Prices and deliveries on application.



**High-Speed
STEEL**

The tools that are made with "Wolfram" High Speed Steel are warranted to be super-keen at the edge and super-strong at the neck.

WOLFRAM

Embodies a true and permanent alloy of Tungsten, Chrome, Vanadium and Iron. No better High Speed Steel in the world.

**VULCAN CRUCIBLE
STEEL COMPANY**

ESTABLISHED 1900

Alliquippa Pa., U.S.A.

Represented in Canada by Messrs. Norton, Callard & Company, Montreal.



**ELECTRITE-
URANIUM
High-Speed Steel**

Will amaze you in its ability to remove metal

The introduction of this rare element—"URANIUM"—into the mixture of our already superb cutting product, has supplied the final perfection of the qualities of toughness and durability which has been the hitherto impossible goal of metallurgical hopes. Electric Furnaces, Automatically regulated, produce inevitably similar results at every melt.

We are ready to assist your inquiry in every way possible.

Write

Latrobe Electric Steel Company
Latrobe, Pennsylvania





If your work can be best done with
Non-Changing Tool Steel

try

Colonial No. 6
Oil Hardening Tool Steel

This test piece shown was 6 in. long and $1\frac{3}{4}$ in. wide; $\frac{1}{8}$ in. thick on left side; $\frac{1}{4}$ in. thick on right, and $\frac{1}{8}$ in. thick on top.

The average **change in hardening**, taking all dimensions, was .0015.

Buy **Colonial No. 6** for difficult hardening jobs.

Stock carried in New York and Pittsburgh.

Colonial Steel Co.

PITTSBURGH

New York
Detroit

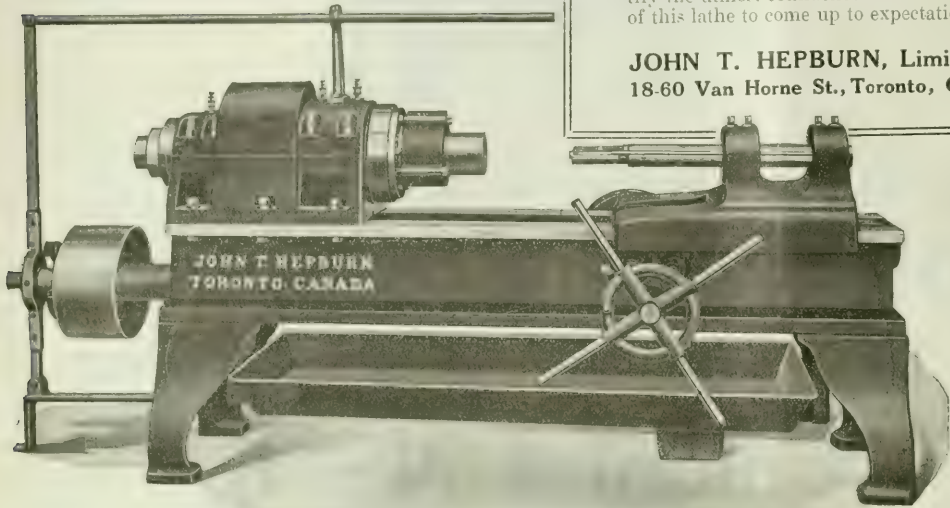
Boston
St. Louis

Chicago
Denver

Are You Getting Results?

Results are dependent upon two things: speed and quality. If you get speed without quality, yours is a losing proposition. This Hepburn 6" boring lathe gives both speed and quality. The results obtained by Canadian users justify the utmost confidence in the ability of this lathe to come up to expectations.

JOHN T. HEPBURN, Limited
18-60 Van Horne St., Toronto, Ont.



WHITCOMB-BLAISDELL

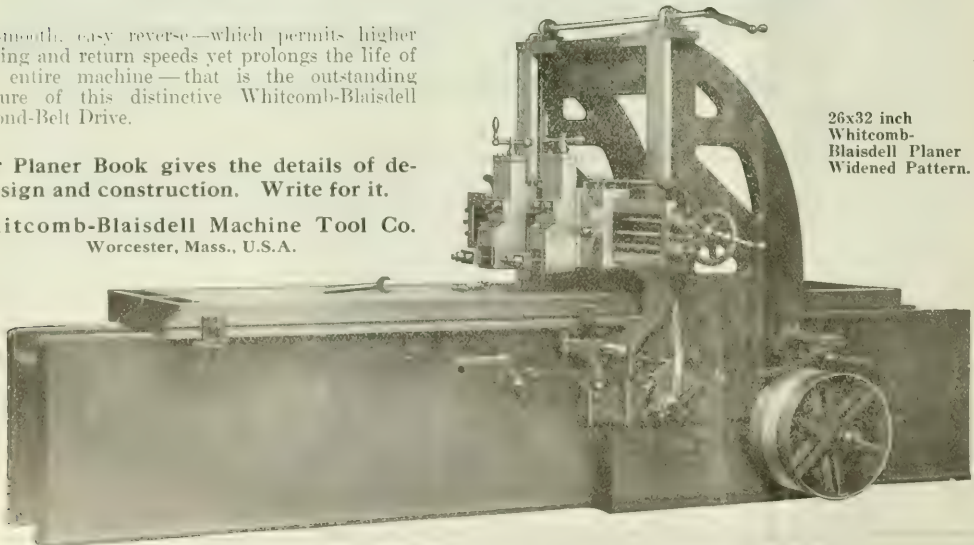
The Planer With the Second-Belt Drive

A smooth, easy reverse—which permits higher cutting and return speeds yet prolongs the life of the entire machine—that is the outstanding feature of this distinctive Whitcomb-Blaisdell Second-Belt Drive.

Our Planer Book gives the details of design and construction. Write for it.

Whitcomb-Blaisdell Machine Tool Co.
Worcester, Mass., U.S.A.

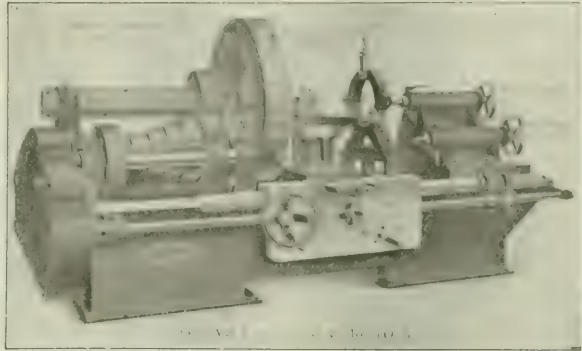
26x32 inch
Whitcomb-
Blaisdell Planer
Widened Pattern.



One Ship-building Plant

wrote to six different Lathe-Builders

and bought McCabe's "2-in-1" Double-spindle Lathe—on a 30-ft. bed—because it was "different" and built especially for such a wide range of work.



McCABE'S "2-in-1" Double-Spindle Lathe—26-48 inch Swing As a 48 inch Triple-Geared Lathe

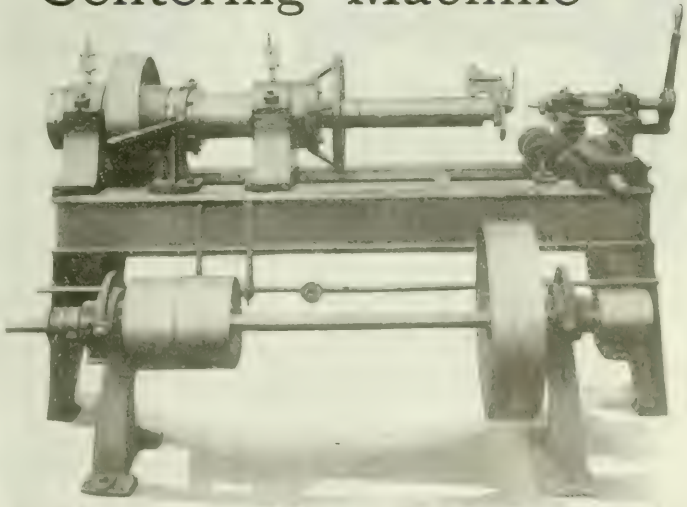
Write for McCABE'S "2-in-1" Double-Spindle Lathe—26-48 inch Swing As a 48 inch Triple-Geared Lathe—on a 30-ft. bed—because it was "different" and built especially for such a wide range of work.

J. J. McCABE, 149 BROADWAY, NEW YORK

Improved Centering Machine

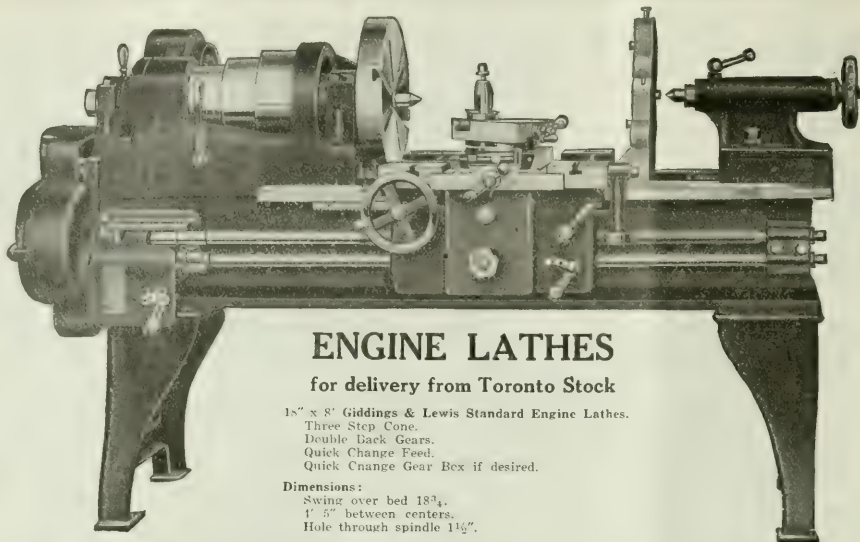
**Mr. Shell
Manufacturer:**

The importance of centering is obvious. This tool is giving real satisfaction every day and stays on the job. Write for price and description. Delivery, ship 10 days after order. Shipping weight 2040 pounds.



VICTORIA FOUNDRY COMPANY, LIMITED
OTTAWA, ONTARIO

If any advertisement interests you—cut it out and send plain copy with letters to the publisher.



ENGINE LATHES

for delivery from Toronto Stock

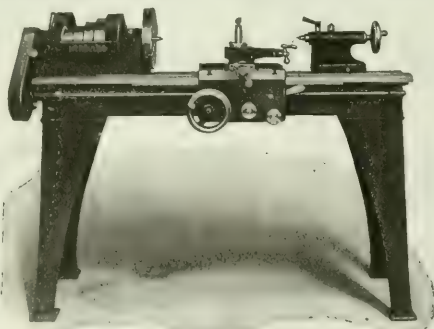
18" x 8' Giddings & Lewis Standard Engine Lathes.
 Three Step Cone.
 Double Back Gears.
 Quick Change Feed.
 Quick Change Gear Box if desired.

Dimensions:
 Swing over bed 18 3/4".
 1' 5" between centers.
 Hole through spindle 1 3/8".

These are strongly built, accurate machines. Will give equal satisfaction in tool-room or shop. The following extras can be furnished if desired: Taper, Relieving or Draw-in attachment, Waving attachment, Hexagon turret on carriage, Pan pump and piping.

Write for full specifications and prices.

Garlock-Walker Machinery Co., Ltd., 32 FRONT ST. WEST, Telephone MAIN 5346 **Toronto**



LATHES

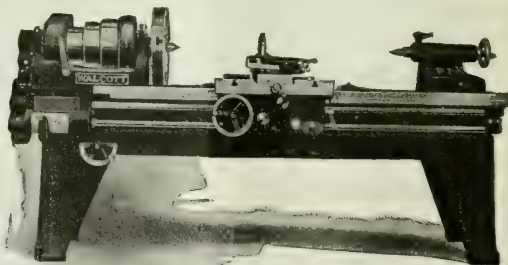
12", 16", 18" and 21" swing

Strictly modern in design, rigidity and accuracy guaranteed.

Himoff Machine Company

45 Mills Street

Astoria, City of New York, N.Y.



THE WALCOTT LATHE

is backed by lathe-building experience extending over 35 years

These are features of Walcott Lathes: drop-forged gears in apron; all-steel gears in gear-box; large ways on bed, all gears completely enclosed. Parts are interchangeable. Rigid headstock and tailstock.

You'll get the full story in our printed matter. Send for it surely if you are about to buy a lathe.

WALCOTT LATHE COMPANY

Successors to

Walcott & Wood Machine Tool Co., Calhoun St., Jackson, Michigan

Do It Automatically!

With labor so scarce and expensive, can you afford to jog along with the old "one machine to a man" method when one man can do the work of six with Potter & Johnston Automatics?

By practically eliminating the labor problem, P. & J. Automatics reduce production costs amazingly. One attendant can readily operate from two to six machines.

SPECIFICATIONS

Geared head, having three automatic changes of spindle speeds.
Geared feed.
Auxiliary reaming and threading feed.
Cross slide.
Automatic back facer bar through spindle.
16-inch convertible two and three-jaw scroll chuck.
Spindle $5\frac{3}{4}$ inches diameter, hole $3\frac{1}{2}$ inches diameter.

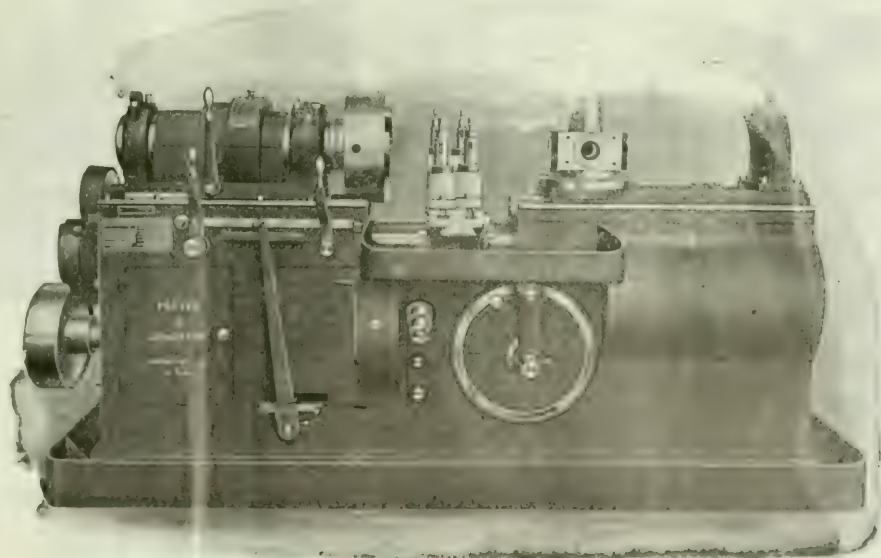
And production! A study of your problems will result in some surprising information for you. We have shown many firms the way to greater and more accurate production. Let us study your blue-prints.

If you machine iron, bronze or steel castings or forgings; if you manufacture gear blanks, bushings, etc., let us tell you how P. & J. automatics will increase your production.

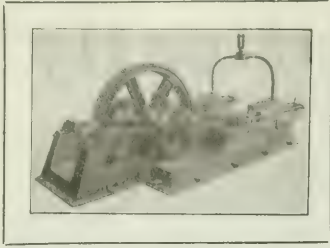
Canadian Offices Potter & Johnston Machine Co., Pawtucket, R.I.

Roelofson Machine & Tool Co., Ltd.

Head Office: 1501 Royal Bank Building, Toronto, Canada
Works and Warehouse: Galt, Ont., Canada



6-A Potter & Johnston Automatic Chucking and Turning Machine



ELMES

18" Stroke Hydraulic Pump

for maximum pressures and capacities, for 250 horse-power motor—a pump designed to meet the demand for a high-pressure outfit of large capacity, and one able to withstand the severe usage of present-day practice.

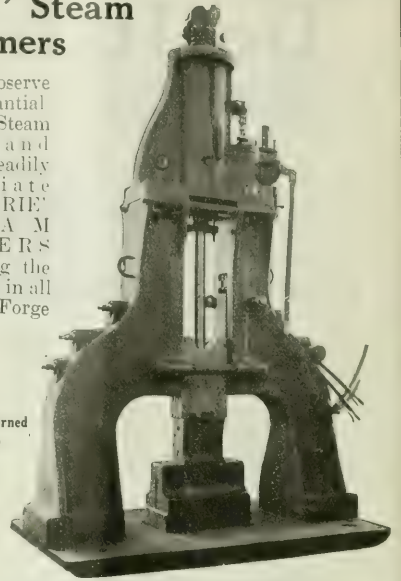
Other designs for all pressures and capacities.

Charles F. Elmes Engineering Works

217 No. Morgan Street CHICAGO, ILL.

“Erie” Steam Hammers

Closely observe this substantial well built Steam Hammer and you will readily appreciate why “ERIE” STEAM HAMMERS are getting the preference in all modern Forge Shops.



They have earned their enviable reputation.

ERIE FOUNDRY COMPANY
ERIE, PA. U. S. A.

Your Riveting?

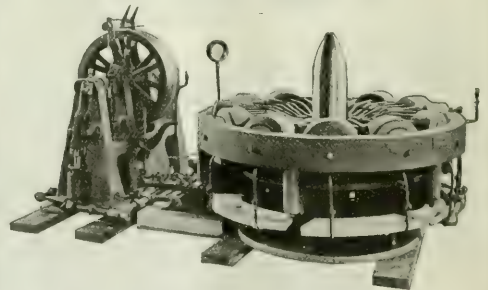


How is it done? Are you getting the necessary speed? Is the quality of the highest character? How much is it costing you?

The Grant Rivet Machine has established the records of one clean, perfectly finished rivet per second. Is that speedy enough, or is it too speedy? This is the fastest any similar machine will work and if too speedy it could be worked in conjunction with some other work. Our catalogue is worth writing for. There is one for you.

THE GRANT

Mfg. & Machine Co.
Holland Ave.
Bridgeport, Conn.



The New “West” Banding Press

For 9.2" and 8" shells

12 Cylinders; Ample Power; Ample Strength; Reasonable Price.

NO ACCUMULATOR REQUIRED.

The West Tire Setter Co.

255 Mill Street, Rochester, N.Y.



A time saver Can you beat it?

HAVE you noticed the Consolidated Clamp Connection on all Consolidated Presses, grips like a vise and stays put, one of the bull-dog kind, which, when properly tightened, will not break away, or slip?

If you break it we will furnish a new one free of charge.

Consolidated Press Company

HASTINGS

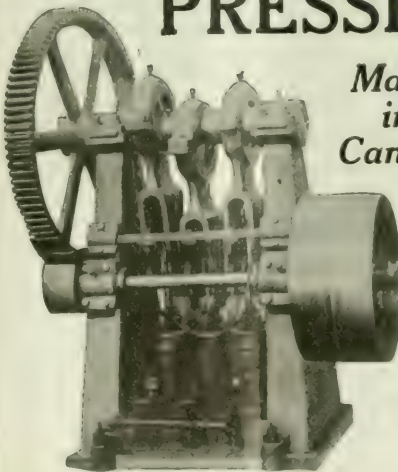
LARGEST EXCLUSIVE MANUFACTURERS OF POWER PRESSES IN U.S.A.

MICHIGAN

Canadian Representatives: A. R. WILLIAMS MACHINERY CO., Limited, Toronto, St. John, Winnipeg, Vancouver

PRESSES

Made
in
Canada



Hydraulic Presses, Pumps and Accumulators for all purposes

WRITE FOR PRICES AND DELIVERIES

WILLIAM R. PERRIN, Limited
TORONTO, CANADA

Triple Purpose "METALWOOD" COMBINATION

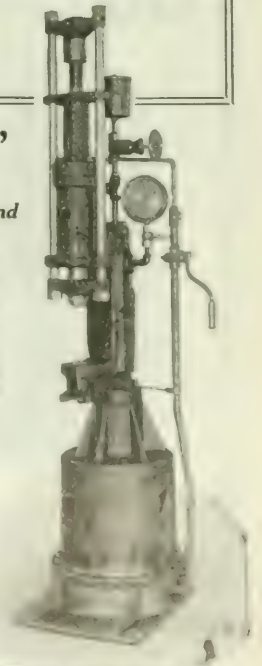
*Forcing, Broaching and
Straightening Press.*

Its value is in the many uses to which it is adaptable. Auxiliary tables and fixtures add greatly to its usefulness. It is not "encumbered" with a single excess part. Built for production.

Metalwood Mfg. Co.

Leib & Wight Sts.,
DETROIT, MICH.
U.S.A.

For Great Britain and
Continental address: Messrs
E. Mather & Co., Corporation
Homes, 1, Lincoln St.,
London, E.C., England.



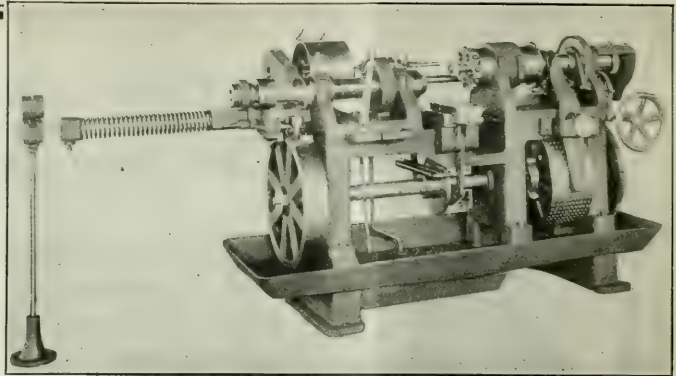
The Chicago Automatic Screw Machine

TEN YEARS OF EXTENSIVE MANUFACTURE OF ONE PRODUCT — AUTOMATICS — STAND BEHIND EVERY MACHINE.

No complicated mechanism or a system of cams that are difficult to determine and arrange on this machine.

The rigidity of the machine has not been sacrificed for the flexible features which are embodied in the Chicago Automatic. Alignment is correct and there are no parts where excessive wear takes place—therefore, accurate production is assured during the long life of the machine.

Spindle speeds suitable to different sizes and kinds of stock within the capacity of the machine are obtained by changing two gears on the spindle head.



In less than six weeks we can place Chicagos in your plant ready for production.

They must satisfy you before we consider them sold. Write us about all the features now.

THE JOHN MACNAB MACHINERY COMPANY

NEW YORK CITY, U.S.A.

European Representatives: John Macnab, Hyde, England

OBTAIN THE BEST RESULTS

From Cutters and Tools Kept Sharp on GARVIN No. 3 UNIVERSAL CUTTER AND SURFACE GRINDERS

Simple Light Running Accurate

The spindle is hardened and ground and supported out close to the wheel by an extended bearing, and carefully protected from emery.

The knee and the yoke carried on the knee both have a large range of adjustment. On the knee yoke or carriage is mounted the swiveling table, which has a quick, sensitive movement by rack and pinion operated from end or side.

On this table is mounted the index head, and all the attachments are held in this head.

An outfit of emery wheels, mandrels, bushings, wrenches, etc., is supplied with the machine.

Machine is designed to keep its original factory accuracy.

CAPACITY: CUTTERS, 14 in. x 6 in.; SURFACES, 9½ in. x 6 in.

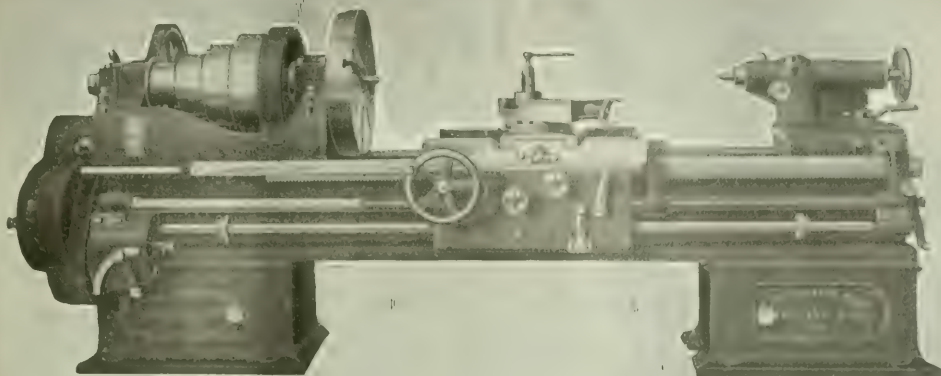
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or WRITE US DIRECT

IMMEDIATE DELIVERIES

Send for Complete Catalog

MANUFACTURED BY

THE GARVIN MACHINE COMPANY
Spring and Varick Streets (Visitors Welcome) 50 Years New York City



Hamilton Lathes

*For 25 Years
Makers of
Fine Machine Tools.*



*The "Hamilton" Line
has a Reputation
to Sustain.*

THERE are two phases of production that require expert attention; those of *quality* and *quantity*. We have made a study of them for your benefit. The result is that we are able to offer you machine tools that give the highest efficiency and will still keep down the cost of production.

Illustrated here is one of our lathes. A close study of your part will partly reveal the care we have taken to give you a machine that is fitted to the needs of the day — after production.

The "Hamilton Line" of machine tools is very complete and users are never tired of telling others of their features. A letter will command our immediate attention.

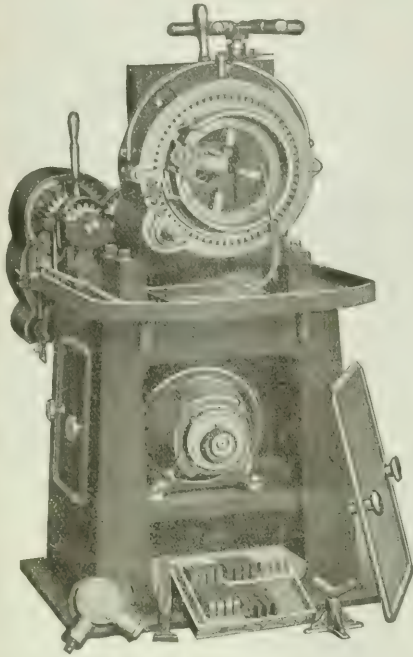
WRITE US TO-DAY.

The Hamilton Machine Tool Co.
HAMILTON

Sole Agents for Ontario:

OHIO, U.S.A.

H. W. PETRIE, LIMITED, TORONTO, ONT.



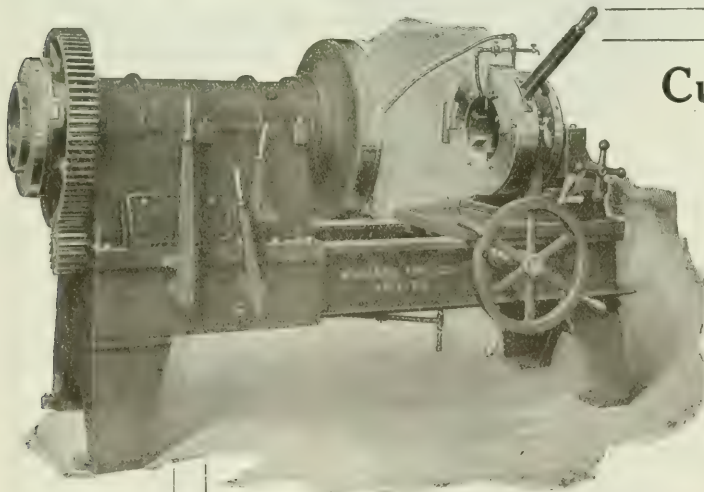
Take It To The Job

ONE man with a Forbes can do more than six men using the old stock and die method of cutting. The Forbes is easily portable and can be carried right to the job. Saves time and labor by eliminating the carrying to and fro of heavy pieces of pipe. Is operated by a self-contained motor, or can be easily operated by hand where no power is available. There are no belts, no countershafts—it is a compact and sturdy machine built to do all kinds of pipe-cutting and threading and do it well.

It has many features that will interest you. Our catalog explains them all. Write for your copy to-day.

The Curtis & Curtis Company

115 Garden Street, Bridgeport, Conn.



Cutting-off and Threading

By the decree of expert judges Williams Cutting-off Machine has been declared the most efficient.

We have made this claim all along and this judgment only verifies it.

Made in 11 sizes and each size has a range of 8 to 10 consecutive sizes between $\frac{1}{4}$ " and 18" diameter.

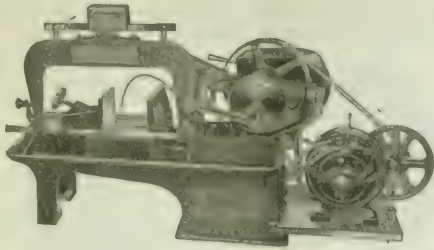
Write us about this. They will save you money, time, and increase the quality of your product.

Williams Tool Company

Erie, Penn., U.S.A.

Canadian Agents:
The A. R. Williams Machinery
Co., Ltd., Toronto, Canada

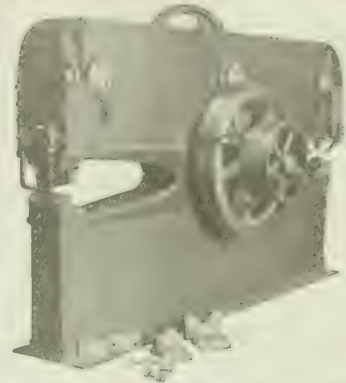
European Agents:
Universal Machinery Corp.
London, England



Your Cutting

How do you do it? Are your methods giving satisfaction? Are you getting the maximum production? With a Racine to compare results with you will get a better idea of the results you should be getting or could get. Metal cutting has been our study. It is the purpose for which our machines are built. We stand ready to co-operate with you in your cutting problems. Write us for information.

Racine Tool & Machine Co.
15 Melbourne Ave., Racine, Wis., U.S.A.



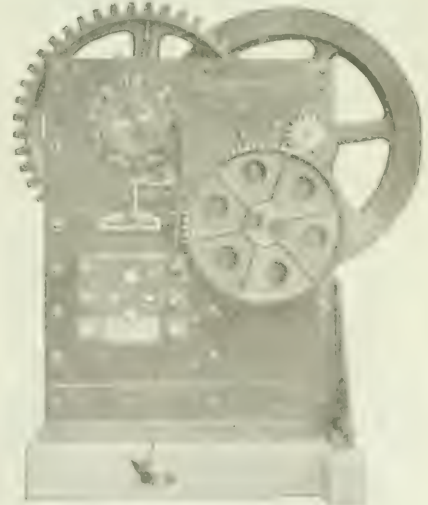
Canadian "Armor Plate" Double End Punch and Shear.

"CANADIAN" Armor Plate

Punches, shears and bar cutters are powerful, dependable machines—7½ times as strong as cast iron machines of equal capacity and less than one-half as heavy. They are built to last.

Ask us to send you a copy of Catalog P S-16.

Canadian Blower & Forge Co., Ltd.
KITCHENER, ONTARIO



Canadian "Armor Plate" Power Bar Cutter.

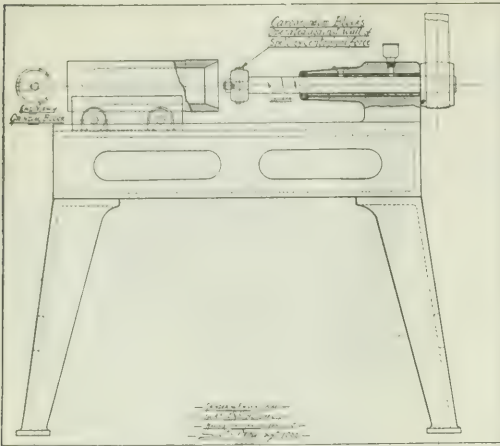
DOUBLE SAVINGS

in cutting on PEERLESS HIGH SPEED METAL SAWS: they save both Time and Material.

PEERLESS MACHINE CO. 1607 Racine St. RACINE, WIS., U.S.A.



For information on our various types of saws and other machinery, write to the nearest office of the Racine Tool & Machine Co., Racine, Wis., U.S.A.



Smooth Bores

We have designed for our own use a simple and inexpensive grinder to give the final touch to the bore of our shells.

It does the work, and we will have some of these machines on the market shortly.

Write us for our proposition.

**Marsh & Henthorn
Limited**

BELLEVILLE, ONTARIO

Assuming that you want a grinder that is better than the average—

A grinder with massive table, micrometer adjustments, very long knee and gibs, and extra heavy head and tailstock—it will pay you to investigate the

Standard No. 6 Universal Grinding Machine

In addition, you'll find that the headstock is fitted with large bearing for chuck spindle and with special bronze bearings of navy specifications, spindle is tapered and tapered, bored to take wheel arbor, and bearings are 1 in. in diam. and 2 3/4 in. long, and an exceptionally simple and sturdy countershaft with self-lubricating bearings.

Start the investigation by sending for the full details—to-day.

Simmons Machine Co., Inc.

1001 Singer Bldg., New York City
981 Broadway, Albany, N.Y.



Stow Shell Grinders Increase Production



**Suspended
Pedestal
Mounted
on Truck**

**Any Size
Any Current**

**Immediate
Shipment**

Stow Manufacturing Co.

Binghamton, New York, U.S.A.

Oldest Portable Tool Manufacturers in America

Grinding Wheel Dressers



We are specialists in Grinding Wheel Dressers and can recommend the best types for any particular needs.

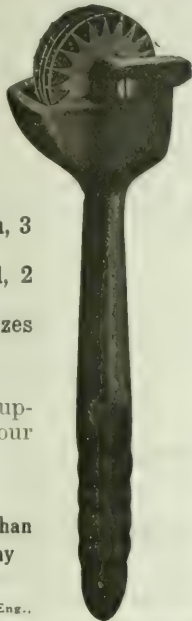
Our Dressers are:

Diamo-Carbo
Desmond Huntington, 3 sizes

Sherman Corrugated, 2 sizes

Norton Zig-Zag, 2 sizes
Magazine
Diamonds

We can promptly supply your needs from our stock.



The
Canadian Desmond-Stephan
Manufacturing Company
HAMILTON, ONTARIO

Alfred Herbert, Ltd., Coventry, Eng.,
Agent for Great Britain.

For Rapid Production and Accurate Work

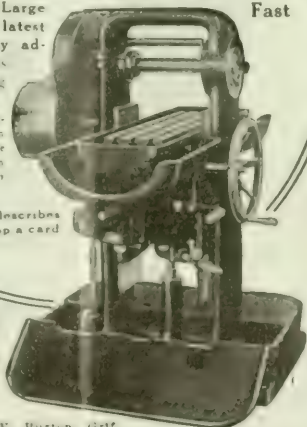
USE THE
"BRIGGS"

The Briggs Miller handles work no other machine of its size can touch. It is a manufacturing machine. On account of its rigid construction it will produce accurate work when running at a high rate of speed and feed.

The Base Tank and Large Gear Pump is the latest addition to its many advantages. Tank holds 20 gallons of cutting lubricant.

Pump never requires priming and will deliver ten gallons per minute to the cutters, keeping them cool when run at very high speed.

Our booklet describes fully. Drop a card for it.



Gooley & Edlund
Inc.
Cortland, N.Y., U.S.A.

Foreign Agents: Alfred Herbert, Ltd., Birmingham, England, Italy, New Zealand, Machinery Company of Russia, Scandinavia, C. W. Burton, Gift City & Co., London, Manchester and Glasgow, Baramidaran, Motiver, Gazou & Cia, San Sebastian, Spain.

Universal Gear Hobber

The machine which completes our lines to cut all types of small gears except internal, within 10" dia 8 Pitch.

The Bilton Gear Hobber will cut spur-pinion gears, worm gears, also various special shapes of teeth. It can cut a spiral gear on end of a shaft 1 1/2" diam. 24" long.

SPECIFICATIONS

Capacity Gears: 10 Diametral Pitch
10 in. Outside Diameter
10 in. Width of Face

Range of hob feed 50-250 R.P.M.

Range hob feed to each rev. of worm .010 to .125

Drive: 3 Steps Cone Pulley; 2 1/2 in. Belt

Weight 2,100 lbs.

A machine of latest design, introducing new features which increase production without sacrificing accuracy. The hob is cutting continuously; operation of machine entirely automatic.

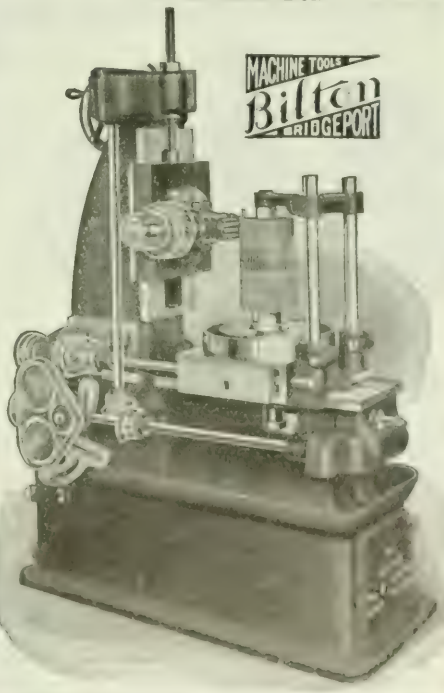
DELIVERY

A few of these machines are now available for October delivery.

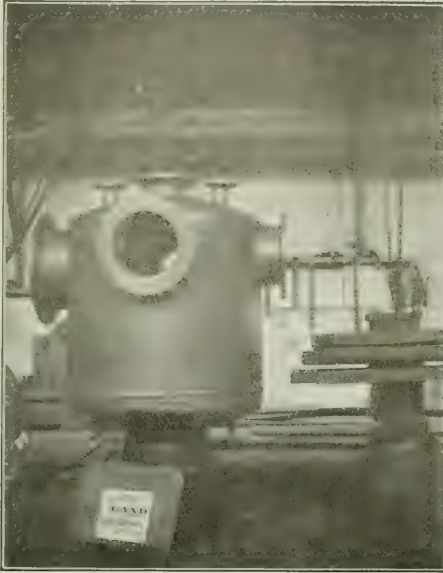
Send for copy of new catalog No. 30, and bulletin describing this machine.

The Bilton Machine Tool Co.
Bridgeport, Conn.

Foreign Agents: Alfred Herbert Ltd., M. Mett Engineering Co., Chas. Churchill & Co.



EFFICIENCY AND ECONOMY OF OXY-ACETYLENE WELDING



Firms all over the world are specifying WELDED seams instead of riveted because they know that a Welded Seam is more efficient and economical. Illustration shows a Welded Tank with flanges and connections, and is a fair example of a more efficient article produced at less cost.

The Application of the process in your plant is unlimited

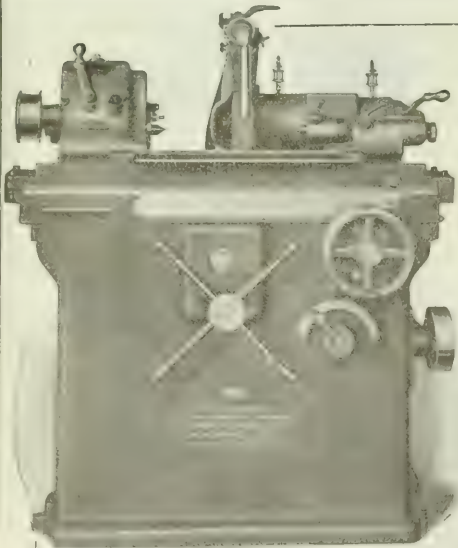
For Prevention of Loss by "Break-downs,"
For Prevention of Wasted Material,
For Reclamation of Broken Machine Parts,
For Reclamation of Broken Castings,
For Increase in your Production,
For Simplifying your Manufacturing Process,
For Improving the Article Produced,
For Reducing the Cost.
And other advantages equally important.

It means increasing Profits

Will you have us prove it to you? we can tell you how and why. Full particulars sent on request without obligation.

L'AIR LIQUIDE SOCIETY

Toronto Montreal Winnipeg
Halifax: Factory under construction



MODEL "B"

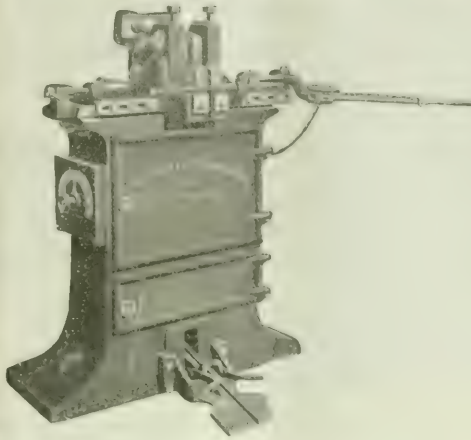
Six x Twenty Grinder A Fitchburg Model

Equally as efficient on small work as on that of larger dimensions. Therein lies its value. It is a compact, energetic worker that will do more for its size than any machine of similar wheel dimensions. It is saving in floor space. Its speed will give you greater production. Investigation or trial will impress you. 1300 to 1800 R.P.M. 16 x 3 grinding wheel, 6 x 4 pulleys. 7 horsepower required. Floor space 52 x 66. Send for complete specifications.

Fitchburg Grinding Machine Co.
FITCHBURG MASS. U.S.A.

Thomson Process
Electric Welding

Thomsons Weld Practically Anything

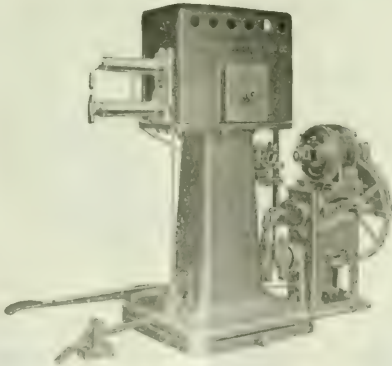


That does seem rather broad — but in reality it isn't. There may be a few metals that won't electric weld—but they are so rare that they aren't commonly used. Such metals as iron, steel, copper, brass, etc., are easy for the Thomson Butt Welder.

Sheets, tubes, bars, pipes, heavy or light work, are all electro-welded by simply pulling a lever.

Send for Bulletin B-4.

We Guarantee Savings With A Thomson Spot Welder



If you have riveting or soldering to do in your plant we will guarantee to save you money by using the Thomson Spot Welder. How could you help saving money — no rivets or solder to buy, no holes to punch, 60 to 90% faster, 60% stronger—you can't help but save a goodly amount and increase your production in the bargain.

Our corps of experts to aid you in selecting the correct machine for your work are at your command.

Send for Bulletin S-4.

Thomson Electric Welding Co. Thomson Spot Welder Company
 Lynn, Mass.

SOLE AGENTS: 111 Falls Street, Niagara Falls, N. Y.

Thomson Process
Electric Welding

Oxy-Acetylene Welding and Cutting



Operator repairing broken loom by the Prest-O-Lite Process of Oxy-Acetylene Welding.

This One Repair Saved the Cost of a Welding Outfit

This loom frame was badly broken in three places. Important textile machinery lay idle awaiting repair or replacement.

A portable Prest-O-Lite welding outfit was rushed to the scene and the repairs were effected "on the spot" at a total cost of but \$2.25.

This one saving of time, material and replacement expense more than paid for the Prest-O-Lite welding outfit.

Let Oxy-Acetylene welding help you—investigate NOW.

Prest-O-Lite PROCESS

employs both gases (acetylene and oxygen), in portable cylinders. Prest-O-Lite Dissolved Acetylene (ready made carbide gas) is backed by Prest-O-Lite Service, which insures prompt exchange of full cylinders for empty ones. Provides dry, purified gas, insuring better welds, quicker work and lower operating cost.

Apparatus consists of an equal pressure blow pipe, automatic regulators and gauges, and all necessary equipment. Adaptable for oxy-acetylene cutting by the addition of special cutting blow pipe.

Thorough instructions are furnished free to every user of Prest-O-Lite Dissolved Acetylene. Any average workman who understands metals can learn the welding process quickly and easily.

Write for valuable illustrated literature and data on work others are doing by the Prest-O-Lite Welding Process. It may point out ways to solve your problems. Address Dept. C-107.

THE PREST-O-LITE COMPANY, INC.

CANADIAN GENERAL OFFICES:

913-14 C.P.R. Building TORONTO

Direct Factory Branches: Toronto, Ont.; Montreal, Que.;
Merrittton, Ont.; Winnipeg, Man.

Canadian Plants: Toronto, Ont.; Merrittton, Ont.; Win-
nipeg, Man.; Shawinigan Falls, Que. (under con-
struction.)

World's Largest Makers of Dissolved Acetylene

STANDARDIZED CUTTING QUALITIES

Since the one purpose of a file is to cut, the toughness, regularity and sharpness of the teeth are all important.

A capable mechanic can positively "feel" these qualities in a "Famous Five" file.

The sharp, keen-edged teeth arranged in uniform rows—plus the even balance—tells him at once the file is a good serviceable tool.

It is these qualities that have made "Famous Five" Files Standard Grade tools everywhere.

Specify them when ordering.





Where Quality Comes First

Where quality must be made certain, you use tools of known accuracy. You are also very careful to use the tools especially adapted to the work in hand.

It makes little difference what sort of work it is, if accuracy is the first thing, you can be sure of it with

Starrett Tools

TRADE MARK
REG. U.S. PAT. OFF.

There are 2100 styles and sizes of these fine tools. One or more of them matches every demand for the fine work needed in a well-made product.

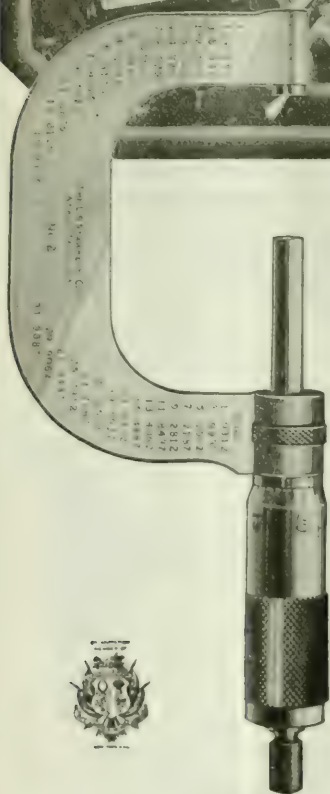
There are micrometers, vernier height and depth gages, vernier calipers, caliper squares, rules, levels, surface indicators and many other instruments of precision.

Catalog No. 214 on request.

The L. S. Starrett Company

THE WORLD'S GREATEST TOOL MAKERS

Athol, Massachusetts

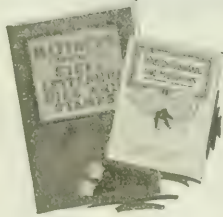


There's a Matthews Steel Lettering Die or Stamp for Marking Your Product

Whatever you manufacture we have a steel lettering die or stamp that will mark clearly your name, address, trade-mark or any distinctive mark you wish to show. Place a lasting advertisement or identification on your product — show the user what to ask for when again in the market.



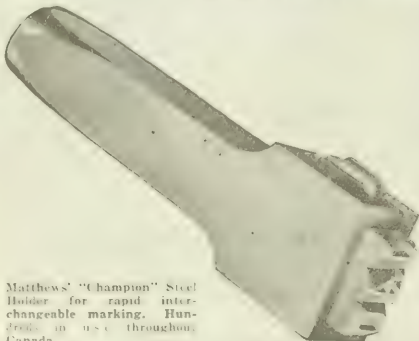
For marking sizes, weights, etc., use these Matthews hand-made steel figures. They are hand-cut from the best tool steel and are furnished individually or in complete sets.



There are many forms of lettering dies and stamps. Some are illustrated and described in this catalogue. It is yours for the asking. Want a copy?

JAS. H. MATTHEWS & CO.
ESTABLISHED 1850
PITTSBURGH PA., U.S.A.

Distributors for Canada
THE CANADIAN FAIRBANKS-MORSE CO., LIMITED
Montreal, Toronto, Ottawa, St. John N. B., Winnipeg, Calgary, Saskatoon, Vancouver, Victoria.



Matthews' "Champion" Steel Holder for rapid interchangeable marking. Hundreds in use throughout Canada.

May We Repeat

THAT



TRADE MARK

QUALITY FILES

are the only files made in Canada using BEST CRUCIBLE CAST STEEL exclusively in their manufacture. What does that mean to the user?

IT MEANS a keener cutting edge to the teeth, and longer life to the file. IT MEANS the stock has that "pep" in it so beloved of metal workers. IT MEANS that after a long and honorable career on the bench, there is still fine steel in the file which warrants the user in having it re-cut and put on the job again on less "fussy" work.

THAT IS TRUE ECONOMY.

Port Hope File Mfg. Co., Limited

Port Hope, Ont.

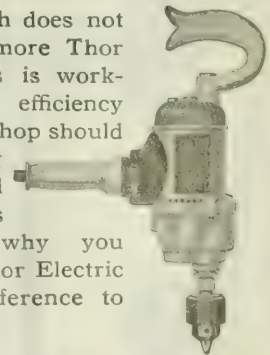
"Ask your jobber"

Thor

UNIVERSAL Electric Drills

Licensed Under Burke Universal Motor Patent

No shop which does not use one or more Thor Electric Drills is working to full efficiency which every shop should do during these critical times. Let us demonstrate why you should use Thor Electric Tools in preference to other makes.



Independent Pneumatic Tool Company

Office: 334 St. James Street, MONTREAL, QUE.
Toronto: 32 Front St. W.; Winnipeg: 123 Bannatyne Ave., E.;
Vancouver: 1142 Homer Street

Economical Screw Threads

—The producing of them is the problem of thousands of manufacturers. We took a long step toward the solving of the problem in producing the



ACORN DIE AND HOLDER

It has so many advantages over the old style spring die and various other forms of dies and holders for machine use that it is difficult to enumerate them all.

A demonstration of the Acorn Die and Holder on your own work and on one of your own machines will give you a new standard for economy in screw threads.

Wells Brothers Company of Canada, Limited
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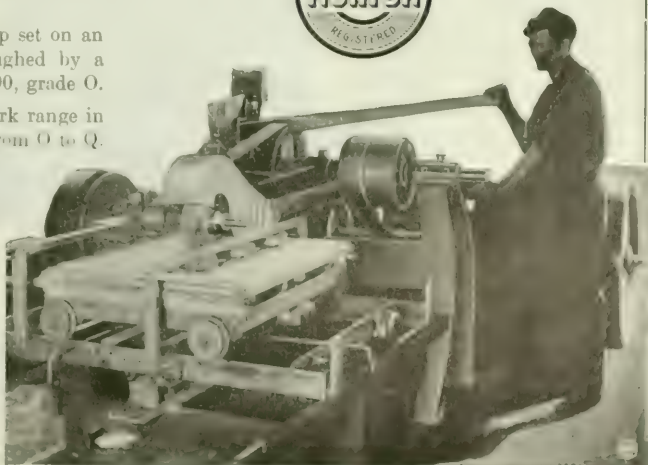
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Belt	" (Hand)
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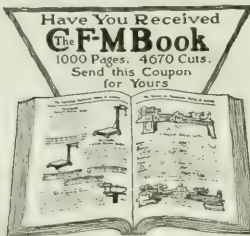
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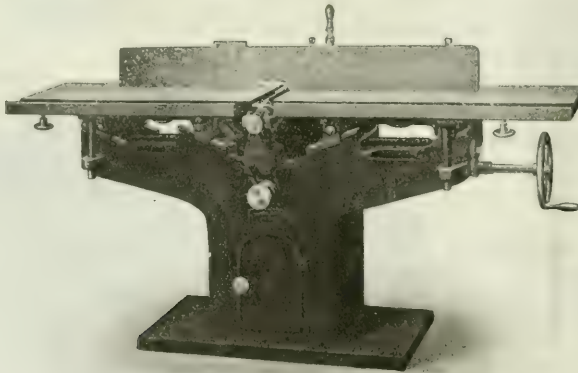
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Brief Historical Sketch of Steam Boilermaking in Canada

By D. M. Medcalf *

The development taking place in our shipbuilding industry, more particularly that of steel construction, and the intimate relationship that exists between it and steam boiler building, make a retrospect of the associated crafts' achievement in Canada peculiarly opportune and interesting meantime. The article embodies the substance of an address delivered before the American Boilermakers' Association at their recent Annual Convention.

WHEN choosing this subject, I hoped to be able to obtain some assistance from the compilations of historians who have linked together the memories of past and present industries in Canada, but have been disappointed because they have overlooked the existence of the black squad who toiled in an unpretentious way, building steam boilers for our early industries. These horny-handed sons of toil appear to have passed away unhonoured and unsung, and their memories have been almost forgotten, save by a few of our old boilermakers and engineers. I have, therefore, decided that, rather than go into the details of construction in this paper, to treat the subject more in a general way.

Doubtless, the first boilermakers in Canada were located around the eastern seaboard. In the early part of the eighteenth century, settlements clung close to river, lake and sea, and the St. Lawrence, the St. John, and their tributaries, besides other lesser rivers, provided inevitably the points of settlement and the lines of travel. The development of water transport in Canada is interesting and furnishes a record of need, invention and enterprise, and not the least among these was the advent of commercially successful steam navigation.

Advent of Steam Navigation

First came the bark canoe, large enough to hold a few voyagers and peltry, and for a long time it held its place for the far journeys. For shorter travels, the canoe was superseded by the larger, but clumsier, bateau. In later years, the increase in river freight led to the introduction of the still larger Durham boats, whilst along the coast and on the great lakes the sailing schooner long filled a notable place. Finally the steamboat came in 1839. Only one year after the Clermont had begun its regular trips on the Hudson, there was built at Montreal the forty-ton steamer Accommodation, and seven years later the Frontenac, of about seven hundred and forty tons displacement, was launched.

It is noteworthy that the first steamship to cross the Atlantic without auxiliary aid was built in Montreal. This vessel was called the Royal William, and left Canada on the 5th August, 1833, for London, and arrived there about one month later. Our early Canadian boilermakers were, therefore, amongst those pioneers who not only developed water

transport in Canada, but inaugurated ocean steam navigation. Marine boilers at that period were built rectangular in form of the marine flue type, carrying from 10 to 20 lbs. pressure. Boilers of this type, with certain modifications in design, were in vogue for a considerable time, and gradually developed into the Scotch marine type, with which we are all familiar. The development of these boilers was, of course, due to the efforts of Scotch engineers on the Clyde.

Boiler Types

With regard to the manufacture of boilers in Canada, around 1850, there were quite a few of the old pioneers engaged in this work. A list of names would perhaps be of little interest now,



D. M. MEDCALF.

but I mention the following firms who are still extant:—

E. Leonard & Sons, London, Ont., established 1839.

Waterous Engine Works Co., Brantford, Ont., established 1840.

John Inglis Co., Toronto, Ont., established 1840.

John McDougall, Caledonian Iron Works, Montreal, established 1858.

Goldie & McCulloch Co., Galt, Ont., established 1844.

Besides these, there was a large number of thriving little boiler businesses, long since petered out, like the Dicky Neal and John Perkins boiler works of Toronto, Joseph Hall, Oshawa, etc.

Pioneers in the Craft

In those early days, that is, sixty or seventy years ago, the types of boilers generally in use were externally fired with three to five flues, 8 to 10-in. diameter. There has been little development in this type of boiler, and the H. R. T. in use to-day is typical of the boiler used then. The diameter of these boilers seldom exceeded 54 inches, but what they lacked in girth, they made up in length, as twenty to twenty-five feet was no uncommon stretch for those old stagers. The seams were all of single-riveted, lap construction, and the plates ranged in thickness from $\frac{1}{4}$ in. to $\frac{3}{8}$ in. The shell rings and also the tube rings were telescoped one into the other, like stove piping. They were very strong on domes at that time, and I believe a boilermaker then did not think he was building a boiler at all, unless he had a huge dome on the outfit. Most of these early domes were cast iron, and some of our manufacturers adhered to this style of dome until as late as 1890, in which connection I venture to say a good many explosions have resulted from these castings fracturing, two accidents of recent date coming under my own personal notice.

Materials of Construction

With the exception of the domes of some of these boilers, wrought iron was the material almost exclusively used in their construction. The brands of iron were Lowmoor, Yorkshire, Bowling, Thornycroft, etc., all imported from the British Isles. As a rule, the plates were short and measured about 4 ft. 6 in. square. These sheets were soft and ductile, but blisters or laminations were not infrequently met with, which caused considerable loss and inconvenience. Another imperfection was that of spongy parts, generally due to imperfect puddling, but, notwithstanding these defects, the old iron boilers gave good service, and we have many still in service, after thirty or forty years of general wear and tear. The majority of the boilers then were used in saw mills and flour mills, and were often employed to augment the power of a water wheel. The steam pressures carried were low, and forty to fifty pounds was looked upon as a very high pressure indeed. Fuel was cheap, and was generally bituminous coal, and the work was done, except by the blacksmith in the smithy fire, and the number of his tools.

Our plate rolls were originally made of wood and were operated by hand. This, of course, was only made possible by the size and thickness of the sheets

*Chief Inspector of Steam Boilers, Province of Ontario.

used at that time. Punching was done by hand with a screw or bear punch, and sometimes as many as four men were employed at a time to pull on the punch lever. All holes were punched full size, and those that did not come fair enough were usually persuaded into alignment by the gentle assistance of drifts and sledges. Sometimes a taper reamer was used, but this was the exception, rather than the rule, and any holes which could not be reached with the punch were cut with a round-nosed chisel. The head plates were flanged with large wooden mauls over cast iron flange blocks of the required size. It was customary to make the heads a little undersize, so that they could be drawn out gradually to the exact diameter.

Heads were dished in a very crude manner by digging a hole in the ground, somewhat resembling the desired curvature of the head. The circular plate was then heated and beaten down into this hole with wooden mallets, the finishing process being accomplished by flateners and sledge hammers. It sometimes happened in the case of heads dished to a deep camber that the work could not be done in this way, and a large cast-iron ball was often used to advantage. This ball was hoisted a certain distance, then dropped on the red-hot plate in much the same way as a pile driver.

These—what now appear to us—crude methods of the early boilermakers have undergone a vast change in the last fifty years. The up-to-date machinery now in use for every branch of this industry has almost entirely superseded hand work, and there is just reason to be proud of the modern steam boiler which our manufacturers are turning out today in large quantities. We must not, however, despise the useful work of our predecessors, for they built many good boilers in those good old days.

Boiler Inspection Feature

We have a large number of boilers in Ontario that were constructed before the present Act governing the construction of boilers came into force and took effect, which were built in a thorough workmanlike manner. We also have some that are not so good, and they were not all built in Canada, but since the enactment of the present law, we are quite satisfied that better boilers are now being turned out, and the purchaser is safeguarded as far as workmanship and material is concerned.

No matter how rigid the inspection, it is not a guarantee that the boiler will not explode, because it largely depends upon the care and attention the unit receives when in operation, how long it will remain in useful service. Quite recently, I was requested to make a personal examination of two 66 in. x 16 ft. H. R. T. boilers that had been seriously damaged. The boilers referred to were built from an approved design and inspected during construction; the shell plates were fabricated by one of the largest plate manufacturers in the United States, and were carefully examined before any work had commenced, the heat numbers and tensile strength

recorded and passed as being suitable for a steam boiler. The workmanship was also examined during the entire construction, and upon completion, the boiler was passed, and certificates issued in the regular way. After these boilers had been in service six months, they each developed bags on the sheets directly over the fire, extending four inches down, three feet wide and five feet long, and on account of their being practically new, the owner claimed that the cause was poor material and workmanship, and I personally acted as a referee in the settlement.

When I visited the plant, and when trying to squeeze into the regulation inspector's outfit—which is now too small for me—I requested the owners to have the manhead under the tubes removed. The manhole in top of shell was open and ready for the inspector. Immediately the light was flashed on the interior of the boiler, it was quite apparent what caused the trouble. The water that lay in the depression was covered with black spots, and the tubes and shell, as far as could be seen, were coated with oil.

It was at first a difficult matter to convince the owners that oil had caused the trouble; it was a new plant, and oil they claimed could not get into the boiler because they had installed an expensive oil separator in the exhaust line from the feed pump, which was the only steam line returning its condensation to the boilers. A further examination was made by disconnecting the oil separator, which was found quite clean, but beyond the outlet a full handful of grease was collected and shown to them, with the result that they were quite satisfied that they themselves were to blame, and not the poor manufacturer, who made the boilers to comply fully with the requirements of the Province of Ontario. The necessary repairs cost about \$2,500 and considerable inconvenience to the operation of the plant.

I could cite a number of cases very similar to this one, but believe there is "nuf sed," and my object in mentioning this fact is because frequently when trouble develops, and the cause of same is not known, it is blamed on the rotten old boiler made by so and so, who is really blameless.

War Effect on Canadian Boiler Making.

Now, in regard to the effect of the war on the boiler-making industry in Canada, I might say that its penetrating influence has affected almost every industry we possess, either directly or indirectly, and the most seriously swayed of these have been engineering and allied trades. Almost since the beginning of the war, or, to be correct, since the Governments of the Allies began to place orders abroad for the supply of munitions, most of our boiler shops have been partly converted into munitions factories, whilst our machine shops are similarly engaged, running night and day.

Besides making shells, however, our boiler shops are turning out boilers in fairly large numbers, not only for domestic use, but for export trade, chiefly

to the Allies, and we have orders for many more which cannot be supplied by reason of our inability to obtain the necessary material. It is true, therefore, that the war has increased the output of our boiler works, and it is also true that the war is retarding that output, owing to the scarcity of steel, or, to be correct, owing to this merchandise finding a more ready outlet in another channel; a large number of the mills, I believe, who are working on metals have sold their full production one year in advance for war purposes.

Dearth and Cost of Steel

The dearth of steel, however, is not the only obstacle. The price of steel, as you all know, has been going up with leaps and bounds since the war began. Labour conditions are also very bad, and good boiler makers to-day cannot be had in anything like sufficient numbers to cope with the increase in business. From the beginning of 1915 to the present time, but more especially in 1915 and 1916, a large number of munition factories and like industries, which were urgently required to meet the existing crisis suddenly sprung into being, and consequently more boilers were required. Our manufacturers having only their usual stock of plates and tubes on hand were very soon unable to supply the goods until more material was forthcoming, and this occasioned much delay. Those factories, therefore, which urgently required boilers turned their attention to the second-hand market, and used boilers were largely sought after. Old boilers of all descriptions were painted up and offered for sale as good boilers, and, needless to say, many were condemned by our department. These scrap boilers have in turn found their way to the furnaces to be melted into shell billets, and latterly shipped to Germany via France. Perhaps a part of one of our old boilers, after undergoing this transformation, may yet find a resting place in the Kaiser or the Crown Prince.

The demand of late has not been so much for stationary boilers, as for marine boilers, and our manufacturers are harder pressed now than ever for steel plates and tubes, and, although they are turning out a lot of work, the demand by far exceeds the supply. If we only had steel plate mills of our own in Ontario, it would have been of great assistance at this period, but unfortunately we are not sufficiently advanced along those lines, and have to depend entirely on imported material.

Instead of Rabbit Metals.—As a substitute for rabbit metals an inventor proposes to use mixtures of metallic sulphides in widely varying proportions. He considers that the sulphides of copper, lead, tin and antimony make good babbitt substitutes. Metallic sodium is used to improve their casting properties.

It is not commercially possible to burn more than 99 per cent. of bituminous coal fed to the furnace.

PRODUCTION METHODS AND DEVICES

A Department for the Interchange and Distribution of Shop and Office Data and Ideas Evolved from Actual Practical Application and Experience

AUTOMATIC SCREW MACHINE LAYOUTS

By D. A. Hampson

THE automatic screw machine is found in so few shops outside of the manufacturing centres that men familiar with them are in the great minority. In times like the present, when vast quantities of turned parts are required in a hurry, the automatic screw machine is a most important tool

men, and in this, as always, the man with education gets ahead faster than his brother who has passed up the opportunities so frequent to-day; the most convenient of which is the trade paper.

Given a shop training on the common machine tools, any man should master the operation of automatic screw machines in a short time. That doesn't mean that he would become an expert, but he should be able to handle any plain work and do simple setting up. A person,

here. Study will reveal that the more complicated looking machines are made so by the addition of more spindles and their indexing devices, feed change gearing, and threading and other attachments, but that the operating principles are the same as in our simple machine.

Even though it may not be a part of his work to design cam layouts, the ambitious man will find it to his advantage to make a study of them. Normally the cam shaft makes one complete revolution for every piece made. Thus, if that revolution were plotted as a circle, every movement produced by the cams can be located exactly. But as cams on different drums are in action at the same time, the circle becomes crowded and the arrangement shown by the drawing gives more room.

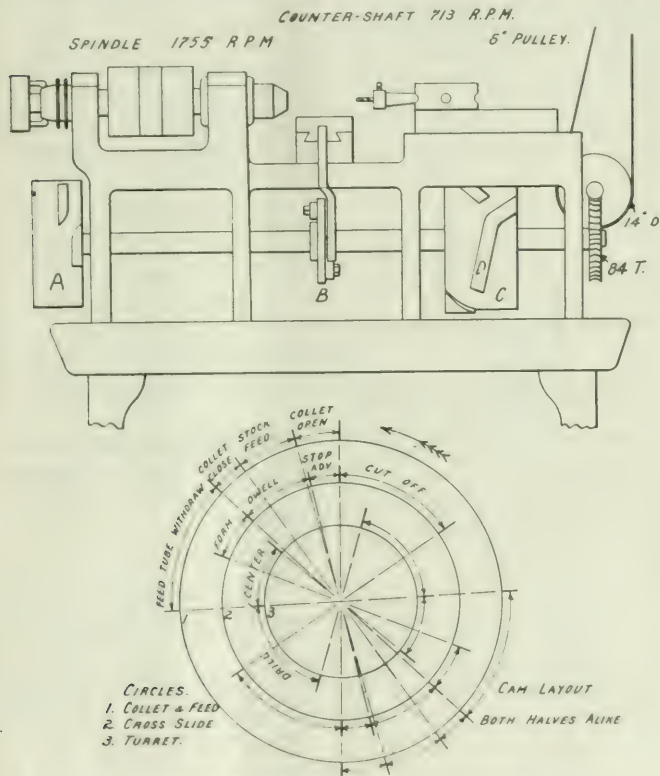
With this layout, each drum has a circle of its own. It is possible by laying out a diameter at any point to tell just what each drum is doing at that time. The outer circle is the drum for the spindle mechanism, the middle one for the cross slide tools, and the inner one for the turret. The larger the scale used in laying out, the easier the work can be done. The cams on the spindle drum (the drum A in the drawing) always are set close together, so the time spent in opening and closing the collet and feeding the stock—non-working movements—will be as little as possible.

Double Feed

Regardless of the number of holes in the turret, there are often one or more idle ones. When the work can be arranged so but half the turret holes are occupied, it is possible to double the production from the machine by "double feeding," that is, feeding twice for every revolution of the cam shaft and having the otherwise idle turret holes carry another set of tools. The layout shown is for such a job.

The piece to be made on the machine has to be drilled, corners rounded, and cut off, but, owing to conditions of accuracy, a centering tool has to be used, and this is put in one turret hole. The corners are rounded by the back tool on the cross slide and the cross slide carries, besides the tool, a stop to feed the bar of stock against. This combination can be traced on the middle circle, which shows that the cross slide advances, waits for the stock to feed (dwell), and then further advances to round corner (form). The movements for each piece are the same, and consequently both halves of the layout are alike.

An example of the help that a man gets from a working knowledge of some arithmetic, as applied to shop problems—applications such as appeared in the instruction articles in this journal, may be found in the screw machine job under construction. A cam (D) is on hand,



AUTOMATIC SCREW MACHINE LAYOUT FEATURES

for the production of small parts, such as small arms ammunition components, and other similar equipment. The demand for operators and set-up men has exceeded the visible supply, and, as usual, manufacturers have turned to the country towns for workmen, but this time they found there were practically no men available with screw machine experience—in fact, a goodly proportion of both country and city mechanics had never even seen the machine at all. It, therefore, became a problem of training

quick to learn, who has been simply a machine hand should likewise make rapid progress. The automatic screw machine, in its plainest form, is shown by the drawing; with the exception of the Brown & Sharpe, all the principal makes embody the same principles—single cam shaft carrying drums upon which are fastened the cams for opening and closing the collet, feeding the stock, operating the cross slide, feeding and revolving the turret. Threading involves another movement not to be considered

and it is desired to know if it is suitable for use in feeding the drill. The drill is a small one, and it is known that it will not stand a feed of over .004 in. per revolution of the stock. Whether or not this is too fast is the question. Of course, it is possible to put it on the machine and try it, but the machine has to be set up to try it and if then the drill breaks, it is not known positively that the cam is the cause of it. All this takes time, and is an uncertain, slow, way of doing. Ten minutes spent in collecting the data required—if it is not already known—and in making the computations, will give a definite answer without any experimenting.

In this particular case, the data obtained by measuring and counting have been put on the drawing. Also it was noted that the cam gave an advance of 7-16 in. in one quarter of a revolution. Figuring speeds we get—

Cam shaft makes 3.63 r.p.m.—1 rev. in 16 sec.

Cam advances 7-16 in. in $\frac{1}{4}$ of above, or 4 sec.

Spindle makes 117 rev. in 4 sec.

Then the feed per rev. of stock is .437 in.

$\frac{.437}{117} = .0037$ in., which is well inside 117 our limit.

The layout of the cam circles is most readily done by calculating the movements in degrees. This is done directly on new work; for existing cams, they are measured in inches around the drum and this reduced to degrees by making it a proportion of the whole circumference—the value in degrees being used in plotting.

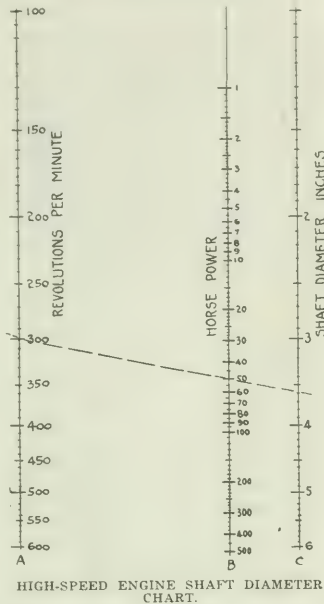
SHAFT DIAMETERS OF HIGH SPEED ENGINES.

By N. G. Near.

A RATHER peculiar thing about steam engines is the varying designs and sizes adopted by the different manufacturers. One manufacturer will use a $3\frac{1}{2}$ inch shaft for a 50 h.p. engine running 300 r.p.m., whereas another manufacturer will use a 4 inch shaft at the same speed. There is no good reason why there should be this difference in size, aside from the fact that one might prefer to use a greater factor of safety than the other. Since the cost of an engine is proportional to the weight, it is evident that the engine having the larger shaft is liable to weigh more than the engine having the lighter shaft and as a result the maker of the light engine can undersell the maker of the other. Inasmuch as both these engines give good dependable service when in actual use, however, it is difficult to tell which engine is "best." Perhaps the heavier engine will last longer, and perhaps not, in spite of its higher cost.

O. N. Trooien of the University of Wisconsin has studied steam engine design pretty thoroughly and has tabulated most of the common dimensions used in current steam engine design. Based

on these tabulations he has developed curves or formulas which represent the average practice. It is allowable for us to use curves and formulas of this kind because we can rest assured that they



HIGH-SPEED ENGINE SHAFT DIAMETER CHART.

will "work." They will give us engines and parts of engines that will be heavier than the lightest, and lighter than the heaviest. Mr. Trooien's study covered the best known engines only—not those that give trouble or are doomed to failure. As a result of this investigation, an "average" formula was developed for the shaft diameter of high speed centre crank engines. This is the formula:

$$d = 6.6 \sqrt[3]{(h.p. \div N)}$$

where d = diameter of the shaft in in. h.p. = the horse power of the engine

N = the revolutions per min. on the shaft. Based on this formula, I have developed the chart herewith which will be found handy for determining any shaft diameter for any ordinary high speed engine. All that is necessary is to lay a straight-edge across as indicated by the dotted line drawn across the chart and the intersection with the "unknown column" gives the desired result. For example: What should be the diameter of a shaft for a 50 h.p. engine whose speed is 300 r.p.m.?

Connect the 300 (column A), with the 50 (column B), and continue the line until it cuts column C. The intersection with column C shows that the shaft diameter should be 3.6 inches. Should it be desired to make the diameter larger, of course, that could be done, at the same time, it would not be good policy to make the diameter smaller.

The chart will also be found useful

for determining the safe load that can be imposed on your engine. Let us suppose, for instance, that the shaft in your engine is larger than necessary for carrying normal load, and this you can easily find out by using this chart. Thus if your shaft diameter is 3.6 inches, whereas it should be only 3 inches according to this chart, it is evident that little danger will result from increasing the pressure on the piston as far as the shaft itself is concerned. To be sure the other parts of the engine must be considered also before increasing the pressure or endeavoring to make a high-powered engine of it. One must be careful of the piston rod, the keys, the cylinder walls themselves, the head and crank end of the cylinder, etc. Every part that will be subjected to a greater stress must be given a proper examination and reckoning.

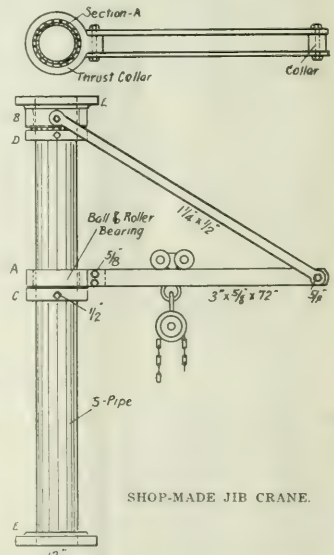
The range of this chart, it will be noted, is wide enough to care for almost any high speed engine, delivering all the way from 1 to 500 h.p. and covering all speeds from 100 to 600 r.p.m. It is very seldom that we see an engine with a shaft smaller than 1 inch or larger than 6 inches, and that is why, altogether, the chart can be considered complete and should be handy to keep on tap by engineers, students, designers, etc.



A SHOP MADE JIB-CRANE

By J. E. Cooley

IN the accompanying sketch is shown a shop made jib-crane. It was made for the purpose for handling work such as



SHOP-MADE JIB CRANE.

frames, beds, and other heavy castings on a milling machine, and was placed in the floor space center of four large milling machines facing each other, so that

for the different milling operations on a piece, the work could be swung on the crane and transferred from one machine to another without the aid of a helper.

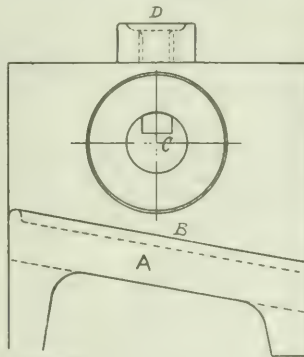
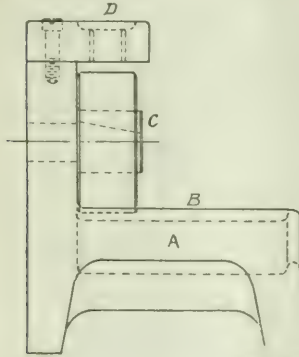
The column is made from 5-inch pipe, fastened to the floor and ceiling by flanges E, which are tight fitting in the pipe. Two thrust collars A, and B, are bored out to take roller bearings, and these rest on fixed collars C, and D, which contain ball bearings. The swing arms holding the trolley wheels are bolted to the thrust-collar A, and are 6 feet long.

This type of crane is easily constructed, and is an economical apparatus for the purpose; it eliminates the need of a helper, and the operator can keep his machines running while removing a piece.

A FEW USEFUL JIG KINKS

By J. E. Cooley

A GREAT many jigs used for drilling purposes are made from standard size knees or angle plates. These, as a rule, entail considerable loss of time in hand-



A FEW USEFUL JIG KINKS.

ling, such as putting on and taking off work; cleaning off chips and oil and other operations that necessarily follow in jig work.

In the accompanying sketch, is shown a few useful kinks applied to a jig for drilling collars for set screws, which may be found suggestive when designing jigs for other purposes. Referring to the sketch, the shelf A, on the angle-plate is cast on an angle instead of horizontally as is the usual method, having a rib B, along the upper and front edge, as seen. This is done for the purpose of allowing the chips and oil to fall away on one side of the drill-press table, making less space to clean or brush away, than is now the case where oil and chips fall from all sides.

Another kink is shown in the plug which holds the collar. It is well-known that the burr left in the hole after drilling, causes the collar to stick to the plug, necessitating the use of a screw-driver or similar tool to pry it off. The plug shown here has a deep angular

spline C, which allows the collar to slip off easily, and besides, aids the chips that come through the hole to fall downward.

Considerable oil is unnecessarily wasted in drilling. In one particular instance, when this is squirted on the drill, a certain amount of this gets on the piece that holds the drill bushing, and falls away on the sides without being used. If a small well or chamber as D, is cut out, and the top of the bushing is made flush with this, it will catch all surplus oil and fall in the bushing.

SPECIAL VISE JAWS FOR ANGULAR MILLING.

By F. H. M.

A RATHER difficult job of milling to accomplish economically is illustrated by Figs. 1 and 2. The job, as completed, is shown at A Fig. 1, while the appearance of the part after the first operation is shown at B. Both of these operations are accomplished simultaneously on two different parts by gang milling using four cutters and a vise equipped with

are shaped to the curvature of the inside and outside of the work. These jaws present the work at the correct angle for milling radial, while the jaw on the moveable part of the vise B is made

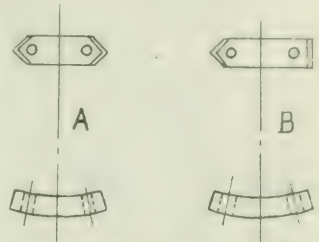


FIG. 1. SHOE MILLED IN VISE FIG. 1A. AFTER MILLING BOTH ENDS FIG. 1B. AFTER MILLING ONE END.

floating to accommodate slight inaccuracies in the thickness of the work.

In operation, two parts are placed on the pins in the manner shown, and after tightening the vise, the ends are milled in the usual manner by means of the longitudinal feed of the table.

ACCURATE DRILLING AND REAMING

By F. Scriber

MACHINING holes may be just plain drilling and reaming, or it may be getting results on particular work economically, and, while most any old type of drill will cut, there are a good many ways of improving the cut and getting more accurate holes both for size and alignment. It is well known that a drill will not cut true and to size unless ground correctly, although by drilling a small hole and following this with a drill of the right size, a fair hole close to size may be had. The illustrations and description in this article are intended to show how combinations of plain drills and reamers are used to get the desired result when jig drilling.

Referring to Fig. 1, there is shown a

special jaws, as shown by Fig. 2.

Referring to the illustration Fig. 2, the gang of cutters, consisting of a pair of straddle mills A in the centre and two surface mills B and C, machine the work which is curved and must be held on a 45-degree angle. The work is located by means of two pins D and the vise jaws

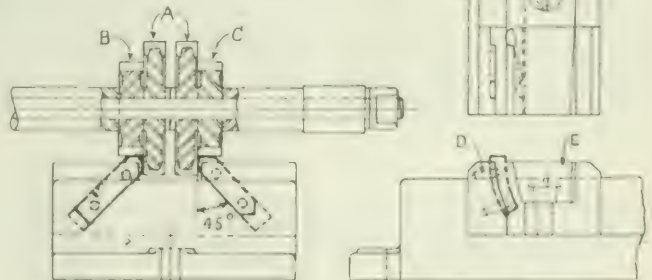


FIG. 2. VISE JAWS IN WHICH PARTS SHOWN BY FIG. 1 ARE MILLED.

twist drill and bushing for short holes up to about $\frac{1}{16}$ in. dia., and also a reamer for machine reaming the same. The bushing is held in a jig in the usual

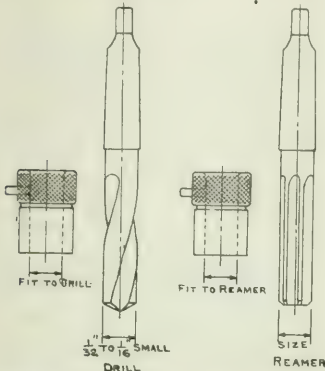


FIG. 1. BUSHINGS AND TOOLS FOR SHORT DRILLING.

manner, while the drill is $\frac{1}{32}$ in. to $\frac{1}{16}$ in. smaller than the reamer. The bushings are known as the slip type, inasmuch as the bushing which guides the drill is removed from the jig after drill-

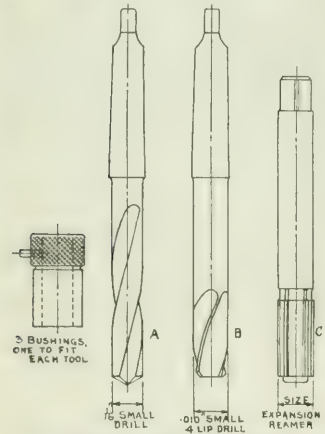


FIG. 2. TOOLS FOR DRILLING LONG OR LARGE HOLES.

ing and the reamer bushing is then slipped in its place.

The foregoing method of guiding or piloting drills is in quite general use, but for long holes under $\frac{1}{8}$ in. dia. and large holes of any length where accuracy is required a much better method is that shown in Fig. 2.

With this combination three slip bushings are used, and three cutting tools, namely, a two-lip twist drill, a three or more lip core drill and a plain, an expansion, or a shell reamer as desired. In making the cut drill A, which is about $\frac{1}{16}$ in. small, starts the hole with the proper bushing in place; following this, drill B, $\frac{1}{16}$ in. small, with short flutes, is used, which makes the hole quite true for its entire length. Reamer C is used for finishing the hole.

For drilling long holes where extreme accuracy is required, resource may be had to a combination of tools, such as are shown by Fig. 3.

In using this combination the part held in the jig is first drilled in the usual manner with twist drill A guided by bushing B. In line with the main guide bushing C a pilot bushing D is placed in the jig, as illustrated by Fig. 4. The purpose of this pilot bushing will be better understood from Fig. 4, as the four-lipped drill is thus supported above and below the cut. The drill used is E, Fig. 3, and this is followed by a reamer in like manner.

Drilling and reaming in this manner is a very accurate method, provided the two bushings are in line, and the tools are not cramped in any manner. For this reason it is a good plan to have the line boring and reaming tools driven by a holder in which the shank or driving end of the tool is able to float and a good example of this type of holder is shown by Fig. 5.

Referring to the illustration, A is the reamer and B the holder, the reamer shown being of the shell type mounted on a shank. As will be noticed, the main hole through the holder is bored out slightly large to allow the reamer to float, while a pin C driven into the holder drives the reamer. The hole through the shank of the reamer is opened out, tapering at both ends from the centre, so as not to interfere with the float of the reamer. The floating holder itself is, of course, made in many shapes to fit the particular machines, the type shown being adapted for use in a turret.

IN spite of the various difficulties French shipbuilders are faced with, there were 140,000 tons of new construction on hand in that country at the end of 1916.

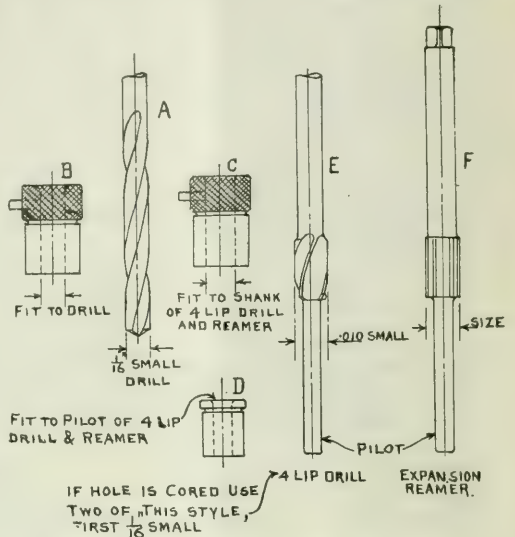


FIG. 3. TOOLS FOR LINE DRILLING AND REAMING.

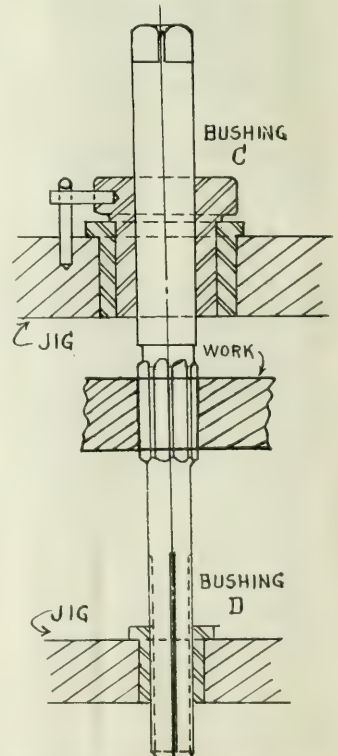


FIG. 4. METHOD OF USING LINE REAMER.

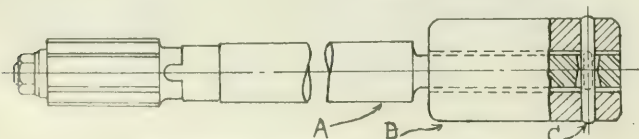


FIG. 5. HOLDER SUITABLE FOR LINE REAMING.

READERS' QUERIES AND ANSWERS
WANTED an alloy for making white metal hollow-ware, such as is used in casting portable reading-lamp stands.—N. A. G.

If the casting is required to be of good colour, strong enough to withstand accidental rough use, and finish to a durable surface chiefly, try the following:—

Copper	49 lbs.
Zinc	36 lbs.
Nickel	15 lbs.
Aluminum	2 oz.

Melt the copper and nickel first with a borax flux, then add the aluminum, and then the zinc. By remelting from ingots, you will obtain better results than otherwise. May be used with heated iron moulds or for sand castings.

If the casting is not required to be stiff and resistant to possibly injury from sudden contact with hard objects, either of the following may answer your purpose.

Lead	75 per cent.
Antimony	10 " "
Tin	15 " "

Tin	91 parts
Antimony	9 "
Copper	2 "

The latter makes a very strong, tough alloy, which is very fluid when melted.

A mold, the composition of which we believe is patented, and which would no doubt serve your purpose for casting the latter alloy is made as follows: Mix 11 parts powdered soapstone with 1 part Portland cement, then wet the mixture with a solution of 2 parts water and 1 part sodium silicate. Form a mixture of the consistency of moulding sand and employ in the same manner. Remove the pattern and heat the mold to 300 or 400 degrees Fah. until well dried. It is then ready for use.

CHART FOR DETERMINING LENGTH OF ROLLED-UP AND BALED STRAP IRON, ETC.

By N. G. Near.

THIS chart, plus a ruler and a pair of scales, will enable you to measure the length of rolled-up strap iron, flat iron, odd lengths in bales, etc. Even though the roll is not uniform, or if there are a number of rolls, or if the material is "all baled up," as the expression goes, it makes no difference to this chart, so long as the thickness and width are uniform. It is obvious that a chart of this kind is possible because the weight of wrought-iron and mild steel per cubic inch is a fairly constant quantity.

For example, if you find that a roll of your strap iron measures .03 inch in thickness and one inch in width and the weight is 22 pounds, what is the length of the roll in feet?

Very simple. Run a line through the .03 (left side of column A), and the 22 (column B), and locate the intersection with column C. Then through that intersection and the 1 (column A, right side), run another straight line and the final intersection with column D gives the answer as 200 feet, which you will

find to be pretty accurate. The dotted lines drawn across this chart show how the above problem is solved via the chart. Solve your problem in the same way and it will come out OK.

This method is surely much simpler than to unwind a long roll of metal and measure it and then have to roll it up again. All you have to do here is to lay a straight edge across the chart twice and the answer is found immediately.

To find the thickness of the metal accurately, if you have no micrometer caliper, measure the total thickness of ten layers, one on top of the other. Then divide by 10. It is always easy to divide

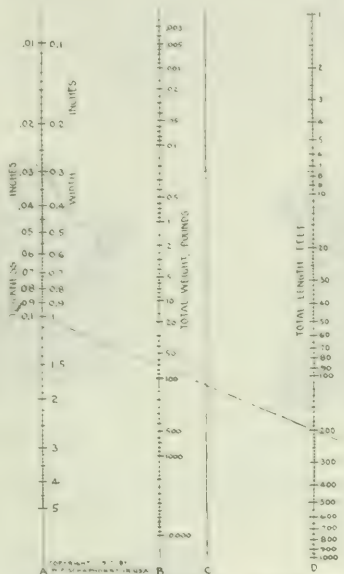


CHART FOR DETERMINING LENGTH OF ROLLED-UP STRAP IRON, BALES OF STRAP IRON, ETC., BY WEIGHING.

by 10. For example, if you find that with any ordinary rule the total thickness of ten layers is $\frac{3}{8}$ inch, which is equal to .375 inch expressed decimally, it is a simple matter to point off one place to the left, which makes the thickness .0375 inch. Isn't that easy enough? Your answer is about as accurate as though you had used a pair of micrometer calipers.

The range of this chart, it will be noted, is wide enough to care for any ordinary roll of metal running up to a total length of 1,000 feet.

UTILIZING WASTE HEAT IN BRITAIN

MILLIONS of units of electricity, generated in waste-heat stations in connection with coke ovens and blast furnace plants is the result of developments in the South Durham coal field in the north of England. In 1907 a corporation was formed under the title of The Waste

Heat & Gas Electrical Generating Stations, Ltd., to promote the use of waste heat for power purposes, and the problem of using the waste heat from iron and coke oven plants has been solved to the extent where savings estimated at 150,000 tons of fuel per annum are now being effected.

Two of the leading power companies operate in conjunction with the waste-heat stations, supplying a combined total energy of 343,000 horse-power over an area of 1,400 square miles. The waste heat stations are placed close to the larger coke ovens and blast-furnace plants, and operate in parallel with the five main stations of the power companies. They are run at their maximum capacity, and all regulation of the power is effected by the main supply stations.

The main distribution and transmission system is three-phase, and the working pressure is 20,000 volts. The power is utilized chiefly in the engineering shops and shipbuilding yards situated on the Tyne and Wear, and as the purchasing companies have a market for their current many times greater than the output of any individual waste heat station, it is possible to run these stations continuously at their full capacity, and to utilize to the best possible extent the machinery installed in them. Unfortunately for scientific purposes, no figures have been published, or can be obtained, for the thermal or working efficiency of these North-East Coast waste heat stations, and therefore it is impossible to say how the system adopted compares in practical value and economy with the waste heat stations situated in other countries.

FOR PIN HOLES IN BRASS

PIN holes in brass castings may be caused by pouring very hot metal into poorly vented molds, molds rammed too hard, or molds made of sand that is too close which will not allow the vents to come off freely. To avoid them, do not pour any hotter than necessary to run the castings, vent the molds with a fine knitting needle and do not ram them very hard.

If the metal contains no aluminum, try the addition of 2 ounces per 100 pounds, pouring when the metal no longer smokes. If aluminum cannot be used, pour the molds with sufficient force to keep the pouring heads full, even if some of the metal spills when they are filled. Exercise care to have the molds so well vented that when the gases come off, they will explode when the red-hot skimmer is inserted underneath the bottom boards.

Big-head keeps more men from succeeding in this world than lack of education. —W. A. R. —

A monthly mechanical paper is not what one would call a newspaper, yet it keeps a lot of news in the "ad" pages.

The Development and Application of Centrifugal Pumps

By H. S. Budd •

Centrifugal pumps by reason of their compactness of design, smoothness of operation, few constituent parts all of which are of comparatively simple and rugged construction, and freedom from shock and water hammer, make a powerful appeal to users of pumping machinery generally; and that their adoption to a wide range of service has in the past been productive of good results, is shown by the growing tendency to broaden their application scope still further, while intensifying their installation where already operative.

CONTRARY to the belief held by some that the centrifugal pump is a modern invention, it is in fact quite an old one and of obscure origin. One authority informs us as follows:—

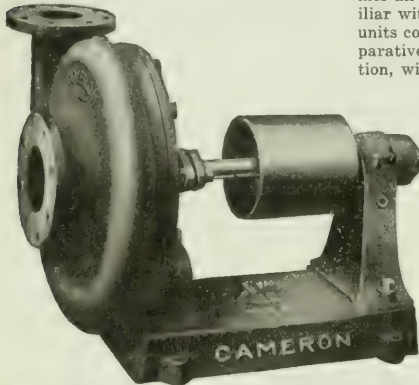


FIG. 1. BELT-DRIVEN, SINGLE SUCTION, OPEN IMPELLER PUMP.

"The first pump of this kind which attracted notice was one exhibited by J. P. Appold in 1851, and its special features have been retained in the best pumps since constructed. Appold's pump raised continuously a volume of water equal to 1,400 times its own capacity per minute. It had no valve and it permitted the passage of solid bodies, such as walnuts and oranges, without obstructing its working. Its efficiency was also found to be good."

For many years the centrifugal pump was considered useful only for handling large quantities of water at low heads and was uneconomical to operate. The development of the steam engine and its application to direct acting steam pumps kept the centrifugal in the back ground where it remained almost forgotten for many years. With the introduction of electricity and motor drives and, later on, steam turbines, however, there arose a demand for a pump that could be direct driven at comparatively high speeds, and the centrifugal pump has been improved and refined to meet this requirement. This development has been along purely scientific lines with quite wonderful results, until these pumps now operate with surprisingly good performance and economy on nearly all classes of both high and low head service for which only

reciprocating pumps had formerly been used.

The simplicity and compactness of construction, smoothness of operation and freedom from shock and water hammer all appeal immediately to those familiar with pumping machinery. As these units consist of but few parts, all of comparatively simple and rugged construction, with total absence of reciprocating

parts, water valves, etc., they present quite a contrast to reciprocating pumps, both in attendance required and cost of

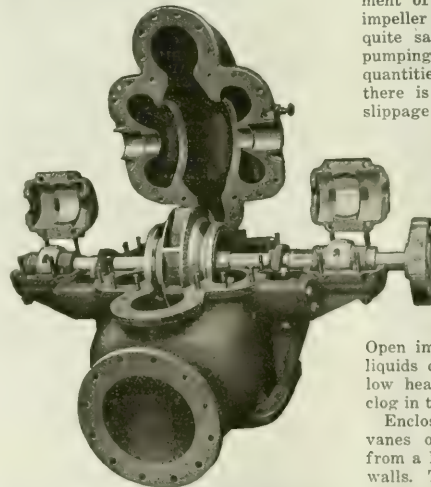


FIG. 2. DOUBLE SUCTION VOLUTE PUMP WITH CASING OPEN TO SHOW ACCESSIBILITY.

repairs, and in most cases will operate with a considerable saving in power consumed.

Centrifugal Pump Types

Centrifugal pumps as built to-day are of two general classes, namely, open and enclosed impeller types, depending on the type of impeller used.

Open impellers consist of a number of arms or vanes radiating from a hub in the manner of an ordinary centrifugal blower. The sides of the vanes are usually faced off and run close to the walls

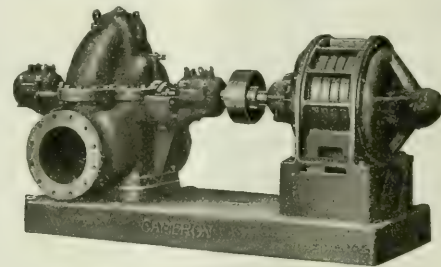


FIG. 3. MOTOR DRIVEN DOUBLE SUCTION VOLUTE PUMP.

of the casting on both sides in order to prevent, as far as possible, the slippage of the liquid being pumped. By refinement of design and construction, open impeller pumps have been made to show quite satisfactory results on low head pumping, especially in delivering large quantities at a head of a few feet, but there is always a large percentage of slippage between the impeller and casing,

as well as excessive skin friction and internal disturbance which becomes more pronounced as the operating head is increased. These losses are variable quantities and make high efficiency impossible; the designer cannot, therefore, predict with any great degree of accuracy the ultimate performance of the pump.

Open impellers are adapted to handling liquids containing some solid matter on low heads that would tend to hard or clog in the inclosed impeller types.

Enclosed impellers consist of blades or vanes of suitable curvature radiating from a hub and enclosed by two discs or walls. The liquid to be pumped enters at centre or eye of the impeller around the shaft on either one or both sides, pending on whether it is of single or double suction type, and passes through the wheel in channels formed by the walls and vanes. Double suction impellers which

are subjected to the same pressure conditions on either side, are automatically balanced against thrust along the line of the shaft for all ordinary operating heads. Single suction impellers are not so comparatively balanced an therefore require end thrust bearings.

As the enclosed impeller handles the liquid being pumped through confined passages or channels of definite form with a limited amount of disturbance or leakage, a capable designer can quite accurately control the performance of the pump over a broad range of operation. For this reason the enclosed impellers are used for all medium and high head pumping equipment and when high efficiency is desirable.

Single Stage Pumps

A single stage pump contains one impeller and can be built for almost any capacity and reasonably high head with efficiency results, the larger sizes being more economical, of course, than the smaller. The greater the head created by a single impeller, the greater will be the difference in pressure between the suction and discharge chambers of the pump. This is accompanied by a greater internal slippage and leakage and more rapid destruction of the internal parts, and, therefore, is one of the factors that determine the greatest pressure or head allowable per impeller or stage.

Multi-Stage Pumps

For higher heads, multi-stage or turbine pumps are used. These consist of two or more enclosed impellers on the same shaft, running in a casing with passages so arranged as to lead the liquid through the several impellers in succession, each one adding its equal share of the total pressure desired. By this means, pressures of several hundred pounds may be obtained from a single pump, the limit depending on the mechanical limitations of design, strength of materials used and their resistance to abrasions by the liquid at high velocity. In multi-stage pumps the liquid discharged at high velocity from all, but the last impeller must be abruptly turned through 180 degs. to enter the eye of the succeeding one, and suitable vanes known as diffusers are provided to reduce the speed of this water as far as possible, and convert it into pressure as soon as it leaves the impeller, so that it may be conducted into the succeeding one with the least disturbance and impact on the walls of the casing.

All multi-stage pumps require some means of maintaining correct alignment of the rotating element with the passages in the casing and of equalizing any end

thrust that may be present. In pumps handling clean fresh water, this is best accomplished by means of an internal hydraulic device in which the thrust is carried on a body of water confined by a suitable piston or diaphragm mounted on the shaft. This device is quite simple in construction, yet it automatically and promptly adjusts itself to varying load conditions, and being a water bearing with no metal to metal contact, operates with practically no loss of power. Where the liquid being pumped carries grit or solid matter that would tend to wear the parts of the hydraulic balancing device rapidly, a step bearing of the Kingsbury or marine thrust type external to the casing should be substituted.

Design and Construction

The requisites of a centrifugal pump are, first, that it shall be well and suitably constructed mechanically, and secondly, that its performance shall comply with all the service requirements and show the highest efficiency possible on that service. The pump should be of strong and substantial construction in all parts, free from vibration of the rotating elements with large and well oiled and close fitting bearings, both to insure continuous operation and to preserve the fine running clearness within the casing which serve to prevent internal leakage from the spaces of higher to lower pressures. The material of which the various parts are made should be well selected for the duty to be performed, and the general design thoroughly accessible for

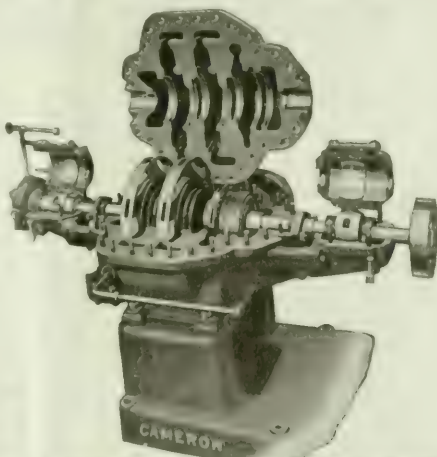


FIG. 4. THREE-STAGE TURBINE PUMP WITH CASING OPEN TO SHOW ACCESSIBILITY.

inspection of the interior and renewal of parts.

The operating principle of a centrifugal pump is quite simple: The liquid

pumped is accelerated by passing it through a revolving impeller, creating both pressure and velocity, the velocity being then converted into pressure in the stationary discharge passages. However, it becomes a very complex problem to design and build a pump to deliver a given quantity of liquid against a specific head at a definite fixed speed and to accom-

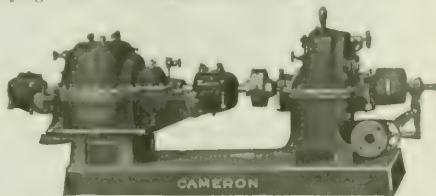


FIG. 5. STEAM TURBINE DRIVEN, THREE-STAGE TURBINE PUMP.

plish same at the highest efficiency. A capable designer can predict within a small percentage of error both the performance and the brake horsepower required not only at the normal operating point, but over a range, from a condition of free discharge against no head, to a closed discharge and no liquid flowing. The solution of these problems requires a thorough knowledge of the theory of centrifugal pumps and an analysis of a very great amount of accurate data obtained experimentally from pumps of similar characteristics.

The production of an efficient and altogether satisfactory pump involves not only a correctly designed impeller, but the casing also must be of such mould and cross-section that changes in velocity of the liquid will take place gradually and without shock and disturbance. It requires very careful and accurate shop work to put into effect all these details so carefully worked out by the designer, in order that the finished pump may fulfill all the requirements specified, and it is, therefore, very essential that each pump be subjected to a performance test after completion, in order that any discrepancies may be detected and properly corrected. Each installation is a problem by itself and must be treated as such, if definite results and highest efficiency are to be realized.

Application and Uses

Centrifugal pumps may be driven direct or through belt or gear from electric motor, steam turbine or engine, or other source of power, as best suits the requirements of the particular installation. Direct connected to steam turbines they make highly satisfactory steam operated units. They operate on low steam and require less lubricating oil than ordinary steam pumps. They occupy much less space and have advantages in freedom from vibration, noise, motion, and pulsating parts. All too evident to need further comment.

Water Works Service.

Motor driven centrifugal pumps have met with great favor on water works service in small towns and villages. When operated in connection with stand pipe or

elevated tank, they may be arranged to be automatically started and stopped by means of a pressure regulator or float switch. When used with a direct pressure system, the pump or pumps may be run continuously maintaining the pressure and delivering only such water as is drawn from the mains. In localities where a part of the district supplied is on a higher elevation or some distance away requiring an excess pressure, it is found expedient to maintain a domestic pressure at the pumping station suitable for the greatest demand and to insert a centrifugal in the main that supplies the higher pressure. Such an installation is known as a booster pump and it may float on the line continuously adding a fairly constant net pressure irrespective of the amount drawn from that line. It is often the practice to use a moderate pressure in water mains for domestic service and to increase it materially in case of fire. As motor driven centrifugal pumps are preferably constant speed machines and, therefore, suitable for one pressure only, it is quite common in cases of this kind to install two or three duplicate pumps designed for domestic service and operating two in series to obtain increased pressure for fire service.

Quite a large number of turbine driven centrifugal pumps, running condensing, have been installed where in former years only crank and flywheel pumping engines in total yearly operating cost, when due allowance is made for all interest and standing charges on the capital involved. These charges, of course, greatly favor the centrifugal unit on account of its comparative low first cost, together with that of the smaller building, lighter foundation, etc.

Boiler Feeding

Among the many uses of the centrifugal pump, boiler feeding is a service for which it is ideally suited. The pump is usually driven electrically or by steam turbine, whichever is best suited to the particular installation. In operation the motor-driven boiler feeder is generally allowed to run continuously at full speed, maintaining a fairly constant pressure on the feed line for a considerable range of capacity. The amount of water fed to the boiler may be controlled by a throttle valve in the feed line without danger of creating a dangerous increase in the latter, as the centrifugal will not build up a pressure exceeding 15% to 20% above normal pressure, even when the discharge is entirely closed.

Steam turbine driven boiler feeders are sometimes operated in this manner also, but they are more often equipped with pressure regulators of a type similar to those used on ordinary steam pumps to maintain a constant differential between the steam and the feed line water pressures, especially where the variation in steam pressure is considerable. Whether driven by electric motors or turbines, the

feed water to the boiler can be regulated without reference to the pump, and further, there are no valves or large packings to be maintained, nor is there danger of water hammer and breakage in case of loss of suction as with reciprocating pumps.

Efficiency.

The efficiency of any centrifugal pump is highest at only one combination of head and capacity for each change of speed, and, therefore, if a pump is operated on a head or at a speed other than that for which it is designed, the amount of delivery and power required can be only approximately predicted. At the same time, the efficiency would likely be very low, making the installation quite unsatisfactory for the work it was intended to do, as well as expensive in cost of power for driving.

Low pump efficiency means increased power required, and even though it be but a few per cent. it must be borne in mind that this excess horsepower is consumed continuously while the pump is in operation and will total up to a considerable sum in a year's time, representing in dollars and cents more than the difference in cost of a well designed as against an inferior pump, or equalling the interest and depreciation on the entire installation for the same period. In like manner, the saving made by the better pump when compared with the common type, will invariably pay back its entire cost in a comparatively short time.

Wearing Parts

There are a few parts of the enclosed impeller type of pump that are subject to wear, namely, that part of the casing which makes a running joint with the impeller, and the sections of the shaft within the stuffing boxes and the bearings. If these wearing surfaces are provided with renewable parts that can be replaced at small expense, the main and more costly parts, being protected, will last almost indefinitely, ensuring a low cost of maintenance. Wearing rings secured in the casing around the impeller inlet protect the case from wear at this point, and a similar pair of rings made of bronze and secured on the impeller protect it from wear also. Bronze sleeves secured on the shaft and passing out through the stuffing boxes relieve it entirely from scoring by the jacking, or rusting. By supplying the bearings with removable ring-oiled split babbitt-lined shells of spherically seated type which may be easily slipped out when worn, and either rebabbitted or replaced by a new set, the alignment of the rotating element will not be disturbed, and the close fit between the impeller and case so necessary to prevent internal leakage, will be preserved. These features will be clearly illustrated by the views that will be shown on the screen a little later on.

Operating Conditions

It will be readily appreciated from the foregoing that in building a centrifugal pump for a particular installation, it is essential that the conditions of head,

capacity and speed be accurately determined and furnished to the designer, together with any special requirements involved, especially if the highest efficiency is expected. It is not to be understood from this that the centrifugal pump is an extremely sensitive affair that will be efficient at one particular combination of head and capacity only, and of low economy when these ideal conditions do not obtain. The efficiency will remain nearly constant for a small variation in head both above and below the normal, the capacity varying inversely as the head, consequently it is usually safer to figure the total head a trifle high and design the pump accordingly, and then if the head is actually less, a slight increased capacity will result, which is not usually objectionable. Very often two or more conditions of head or capacity can be obtained from a pump of special design running at constant speed with a satisfactory balance of efficiency, and with provision for some speed variation the possibilities of designing for varying service are greatly increased.

Total Head

The total head on which a pump has to operate is made up as follows: Vertical static suction lift from the level of the liquid in the well or sump to the centre of the pump; static discharge head measured vertically from the centre of the pump to the point of discharge; friction in the piping, valves and elbows of both suction and discharge lines, velocity head, and entrance head. In addition the pump must overcome the loss of head within itself, but the builder only is concerned in this, and the efficiency of the pump is the ratio of the theoretical power required in raising the given quantity of liquid against the total head, to the sum of this power plus the hydraulic losses in the pump, and the friction in bearings and stuffing boxes. This sum is known as pump horsepower.

Effect of Speed Variation.

Both the total head and the capacity of a centrifugal pump are quite sensitive to speed variation, therefore great care must be exercised in determining the speed at which a pump is to operate in order that it may be designed accordingly. This is particularly essential when the pump is to be direct connected to a constant speed alternating current motor of which the speed at full load is several per cent. lower than at no load, and there is no convenient way of altering the speed of such a motor.

Priming

A centrifugal pump cannot raise a liquid to itself from a lower level without first being primed, because it possesses no positive displacement feature and, therefore, both the pump case and suction piping must be entirely filled before starting. Priming may be accomplished either by providing a good valve on the lower end of the suction line and filling the pump and suction piping from the discharge line or other source, or by drawing the liquid up into the pump

through the suction pipe by exhausting the air from the top of the pump case. With this latter method, the discharge must be closed off by means of a gate-valve, and the foot valve may be dispensed with if desired, provided the pump is started while it is primed. The air may be withdrawn from the pump by means of a suction pump, steam injector, or other means of creating sufficient vacuum to entirely fill the pump case.

Suction Lift.

Once in operation, a centrifugal pump will handle water or other liquid of the same specific gravity and character at ordinary temperature on as great a suction lift as a reciprocating pump, namely, about 26 feet at or near sea level, and provided the suction piping and pump are entirely free from air and air leaks. Because of the difficulty sometimes encountered in maintaining air-tight suction glands and piping, 18 feet is, however, usually considered the maximum commercial suction lift, and even less is advisable whenever possible.

The limit of suction lift decreases with the rise in temperature of the liquid on account of the increased vapor tension, and it is not advisable to undertake any suction lift with water at a temperature exceeding about 150 deg. Fah., but rather have the pump so located that the water will flow into it by gravity. When handling water at or near the boiling point, as in boiler feeding, the water should flow to the pump under a head of from 6 to 10 feet, and the suction piping should be as direct as possible and of large diameter to eliminate the formation of vapor. Vapor or air or other gas in the pump in considerable quantity will collect within the suction opening of the impeller, being the point of least pressure, and impede the passage of the liquid, reducing the capacity of the pump, and at times causing it to lose its suction entirely.

Size of Piping

Bearing in mind the marked advantage of small suction lift, the intake pipe should be as short and direct as possible, with absolutely tight joints. It is usual to make the intake pipe and foot valve at least one size larger than the pump inlet to reduce friction, which, of course, adds to the suction lift. As the basic principles of the centrifugal pump require the liquid to be handled at high velocity, the suction and discharge openings are much smaller than are usual in reciprocating pumps of equal capacity, and the sizes of both the intake and discharge pipe lines should be determined from the amount of friction in the required length, which can be learned by referring to standard published friction tables.

Installation.

Centrifugal pump installations are usually provided with a gate valve in the discharge to shut the pump off from the line when not in use, or when open for inspection. There is nothing in a centrifugal to hinder the liquid flowing backward through it from the discharge line

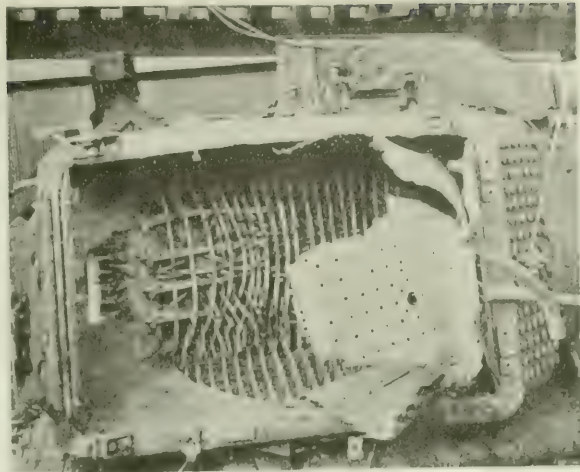


FIG. 1. SHOWING THE FURNACE AND CROWN SHEET.

when not in operation, and consequently in case of a sudden shutting-off of the power, the impeller acting as a water turbine, may be revolved backward at a speed dangerous to both the pump and prime mover. A foot valve on the intake pipe will prevent this occurrence, or if this is not provided, a check valve should be located in the discharge. Where the operating pressure is great and a foot valve is employed, there should also be a check in the discharge to reduce the shock on the pump case when the foot valve seats. The check valve should be provided with a by-pass in order to prime the pump should the foot valve leak.

In placing suction and discharge pipe lines they should be free from high spots or loops forming pockets in which entrained air may accumulate, as the air bubbles thus formed will offer considerable resistance to the movement of the liquid by obstructing its passage, and in case of the suction pipe they are liable to

enter the pump in such quantity as to cause loss of suction entirely.

LOCO. BOILER EXPLOSION

A RAILROAD locomotive boiler exploded recently and caused the death of five men and the injury of another. It will be seen that the crown sheet failed, which is a common method of failure with boilers of this type. The explosion is said to have been due to low water, which caused the crown sheet to become overheated. It is reported that the locomotive had been overhauled not long before, and that it had been in service but a day or two before the explosion occurred.

The boiler was built in 1905. The waist or shell was 69½ inches in diameter, and there were 273 tubes, each 2 inches in diameter and 162½ inches in length. The working pressure was 205

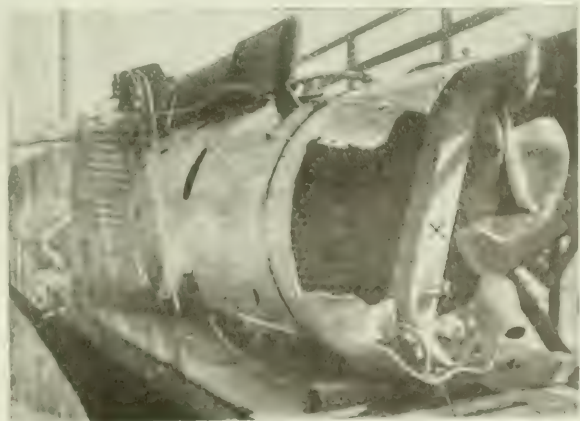


FIG. 2 FRONT END OF BOILER. NOTE RAILROAD TIE X WEDGED INTO SMOKEBOX

pounds. We are informed says the Travelers Standard, that when the explosion occurred the boiler was torn from the locomotive trucks and was blown over a signal tower about 50 feet distant. It turned over twice during its flight, and landed about 124 feet from the spot where it started. At some time during its journey the front end of the boiler fell upon the right of way and cut off a railroad tie, which is shown wedged between the opposite sides of the front course of the boiler in Fig. 2. It is easy to imagine the extreme havoc that would have been wrought by the explosion if this had been a stationary boiler located in the boiler house of a power plant.



UNITED STATES TO LEAD IN SHIP-BUILDING?

IN the recent purchase of 60,000 tons of steel ship plate by the French Commission, through J. P. Morgan & Co., at 6c a pound for hull plate and 8½c to 9c a pound for marine boiler plate, the attitude of the U. S. Government towards its Allies is clearly shown. Washington authorities were not satisfied with charges for plate over these prices, and the mills that have named minimum prices of 7c a pound for hull plate and 13c a pound for marine boiler plate to the Allies, were constrained to accept the Washington view, says the Wall Street Journal.

Plate mills could readily sell maximum capacity for another year on the basis of 12c to 12½c a pound for hull plate and at 10c to 11c for tank plate, so great is the demand at home and abroad; while marine boiler plate for forward shipment would readily command 16c to 17c a pound in the open market. Some mills have asked 20c a pound for boiler plates.

It will be recalled that the Navy Department secured a price of 2.90c a pound for ship plate from the steel manufacturers virtually under duress. The agreement was made between Secretary Daniels and President Farrell of the Steel Corporation, representing the steel makers; but some of the plate manufacturers declared at the time that they could not produce plate at that price and come out even, while others had only a small profit. Since that time, the productive cost has increased. It is claimed that even the Steel Corporation to-day has a profit of only \$4 a ton in ship plate at 2.90c a pound. It is estimated that the cost of producing hull plate under present conditions is \$60 a ton for some large mills and probably \$70 a ton for mills that are dependent upon the open market for raw material.

Labor Cost at Steel Mills

A large percentage of the cost of producing iron and steel at any time is due to labor. Since the first of this year, the wage scale has been increased 40c to 50c, and labor efficiency has decreased 20c to 30c during the same time. Steel companies that have their own supplies of raw material, of course, have

a lower cost than plants that must depend on the open market for their pig iron and other raw material. In ordinary times, the cost of converting pig iron into steel ingots ranges from \$4 to \$10 a ton. The cost is least where molten instead of cold pig iron is used. Today the minimum cost of conversion is several dollars a ton higher; one authority places the minimum to-day at \$7 a ton. To convert ingots into billets, the cost varies from \$4 to \$16 a ton; the minimum to-day is believed to be not far from \$7.50 a ton. Cost of rolling steel varies according to the amount of gas consumed in the reheating furnaces and also depends upon whether gas or oil fuel is used.

Steel plates are rolled from slabs—where the rolling is not direct from ingots—and slabs are made from ingots. There is a loss of 20c to 25c from the ingot to the plate due to the necessary cropping of the ingot. Ship plate costs more than tank plate because of the additional physical and chemical tests that ship plate must meet. The minimum cost of converting ingots into finished plate to-day is fully \$20 a ton for ordinary plate and may be as high as \$30 a ton for ship plate.

U. S. Plate Mill Outputs

Output of the plate mills to-day is at the maximum in the history of the industry, and more new capacity will soon be active. Jones & Laughlin Steel Co. has just started a new 128 inch mill at the Soho Works with a rated capacity of 15,000 tons of plate a month. Bethlehem Steel Co. will start new mills with a capacity of about 10,000 tons a month, probably in September. The new plate mill of the Carnegie Steel Co. at Homestead is expected to be ready to roll in November, but the two new mills of the Brier Hill Steel Co. and the 84 inch mill of the Youngstown Sheet & Tube Co. will not be ready for 12 to 15 months. Illinois Steel Co., Worth Brothers, Corcoran & McKinney Co. and the Ashland plant also are building new mills. When all of these mills are in operation, it is estimated that the United States will have a capacity to roll 430,000 tons of plate a month, of which about 230,000 tons will be ship plate. To-day the monthly rolling of ship plate is about 150,000 tons, or approximately 42c of the total output.

In recent weeks the United States Government has been receiving about 50,000 tons of plate a month from the Carnegie Steel Co., and with the Allies has been getting about 40c of the entire capacity of all of the plate mills. The embargo declared by the President against export of ship plate to become effective August 15, of course, is a step to husband plate resources for government needs.

It is an interesting fact that some of the ship plate bought by the French Commission about two weeks ago, to be used to build war ships and barges to carry supplies on rivers and canals in France, have already been shipped, and the balance will be exported in September

or October. It is stipulated in the Morgan contract that if for any reason exports are held up, and it becomes necessary to store the plate, that the mills will receive 90c of the purchase price. One of the mills has asked for an additional payment of \$2 a ton a month for storage if warehousing becomes necessary. There are many thousand tons of plate already sold for export that remain at the mills or at the seaboard waiting Government licenses, but shipments to England, France, Italy and Russia have gone forward without much delay. New inquiries from Japan and Italy, however, are still going begging.

It should be recognized that the plate mills have taken relatively few orders at the high prices current in the open market recently, but that the bulk of the merchant business has been booked at prices ranging from 4c to 5c a pound, and the large tonnage for the United States Government will be furnished probably between 2.90c and 3.50c a pound. Some mills contend that 4½c would be a fair price for government work.

When the plate mills now building are in commission, the United States will have capacity to produce 230,000 tons of ship capacity a month or 2,760,000 tons per annum. This will be sufficient to permit the building of 690,000 tons of shipping a month, or 8,280,000 tons a year. In an emergency, tank plates can be used for the building of small boats, so achievements may be even greater than anticipated. The total capacity to produce all kinds of plate in another year will be 5,150,000 tons per annum. The United States will emerge from the war as the greatest shipbuilding country in the world; not even second to Great Britain, and if the success of the war depends upon ships—as it seems—the fate of the Teuton is sealed.



ADDITIONAL AIR OVER FUEL BED

ADMISSION of air into the boiler furnace through leaks in the furnace wall is undesirable and should be avoided.

The ideal way to supply additional air over the fuel bed is to introduce it as close to the latter and in as large a number of small streams as possible. The nearer the air is introduced to the surface of the fuel bed, the more combustion space is utilized for mixing air with the combustible gases and for burning the mixture. A large number of small streams of air entering the furnace facilitates mixing the air with the combustible gases, particularly if it is forced in at high velocity. When the air is introduced in one large stream at low velocity it tends to flow parallel to the stream of combustible gases without mixing with them, thus causing slow combustion. The rate of mixing determines the rapidity of combustion of the combustible gases. With a perfect mixture and the usual furnace temperature, the velocity of combustion is very great indeed, so that the combustion is almost of the nature of an explosion.

EDITORIAL CORRESPONDENCE

Embracing the Further Discussion of Previously Published Articles, Inquiries for General Information, Observations and Suggestions—Your Co-operation is Invited

ENGINE-HOUSE EFFICIENCY

By L. E.

A N important difference is to be observed between the boiler house and the engine house as regards the securing of maximum efficiency. In the boiler house, once the design of the plant is satisfactorily settled, everything depends upon the operator. In the hands of a skilful fireman an ill-designed plant may be made to give quite passable results; in the hands of an unskilful fireman the best plants may show a deplorably poor efficiency. Even with mechanical stokers the personal factor is important; with hand firing it is also important. But when one passes from the boiler-house to the engine-house the order is reversed; the determining factor is here the machine rather than the man. If the engine is well designed for the load, and conditions which it has to meet, if the loads on the cylinder are well proportioned, and the valves correctly set, then the engine when set to work will give of its best without any large amount of supervision or alteration by the engineer. Care must, of course, be exercised in seeing that lubrication is perfect, the cylinder must be indicated regularly, to see that the valves are in correct adjustment, and slight alterations made accordingly; the valves and piston must also be tested regularly for steam tightness.

Generally speaking, however, the operations going on in the engine are entirely automatic, and do not require the constant control of the engineer. The normal operation of the engine on which the steam consumption depends is out of the control of the engineer after he has correctly adjusted the parts. For these reasons, power plant owners, while taking care to have good design and skilled operation in both departments, should give especial attention to the machine in the engine room and to the man in the boiler-house.

Engine Losses.

The efficiency problem in the engine-room is mainly one of installing machinery so designed and constructed as to convert the energy in the steam received from the boiler-house into the greatest measure of mechanical power, which means the least losses of heat between the steam inlet valve and the rim of the flywheel.

It has been determined that of the total heat in the fuel, something like 41 per cent. is lost in the engine. This loss is comprised, as to a very small part, of engine friction and radiation; the bulk of it is accounted for by the heat that passes away in the exhaust steam to the condenser. This latter loss is for the most part unavoidable, being due to the

limited range of temperature within in which it is possible to work without resorting to expedients more costly than any economies to be effected. With an average modern engine working under good conditions, using steam at 100 deg. superheat and discharging into an efficient condenser, something like 11½ lb. of steam per indicated horse-power will be used, which means that only 25 per cent. of the heat in the steam is turned to account as mechanical power. But between the absolute minimum of loss necessitated by the nature of the case and the loss which may occur in an engine which is badly designed, constructed and maintained a considerable margin exists, and it is for the power user to reduce this margin to the lowest figure attainable. In a paper read by Mr. John Ingham before the Yorkshire Association of Textile Managers, reducible heat losses in the engine-house were classified under the following heads:

- (a) Leakage of steam past valve and pistons.
- (b) Cylinder condensation.
- (c) Loss due to large clearance.
- (d) Loss of heat between the cylinders.

Valve Leakage.

Take first the loss due to leakage past the valve. Theoretically, when the valve has closed on its seating, no steam should enter the cylinder. Practically there is great difficulty in obtaining and maintaining a steam-tight valve. Whether the valve employed be a slide, Corliss, piston, or drop valve, some leakage takes place. Further, whilst the valve might be steam-tight when tested under pressure when stationary, slight distortions are possible when working, which will cause leakage. With well-bedded valve faces in good condition, the loss will not be much, but periodical tests should be made to ensure that all valves are reasonably steam-tight. Some leakage will similarly occur past the piston. Piston rings and cylinder liners will wear, and although many ingenious devices are in use for maintaining steam-tightness under difficult conditions, tests should be made and the parts examined regularly to make sure that the steam does its work without taking a short cut past badly fitting piston rings.

The loss due to cylinder condensation depends on the range of temperature in the cylinder, or the difference between admission and exhaust, and upon the time the cylinder surfaces are subjected to the lower temperature. Consider for a moment what happens in, say, a Corliss cylinder. Steam is admitted to the cylinder, and fills the cylinder up to say 25 per cent. of the stroke with steam at, say 480 deg. Cut-off takes

place, and steam is expanded down, and, at, say ¾ of the stroke the exhaust valve opens, and the steam passes away to the low-pressure cylinder at a reduced temperature. During the rest of the forward stroke, and up to almost the end of the return stroke, the exhaust valve remains open, and the cylinder walls are subject to the cooling effect of the low-temperature steam. Consequently on the next admission of steam a certain proportion of the heat in the steam is expended in heating up the cylinder walls. The remedy for this is to reduce the temperature range in any one cylinder or to reduce the time during which the cylinder walls are exposed to the lower temperature.

Clearance.

Another factor to which loss may be due is large clearance spaces. The most economical engines, other things being equal, are those with the least clearance. With the piston at one end of the cylinder closed, the space between the back of the pistons and the cylinder cover, and the passages from the valves to the cylinder, must be filled with steam every stroke, and although cushioning after the exhaust valve closes partly affects this, yet much new steam is wasted every stroke from this cause. Any design of cylinder which reduces the clearance space makes for steam economy.

There is, finally, the loss of heat which takes place between the cylinders in compound or triple-expansion engines. An examination of the combined diagrams from such engines reveals that material loss does occur at this stage. It can be reduced considerably by good design and care in covering, and by properly draining the connection between any two cylinders, but it can only be eliminated by allowing the whole of the expansion to take place in one cylinder. In all types of steam engines greater efficiency can be secured by close attention to these four principal sources of heat loss, but in what may be called the standard types of engine there are limiting conditions which prevent improvement beyond a certain point.

Uniflow Efficiency.

There is a type of machine known in which piston leakage, cylinder condensation, and clearance losses are reduced to a minimum, and between cylinders losses are eliminated. This type, known as the uniflow type, was introduced into this country some six years ago, and has been recently described recently. Instead of cylinder valves, it has a ring of exhaust ports round the cylinder midway in its length, and as the piston reaches the end of its stroke it uncovers the port automatically, and

allows a free escape of steam to the exhaust. The cylinder is much larger than in the standard design of engine, and the piston is about three times as deep as the ordinary piston. The steam cycle in the uniflow cylinder is fairly generally understood. The steam valve opens and admits steam expands in the cylinder as the piston moves forward. At a pre-determined point cut-off takes place, and the steam expands in the cylinder as the piston moves forward. When the stroke is nearly completed, the circular exhaust ports surrounding the cylinder are uncovered and the steam escapes to an annular chamber, which is cast round the cylinder, and thence direct to the condenser. The area of the exhaust ports thus uncovered is many times greater than could be provided by any exhaust valve, and consequently the exhaust steam can be got away to the condenser rapidly. As a matter of fact, the piston only just uncovers the openings, and then closes them on its return stroke.

The period during which the cool temperature of the condenser is in touch with the cylinder walls is consequently about $\frac{1}{4}$ of the stroke, as against $\frac{2}{3}$ of a stroke in the ordinary form of cylinder. Compression, of course, commences immediately the ports are closed again, and is carried up to almost the initial pressure.

The heat economies in this type of cylinder are due mainly to two things; first, to reduced cylinder condensation resulting from the diminished time during which the cylinder walls are exposed to the condenser temperature, and second, to the elimination of exhaust valves and the clearance spaces which they entail.

High Vacuum Effective.

A further gain, however, results from the fact that the large area of the exhaust ports permits the bringing of a high vacuum into effective use on the cylinder. To make the most of this factor, special condensing plant must be employed. Where an adequate water supply is available, and a suitable type of condenser is used, it is possible to maintain an effective vacuum of 28 in. and even 29 in. on the piston. The uniflow type of engine has also mechanical advantages. It is simpler in construction and has fewer parts. The working friction is, consequently, less than with a cross compound engine, and a mechanical efficiency as high as 94 per cent. can be obtained. The costs of attendance, oil, repairs and insurance are correspondingly reduced; and the first cost of building and foundations is much smaller. Because of its moderate speed the engine is particularly suitable for weaving sheds, since it can be coupled direct to the main line shaft without the interposition of ropes, belts or gears. Mr. Ingham places the overall economy of such an engine and drive at 5 to 7 per cent. higher than that obtainable from a cross compound engine.

The engine has also the same rate of

steam consumption per horse-power over a fairly wide range of load, which is important in the case of mills where the load is variable or in new mills where it is necessary to have a margin of power available against future extensions. As to speed regulations, a maximum variation of $1\frac{1}{2}$ per cent. has been obtained in everyday practice. This tained with first-class cross compound engines, but is quite satisfactory.

ACCURATE MEASUREMENT OF WORK

By Mark Meredith.

IT has been said, and few would be bold enough to deny the substantial accuracy of the statement, that it was not until shortly after the outbreak of the war that the British manufacturer got his first chance of manufacturing parts in large quantities. He was then placed at the additional advantage that he was working in conjunction with those who, under normal circumstances, would have been his competitors, but even so he found himself hampered by a want of knowledge regarding standards and the methods by which interchangeable parts, such as screws, could be produced quickly, accurately, and efficiently. The manufacturer, however rose quickly to the occasion, and, assisted by the skilled workman, placed the production of small parts on a sound footing. It is only fair to admit that a large share of the credit due has to be given to the manufacturers of the light, high speed machinery which has been imported into the country in such quantities since the outbreak of the war.

Previously, most of the work done in that country was carried out by home-produced tools, and as there was comparatively little repetition work there was no inducement for any engineering firm to provide special equipment and appliances. Only a few, highly specialised on account of the nature of their work, paid serious attention to accuracy of measurement and interchangeability of parts. Of these, some even had their own individual standards, which were not in accord with those of other firms producing similar articles. Numerous instances of this will occur to the mind of the mechanical engineer, and the electrical engineer will remember how, a few years ago, lamp holders for incandescent, electric lamps, and lamp tops, both of which parts were being turned out by the hundreds of thousands, were not standardised, and were not interchangeable.

These facts are all the more curious in that it is an admitted fact that forty or fifty years ago Britain held the premier position as regards the production of accurate work, and apparatus by which it could be produced. An instance of this was recently given in connection with screw thread work. eighty or ninety years ago, when screws were used in comparatively small quantities, every maker was a law unto himself over such details as diameter of screw, shape of

thread, and number of threads to the inch. With a curious lack of foresight many makers went out of their way to produce screws and other small parts which were out of accord with those made by other firms in order that no parts could be used on his machines other than those which were manufactured at his own works. Whitworth was the first to see the folly of this course of action, and he made a strenuous effort to remedy the state of affairs. Even his great efforts took some time before they met with any marked success, and it may be said that the success reached was only attained because he not only set higher standards, but provided the means by which they could be attained.

It is interesting to note that of the measuring equipment now used in the average British workshop about 90 per cent. is of American make, and almost all the remainder has been produced on the continent, and it is said that not only are very few machines in this country capable of cutting an accurate screw thread, but there is no British-made apparatus available and within the reach of the ordinary manufacturer whereby he can precisely measure the result, and much special apparatus cannot be produced without the use of American-made micrometer heads.

SAFETY IN PIT SINKING

By D. Street

SOME highly interesting evidence as to the value of the cementation process in mining has been adduced by the Midland Institute of Mining, civil, and Mechanical engineers. Among the cases in which the Francois System of cementation had been successfully applied are shaft-sinking, or level driving, underground dams, underground fires, defective boreholes, and defective shaft-lining. Cementation as applied to shaft sinking consists of thorough treatment of the measures through which it is desired to sink, thus rendering them practically watertight by the injection of cement into all the existing fissures or cracks in the ground previous to the commencement of actual sinking operations.

Among various instances of the application of the process, is that at Hatfield Main Colliery, and here cementing was decided upon for sinking through the heavily watered porous new red sandstone, and was commenced on the lands which had so far proved successful in ordinary stratified measures. In this case, however, it was soon discovered that in these measures the ordinary cementation process, alone, was of no service, it being found practically impossible to introduce cement into the ground to any useful purpose, as it was washed out by the pressure of the water. Instead, however, of discarding the process altogether, the work was persevered with, until finally, all difficulties were overcome by the introduction of the mechanical process of precipitation which facilitated the introduction of the

cement into the ground. Two chemical solutions were employed, the properties of which produced, when mixed, the formation of the gelatinous precipitate, which, by sealing the pores of the sandstones in the walls of the fissures and the loose material in the fissures, permitted the introduction of the cement. The chemicals used in this instance were silicate of soda and sulphate of alumina and the most efficient precipitation effect was obtained, by experience, in the degree of concentration of the respective solution. The lining of the two shafts consisted throughout of ferro-concrete.

At Rossington Colliery, cementation was effectively applied during the sinking through water-bearing limestone. A claim which might be justly made for the cementation process was its comparative safety. It made the work of the pit-sinker more secure, and reduced the liability to shaft accident due to a fall of bad ground. The chemical solutions which were employed at Hatfield Main had the effect of lubricating the fissures and allowing the introduction of the cement. In many cases the quantity of water in pit shafts, especially in North Wales was accepted as a necessary evil, but not to a necessity. If colliery managers knew what could be done by the cementation process, they would make efforts to get their mines dry. Very great benefits could be secured, which took a great load off the shoulders of the manager. At Vimy, near where British troops have been fighting, two shafts were sunk through chalk. The ground was very wet, but was cemented to a depth of 130 yards, and they had not one bucket of water.

LOST OUTPUT FROM COAL MINES

THE present wastage of man-power, with a corresponding loss in the national output of fuel, is of such importance as to call for the introduction of measures which will ensure to the nation the full-time service and labor of every mine worker. Thousands of miners have during this year worked only part time, the districts which have suffered most being perhaps the North of England, South Wales, and Monmouthshire and Scotland. It has been stated that the miners in Fifeshire and other districts have had just three days' work per week since the beginning of the present year, and that shortage of trucks has been responsible for laying several pits idle many days recently in the eastern valleys of Monmouthshire. For this state of things there is a remedy, which, though not altogether a profitable one from a pre-war point of view, has much to commend it in present circumstances. This remedy would be secured by giving effect to the following:—

- 1.—Every working colliery, irrespective of the general demand for coal, should bring to bank the largest possible amount of coal that is being mined. Every mine worker should have whole-time employment.
2. In the case of transport difficulties

or irregular demand for coal, the surplus output should be stored; at some collieries the small coal could be converted into briquettes and stored in this form for future use.

3.—If the stores of coal were likely to become too large (the nation would be the better for having a reserve store of some millions of tons) short time should not be introduced, but specially selected collieries should be closed down and the labor thus released transferred to the ironstone mines or to other industries or works of national importance.

Handling and Weathering

The disadvantages of coal storage are:—(a)—Loss due to cost of handling; (b)—loss due to weathering; and (c)—possibility of spontaneous ignition.

The cost of storing the coal and then removing it from the stock ground will, of course, depend on the facilities provided for handling; but the amount spent in this way will only be a very small fraction of the present national loss due to capital, labor, and plant being employed only part time. Stock grounds or coal stores would be so situated as to suit the requirements of each particular colliery or group of collieries. The coal in most cases would be stored at or near the pit mouth—i.e., at the point of production; but it might also be stored in some cases at or near the docks, and if transport facilities allowed consumers might be given the option of storing against their future demands.

The loss due to weathering need not cause much concern, since it would not be large from the pecuniary point of view. Colliery owners could in many cases select for storage the coals which, owing to their physical properties and chemical composition, are most immune from the effects of weathering or storage. Some tests on the effect of exposure on certain coals yielded the following results:—

Description of Coal	Storage Conditions	Effect on Calorific Power
Best coal India	Exposed for 4 months in the open	Depth of loss 4 to 5 per cent.
*South Yorkshire extra-soft	Sample exposed for 8 1/2 weeks in England for 2 1/2 years.	Loss 1 1/2 per cent.
*South Yorkshire coal	Sample exposed for 4 1/2 months	Loss 4 1/2 per cent.

*These coals, if stored in large quantities, would not show such a loss in calorific power as shown in the results here given, as contained in the stores of the colliery.

Spontaneous Ignition

Under reasonable conditions of storage, any loss due to spontaneous ignition will be infinitesimal. Coals which are specially susceptible to spontaneous firing are in most cases well known and comparatively few in number. The stocks under the same proposed conditions of storage and handling, as mentioned in the following, would be perfectly safe.

- 1.—The depth of the stacks should be

of coal is more likely to heat than a mass or stack of moderate depth.

2.—The presence of sulphur in the form of iron pyrites may be a source of heat owing to the reaction between the sulphur and oxygen. Thus the coal stacked should be as free from iron pyrites or brasses as is practicable.—Times Engineering Supplement.

LARGE TRADE INCREASE

CANADA'S trade, exclusive of imports and exports of coin and bullion and of foreign merchandise shipped through, increased, according to a statement by Hon. J. D. Reid, Minister of Customs, by almost one hundred million dollars in July last, as compared with July, 1916, and by nearly \$290,000,000 in the four months ended July 31, in comparison with the like period last year. The value of merchandise entered for consumption in July, 1917, was \$90,181,595, and in July, 1916, was \$63,622,687. Goods entered for consumption in the four months of the present fiscal year amounted to \$382,100,850, as against \$249,867,867 in the like period of 1916. Exports of domestic goods reached \$177,366,148 in July last and \$507,854, 674 in the four months' period. They were \$104,964,270 in July, 1916, and \$350,345,305 in the first four months of the last fiscal year.

Exports of foreign merchandise have shown a decided falling off. They were in July only \$2,850,372 and in the four months \$11,604,620, while in the same periods of 1916 they reached \$55,637,340 and \$122,627,072 respectively.

Of the imports for consumption, \$49,442,400 in July were dutiable and \$40,739,195 were on the free list. During the month Customs duties were collected to the amount of \$14,241,047, as compared with \$11,071,100 in July, 1916. Of the imports in the four months' period \$202,470,345 were dutiable, and the duties collected totalled \$60,528,738, as compared with \$46,063,507 in 1916.

There was a decided increase in exports of animals and their products in the periods covered by the statement. Exports of agricultural products in July about equalled those of July, 1916, but there was an increase of \$34,000,000 in the exports of these goods in the four months of the present year as compared with the like period of last year. The greatest increase was in manufactures. Manufactured goods to the amount of 104,000,000 were sent out of the country in July, and to the amount of \$237,480,303 in the four months of this year.

In July, 1916, exports of manufactures were valued at \$20,000,000, and during the like four months of 1917 they were \$119,824,138.

The total tonnage of coal shipped to all sections of the world by the Canadian railways in July last was 1,000,000 tons, or 10 per cent. more than in the corresponding month of 1916.

It is interesting to note that the value of exports of gold in July, 1917, was \$1,000,000, or 10 per cent. more than in the corresponding month of 1916.

STEEL INDUSTRY DEVELOPMENTS

The War-Created Stimulus given the Steel Industry is Reflected alike in the Nature and Application of New and Improved Equipment being Installed and Developed.

TURBO-BLOWERS FOR BLAST FURNACES—II.

By R. H. Rice and S. A. Ross.

UNTIL recently there has been a considerable difference in the efficiency of utilization of blast furnace gas as between the steam engine and the gas engine, but the latest types of steam turbines permit a steam plant to be operated with the same output of electric power to the mill, while also furnishing sufficient gas for blowing purposes, as plants containing gas engines, by the use of a very reasonable amount of make-up coal, as will be seen in the accompanying table, under Charges, Dollars per year. Therefore, the cost of fuel is one of the smaller considerations in judging the relative merits of these two types of installation; whether the price of coal is high or low, the comparison rests on other grounds.

Even with less efficient turbines the cost of coal for make-up is only one of the items which enter into the complete cost of operation, and we can make up a proper comparison of gas engine and steam turbine plants by adding both the fixed charges and the running charges in each case, and adding the excess cost of coal in the turbine plant, if any; and that plant which gives the least total with these figures is the better, regardless of its thermal efficiency.

Blast Furnace Cost Accounting

Blast furnace and steel mill plants have established certain arbitrary subdivisions for convenience in cost accounting; blast furnace cost, gas purifying cost, gas power station costs, etc., being kept as independent groups and charges being made from one department to another. These subdivisions are not used here. The gas from the furnaces is used for the following purposes: Blowing the furnaces, pumping the necessary water for use about the blast furnace and in steel mills, and generating electricity for driving the steel mill and all auxiliary apparatus about the blast furnace plant.

On this basis complete plants have been laid out for a steel mill as an adjunct to four blast furnaces, one of these plants operated by gas engines and the other by steam turbines. These have been called "Typical Gas Plant," and "Typical Steam Plant," respectively. These plants include a blast furnace blowing station, an electric generating station and a pumping station. The figures used for operation, including the amount of carbon burned in the furnaces, gas supplied, electric power produced, water pumped, etc., are all representa-

tive of actual blast furnace and mill conditions. The costs have been carefully collected and adjusted to represent prices ruling in November, 1916.

Gas Plant Constituent

In the four-furnace gas engine plant there is included a gas-electric and gas blowing station with the necessary steam spares for emergencies. It also includes a boiler house supplying steam for various purposes and fired by gas when it is sufficient, and by coal when it is not. There are also proper gas washing and pumping stations.

The plant will be of proper size to supply all the blast furnace demands of air, water, steam and electricity. In addition it will supply during week day working hours, 5,000 kilowatts per furnace, and 4,450 gallons of water per minute per furnace for steel mills. During the time when gas is insufficient to enable the full output of the steel mills to be produced, coal will be used for make-up, the cost of which is included in the figures.

The carbon burned or gasified in the furnace is taken at 12,835 short tons per furnace per month. This corresponds to 400 tons of pig per day, with a coke rate of 2,100 pounds per long ton, or 500 tons per day with a coke rate of 1,700 pounds per long ton.

Typical Turbine Plant

The four-furnace steam turbine plant contains boilers and turbo-generators of

sufficient capacity to make the output to steel mills of water and electric power equal to that of the typical four-furnace gas plant previously given. The power house will contain six turbo-blowers and three 12,000 kilowatt turbo-generators with the necessary auxiliaries including pumps for supplying all of the water used about the plant, boiler feed pumps, feed water heater, etc.

The steam conditions will be as are used in modern electric stations, 235 pounds per square inch gauge, 200 degrees superheat and 28.5 inch vacuum. It turns out that no coal is needed on the average, but to equalize poor gas supply and excess power demands, an amount is used to bring the operation on a par with that of the gas engine plant.

It is to be noted, however, that even with 150 pounds and 28 inches vacuum, a steam plant would make a good showing, of course including the cost of the coal, which would then be greater.

Cost Comparisons

Comparisons have been made by others between gas engine and turbine plants using estimated figures for the most part. Such figures started out with an assumed amount of blast furnace gas produced per ton of iron and with a full load test figure for gas engine efficiencies; and practically 100 per cent. volumetric efficiency of reciprocating blowing tubs. All such suppositions are avoided in the present comparison. All of the

COMPARATIVE COSTS FOR TYPICAL FOUR-FURNACE PLANTS

	First Costs	
	Gas engine	Steam turbine
Primary washers	\$ 131,250	\$131,250
Secondary washing station	300,000
Gas pipe from boiler house	212,500
Boiler and piping	167,500	609,200
Boiler house	41,250	123,750
Electric station apparatus	3,250,000	745,600
Electric station house	250,000	69,200
Blowers, etc.	1,812,500	726,416
Blowing station house	237,500	69,200
Pumping station, standpipe, conduits ..	787,500	293,484
	\$7,190,000	\$2,768,100
Charges—Dollars Per Year		
	Gas engine	Steam turbine
Running charges:—		
Primary gas washers	\$ 2,100	\$ 2,100
Secondary gas washers	42,000
Boilers	12,000	52,750
Electric station	90,000	68,250
Blowing station	49,500	42,000
Pumping station	6,000	4,000
Running charges, total	\$201,600	\$169,100
Fixed charges at 13 per cent.	934,500	359,800
Coal	21,652	78,352
Total charges	\$1,157,752	\$607,252

—Largest steam plant before the Engineers' Society of Western Pennsylvania.

—Cost of Electric and Turbine Research Departments, General Electric Co., Lynn, Mass.

data is secured from plants in actual operation, and this information is used in such a way as to avoid assumptions of fundamental values.

Taxes, interest and obsolescence or amortization are included under the head of fixed charges. (Depreciation is supposed to be divided between repairs, maintenance and obsolescence). Fixed charges are taken throughout at 13 per cent. This is a customary figure for gas engine plants. Steam turbine electric stations often use a lower figure in the neighborhood of 11 per cent.; therefore, the use of a figure 13 per cent. throughout is relatively favorable to the gas engine case. The fixed charges include the following items:—

	Per cent.
Interest (on bonds or capital invested)	5
Taxes	1
Insurance	1
Obsolescence (amount laid by as a sinking fund to retire or amortize the plant)	6
	—
	13

The running charges include operating charges and also charges for maintenance and repairs, so as to keep the plant in first class condition up to the time it is fully amortized. Total charges are found by adding fixed charges, running charges and cost of coal. Make-up coal is used under emergency conditions and the cost of it is included in the total charges mentioned. Coal is taken at \$2 per long ton delivered at the fireroom door, with 13,500 British thermal units per pound.

The running charges of the turbo-blowing apparatus are taken from the actual figures of cost of a turbo-blowing station which had been in use seven years—but adjusted by increasing them 25 per cent. to represent November, 1916, conditions. The running charges for the turbo-generating apparatus are representative figures from central power stations, similarly adjusted.

Heat balances of furnace during average week day working hours are given below. There is a margin on the average for fluctuation of gas and load. The figures are as follows:—

Gas Engine Plant

	Million B. T. U. per hr.	Per cent.
Boilers	62	5.8
Electric station	380	35.3
Blowing station	88	8.2
Stoves	323	30.0
Margin	223	20.7
	1,076	100.0

The figures for British thermal units for the turbine plant are divided proportionally to the steam consumption, allowing 70 per cent. boiler efficiency. These sub-divisions are nearly, but not exactly, comparable with the gas plant, the internal gas washing, electric and steam distribution being different. The figures are as follows:—

Steam Turbine Plant

	Million B. T. U. per hr.	Per cent.
Pumps and miscellaneous ..	81	7.5
Turbo generators	420	39.0
Turbo-blowers	148	13.8
Stoves	323	30.0
Margin	223	20.7
	1,195	111.0
Deduct heat from coal	119	11.0
	—	—
Heat from gas	1,076	100.0

This comparison is based on the best gas engine figures for actual performance which have come to the authors' attention. The use of the figures from another and larger installation would render the use of make-up coal unnecessary except under circumstances which require its use in either plant.

The results show that, in the plants under discussion, the gas engine plant will cost nearly \$4,500,000 in excess of the steam turbine plant. The operating cost, it is believed, will be about \$550,500 per year more in case of the gas plant.

On the usual basis of computation employed in considering the advisability of installing more economical units in our central power stations, the saving to be realized by the use of the steam plant would justify an excess first cost of \$5,505,000, whereas the steam plant actually costs \$4,422,000 less. No matter what differences of opinion or of fact due to locality or type of installation may be applied to these figures, it may be accepted as certain that wherever fixed charges are assessed against the power plant, the steam turbine will show a balance in its favor.

CANADA'S SUGAR BEET INDUSTRY PROMISING

THE sugar beet is one of the best crops in Western Canada. With the necessary labor and capital, it is stated a most successful industry could be built up.

In Southern Alberta the area suited to the growth of sugar beets is greater in extent than any two of the largest producing districts in the United States. That more has not been heard of the possibilities of this crop in Alberta is due to the success of the farmer in grain growing and stock raising. But, just as a higher quality of grain with larger yields, is produced in Western Canada than in the older districts, so beets grown here generally contain a higher percentage of sugar and yield a greater tonnage to the acre than those grown elsewhere. Beets with a sugar content of 20 per cent. have been grown in successive years, and growers are confident that this percentage can be maintained with large crops.

In 1915 the consumption of sugar in Alberta was approximately 42,000,000 pounds; in British Columbia, 33,000,000; in Saskatchewan, 50,000,000, and in Manitoba, 40,000,000 pounds, making a total for the western provinces alone of 165,000,000 pounds. The total produc-

tion of sugar in the whole of the Dominion amounted to 37,000,000 pounds. A large market is therefore, right at the door. Alberta alone has an area sufficiently large to produce sugar for the needs of Western Canada, and also to export large quantities.

CANADA'S PULP INDUSTRY

THE progress that Canada is making toward becoming the world's centre for the manufacture of pulp and paper is indicated in figures recently published by the Department of Trade and Commerce. For the year ended July, 1916, the exports of paper amounted to \$21,678,868, of which 88 per cent. went to the United States and 5.2 per cent. to the United Kingdom. This total is an increase of 31 per cent. over the figures for the year previous. The first export shipment of paper from Canada was made in 1892. The total exports for 1902 were but \$24,000 and for 1913 only \$6,327,000.

The total exports of paper, pulp, and pulpwood for the year ended July, 1916, were \$40,865,266, of which the United States received 87 per cent. and the United Kingdom 6 per cent. The increase over the previous year was 27 per cent. On the other hand, Canada imported, during the year ended July, 1916, \$6,327,398 worth of paper and manufactures of paper.

The foregoing facts, in conjunction with the use by Canadian pulp and paper mills of nearly \$9,500,000 worth of pulpwood, indicate the tremendous drain upon Canadian pulpwood resources, according to a statement issued by the conservation commission. This drain is likely to increase rather than diminish, in view of the rapid depletion of accessible supplies of timber suitable for pulpwood in the United States.

If this great source of national wealth is to be perpetuated, much more stringent measures than in the past must be taken to prevent destruction by fire and to insure the restocking to valuable species of cut-over and burned-over areas.—“Monetary Times.”

MOVING A BLAST FURNACE.

MOVING a blast furnace is something new in the iron and steel industry, but this has been undertaken by the Algoma Steel Co., which has purchased the No. 2 furnace of the former Canada Iron Corporation, Midland, Ont., and is now moving the entire furnace, including stoves, hoists and buildings, by first excavating out the foundation from Midland to Sault Ste. Marie, a distance of about 100 miles. The steel company purchased this unused furnace because it expected that it could dismantle the plant and re-erect it in much quicker time than a new furnace could be built under the present conditions. This is a "moving" job. The contract for moving the furnace was awarded to the Algoma Steel Co. by Arthur G. McKee & Co., consulting and contracting engineers, Cleveland.

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

NAIL DIE GRINDING MACHINE

THE rapid and accurate grinding of nail machine dies, is a pre-requisite in the economical operation of nail machines. In connection with their line of nail machines, sleeper & Hartley, Inc., Coaticook, P.Q., have designed the die grinding machine illustrated herewith, and are now marketing it for use with dies of all kinds.

The machine is provided with two wheels, mounted on a double-ended spindle. One of these wheels is for squaring

and uniformly ground dies can be produced without the aid of a skilled mechanic.

Normal equipment of the machine consists of one die holder to customer's specification, an additional die holder being required for each section of die stock. The machine is furnished with countershaft, weighs 350 lbs. net, and occupies a floor space of 16 in. by 22 in.

OFFSET DRILLING ATTACHMENT

INCREASED refinements in nearly every branch of machine construction and design have made corresponding demands on machine tool designers. One result of this has been to stimulate to the production of subsidiary devices and apparatus whereby not only is the handicap of deficient equipment removed from the designer, but the producer in the shop receives additional facilities, so that many hitherto impossible or troublesome operations are performed conveniently.

A device of this nature is illustrated herewith, the two operations shown demonstrating its applicability to work of a widely varying character not commercially feasible hitherto. The drilling of a hole in a high speed pulley rim in order to fix an oil tube will throw the pulley seriously out of balance. As shown in Fig. 1, the offset drilling attachment enables this objection to be overcome. Numerous applications of a

like nature will suggest themselves such as drilling holes in engine crank shafts for balancing purposes, or for distribution of lubricant. It further enables designing engineers to embody in their designs ideas which are avoided at the present time due to lack of proper means for drilling in out of the way places.

The method of using shown in Fig. 2 is practically useful in jig and fixture work as well as in straight manufacturing. By using a counterbore or end mill of suitable dimensions, internal bosses



NAIL DIE GRINDING MACHINE.

the dies, and guides for this purpose are provided upon the work rest,—the other wheel has a V-shaped, formed edge, and is intended for grinding the pointed dies. Below this wheel a table is mounted on the machine frame for vertical travel, and is adjustable to and from the wheel by a screw and hand wheel. This table carries a support adapted to receive the holder in which the die is mounted for grinding, the support being adjustable laterally, so as to bring the dies into line with the wheel.

The die holder itself may be rotated in the support so as to locate the die at will in any one of three grinding positions. When positioned, the die (together with its holder and support) is reciprocated to and fro past the wheel, while the whole table may be fed to or from the wheel as desired.

Operation of the machine is easily acquired by unskilled labor and accurately

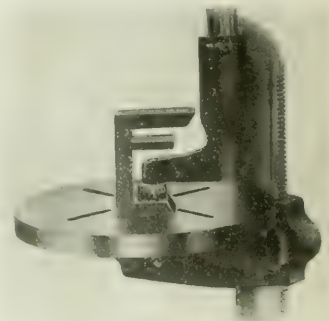


FIG. 2 OFFSET DRILLING ATTACHMENT FACING INTERNAL BOSS ON FIXTURE.

on castings, automobile parts, etc., may be faced off with ease and accuracy, this field of application being greatly widened by the use of a compound slide mounted on the drill press table by which end milling can be done in otherwise inaccessible positions.

This device is built by the H. E. Harris Engineering Co., Bridgeport, Conn., in eight sizes to fit every standard make and size of drill press or similar machine. The entire mechanism is contained in a single casting which is clamped to the lower end of the spindle sleeve by which it is fed down to the work while the spindle imparts motion to the drill through a train of heat treated vanadium steel gears. The attachment can therefore be swiveled among the centre of the drill press spindle to the position which is most convenient for the operator.

One holder is furnished with each attachment and the tool or drill is fitted to this holder, which has a positive drive and means for holding the tool central. Tools are readily changed without disturbing the set up of the attachment in the drill press.



FIG. 1 DRILLING OIL HOLE IN PULLEY WITH OFFSET DRILLING ATTACHMENT.

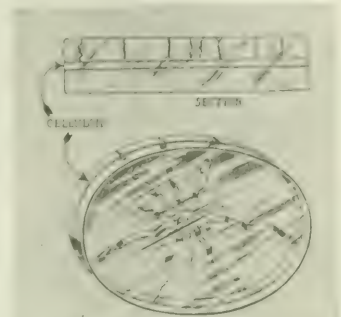
MECHANICALLY-OPERATED LADLE STOPPER

THE disadvantages of operating a ladle stopper in the usual manner in present practice are numerous, owing to the extreme heat of the molten metal, its liability to scatter over the operators and other causes, says the Iron Age. It is apparent that the ladleman and his helper standing on the platform adjacent to the molds, occupy dangerous positions, because the gases escaping, while the mold is filling, keep the metal in motion and eruption, frequently causing some to fall on the operators. Again, the operators are sometimes fatally burned by the metal escaping from a ladle overturning when a rope, chain, hook, or other part of the hoisting mechanism breaks, which is liable to occur at any time. It also occasionally hap-

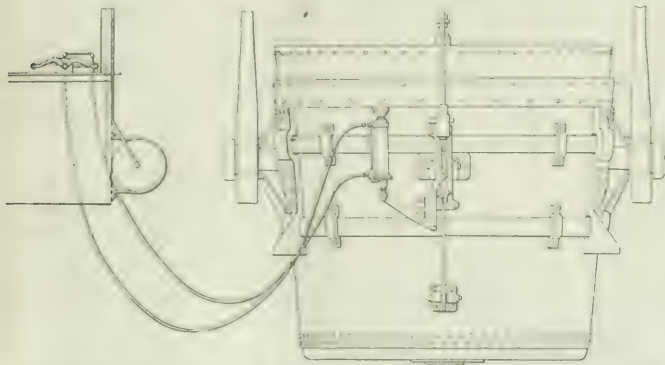
pened, as shown by the illustration, the piston rod of which is connected to the sliding plate by means of a link and lever. Mounted in the crane cage is an air valve similar to those used on pneumatic hoists having flexible tube connections to the cylinder and to the air tank. The ends of the tubes have quick detachable hose connections. A tank is attached to the crane and is supplied with air from a motor-driven compressor. The operation of the device is as follows:

After the ladle full of molten metal is in place over a mold, the cranimen raises the lever of the air valve admitting air under pressure to the cylinder which raises the stopper thus admitting the metal to flow through the nozzle into the mold. When the mold is full, the lever is lowered so as to admit

ence of gas, dust or unbearable light constitute a hazard to the eyesight, has been developed by an optical firm. That it will



SKETCH SHOWING CONSTRUCTION OF UNBREAKABLE LENS.



PNEUMATIC APPARATUS FOR MECHANICALLY OPERATING THE LADLE STOPPER WHEN POURING STEEL.

pens after partly emptying the ladle, that the metal violently reacts, the escaping gas throwing the liquid metal to the roof of the building and rendering it extremely dangerous for the operators.

A further serious objection is that not infrequently the stopper will only partially close the nozzle opening, due to imperfect construction, thereby allowing a stream of metal to escape when the nozzle is supposed to have been closed. The nozzle also occasionally breaks, owing to sudden expansion when the hot metal strikes it, causing a leak, so that while the ladle is being conveyed from mold to mold, the metal from a leaky nozzle striking the top edges of the molds, splashes upon the operators and frequently burns seriously.

To overcome these objections and obviate the necessity of employing ladlemen, George A. Wettengel has devised an improved stopper operating mechanism in which the operation of the stopper is entirely under the control of the cranimen or the pusher, who is always a sufficient distance away to insure his safety.

According to U.S. patent No. 1,207,251, it consists of a mechanism for raising and lowering the ladle stopper. Compared to the usual stopper mechanism is an air

cylinder, into the opposite end of the cylinder, which lowers the stopper and stops the flow of metal. This is not only a safety device, but it is also a labour saver, no ladleman being required.

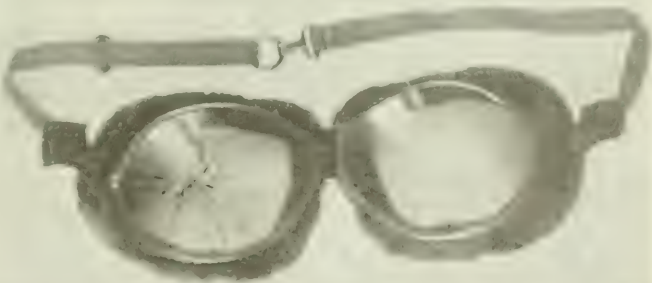
UNBREAKABLE GOGGLE GLASSES

A SAFETY glass, which has a wide scope of applicability in connection with protective goggles and masks used by workmen where flying chips, the pres-

appeal to machinists, foundry men, welders, sand blast operators, etc., can be gathered from the fact that, although the glass can be cracked, it cannot be actually broken even by a hammer blow, while in cracking there is no flying of splinters to jeopardize the eyesight of the wearer.

"Resistal" is the trade name of the glass used in the manufacture of these safety goggles and masks, and its construction is made plain by the accompanying sketch. It comprises two layers of perfect optical glass, which may be plain or curved, with a layer of celluloid interposed, the whole being welded—not cemented—into a solid mass. The result is a crystal that has every virtue of the ordinary glass, with none of its dangers and drawbacks; it has at the same time all of the strength and safety features of the celluloid "light," but, unlike celluloid, it is unscratchable, is rigid, and absolutely fireproof. Neither is it affected by water, heat or cold, and the celluloid layer provides a heat-insulating medium which effectively prevents clouding up, due to moisture condensation.

Goggles fitted with these crystals are being offered in a variety of styles to suit individual tastes and needs, and in either clear, amber or euphos colors,



GOGGLES MAY HAVE THE SAFETY GLASS, MAKING THEM THE MOST EFFICIENT (DON'T) WITH THE MOST MODERN METHOD OF LENS CONSTRUCTION.

by Strauss & Buegeleisen, 37 Warren Street, New York City. The firm also supplies the crystals in special forms for use in industrial masks. It is stated that these goggles have been adopted for the needs of the Aviation Corps, U. S. Army, while from the same quarter the makers have received orders for a large number of crystals for military gas mask purposes. The fact that the glass remains perfectly gas and water-tight even when badly cracked, makes it ideal for use in the latter application.



THE HYDRAULIC RAM

IN response to an inquiry from one of our readers concerning the operation, etc., of the hydraulic ram, we have pleasure in reproducing an article covering same which appeared in our columns some years ago, believing that by doing so the information will be appreciated by others as well.

The principles underlying the construction and operation of the hydraulic ram were recognized as early as 1775 by John Whitehurst, who in that year communicated to the Royal Society a paper describing a machine of a similar type

raises and lifts the check valve, allowing some of the water to enter the air chamber W, compressing the air and forcing an equal amount of water into the tank C. When the water in the drive pipe comes to rest, V₂ closes, V₁ opens, and the cycle is repeated. The pressure may for an instant be slightly less than atmospheric, and advantage is taken of this to introduce a small amount of air through an air valve. This air replenishes any part of the supply in the air chamber which may be carried out with the water.

Although the ram may have a high efficiency, it is wasteful of water, and the form shown in section in Fig. 2 has been devised to pump pure water with a minimum of waste. Connection is made at A to the source of waste water, which may be any polluted water available. The connection to the potable water should preferably come from a source under slightly greater head than the impure water. In this ram the waste water consists mainly of that entering at A but, in part from that entering at I and, if the capacity of the space between the waste valve B and the check valve C is greater than the

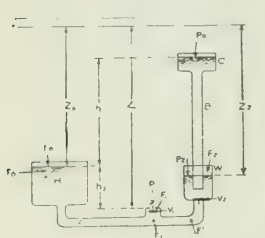


FIG. 1.—DIAGRAM OF OPERATION OF HYDRAULIC RAM.

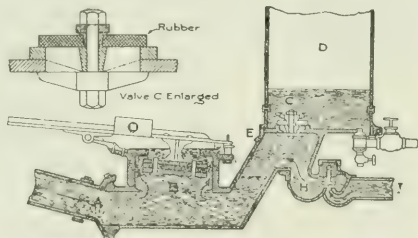


FIG. 2.—SECTION OF DOUBLE SUPPLY HYDRAULIC RAM.

in which the overflow or waste valve was operated by hand. The next improvement was made by a Frenchman, Joseph Michael de Montgolfier. He was the first to see that the variable pressure, produced by changing the velocity of a column of water, could be utilized to operate the valve. Since that time, although numerous improvements have been made in the way of securing quick action of valves by aid of springs and weighted levers, the ram is essentially the same as in its earliest form.

A drive pipe A, Fig. 1, takes water from a source of supply H, to a chamber which contains the valve V. This valve, which opens inwardly, is called the waste or overflow valve. In another part of the same, or communicating chamber, is a check valve V₁, which leads to the tank into which water is being forced and which has a water level considerably above that of the supply tank. When V₁ is opened, the column of water in the drive pipe is set in motion, and will finally attain a velocity which builds up a pressure under V₁ sufficient to close the waste valve. The energy of the moving mass in the drive pipe cannot immediately be dissipated, therefore, the pressure in the chamber

amount of water delivered per pulse, no impure water can enter the chamber D. In this ram the air valve is placed at E.

The hydraulic ram lends itself readily to variable demand, which can be met by either changing the weight of the waste valve or adjusting its stroke. Its greatest field is in the water supply for small towns where the cost of maintenance and attendance must be kept as low as possible.



They Took Him.—John Humphries is telling this one in his "Home From the Front" scene: "Fellow appealed at the tribunal 'cos he 'ad one foot shorter than the other. They passed 'im for general service abroad. The ground's very uneven in France."

A popular archdeacon whilst out one day with his dog and gun met a parishioner.

"I hope," said the archdeacon, "you attend church regularly and read your Bible?"

"I do read my Bible," replied the parishioner, and added, in a severe tone, "but I nowhere find that the Apostles went out shooting."

"No," said the archdeacon, "the shooting was very bad in Palestine, so they went fishing instead."

A man living in a quiet country place invited a neighbor to dine and spend the evening with him. The night being dark, when it was time to go, the guest, who had done himself very well, begged to be allowed to borrow a large lantern in the hall to light him on his way. The next day the host sent his servant round with the following note: "Dear old chap, I shall be glad to have back my parrot and cage if you have finished with it."

"Have you taken anything for your complaint?" asked the doctor of a long, lank, hungry-looking man, who came to him complaining of being "all run down," his appearance verifying his words.

"Well, I ain't been taking much of anything, Doc—that is, nothing to speak of. I tuk a couple o' bottles o' Pinkham's bitters awhile back, an' a bottle o' Quackham's invigorator, with a couple o' boxes o' Curen's pills, and a lot o' quinine, and some dandelion tea my old woman made. I've got a mustard plaster on my back, an' a liver pad on, an' I'm wearing an 'lectric belt, an' takin' cod liver oil four times a dav, with a dose or two of ginger ev'ry other day; 'ceptin' for that I ain't takin' nothin'."

The Theatre Habit.—Two girlhood friends were exchanging confidence over their afternoon tea.

"I saw you in church, dear, yesterday," murmured the younger one.

"Oh, you were there? I didn't see you," gurgled the other.

"Yes. And I was so glad to see that you finally induced your husband to accompany you to divine worship."

"Yes, Frank came along with me. He'd much rather go to the theatre, but the theatres are not showing anything on Sundays now. But he disgraced me."

"Really? In church? How, pray?"

"The minister read four chapters from The Acts of the Apostles, and my husband insisted on going out after every act."

Kind-Hearted Rena.—The wife of a successful young literary man had hired a buxom Dutch girl to do the housework. Several weeks passed and from seeing her master constantly about the house, the girl received an erroneous impression.

"Ogscuse me, Mrs. Blank," she said to her mistress one day, "but I like to say somedings."

"Well, Rena?"

The girl blushed, fumbled with her apron and then replied, "Vell, you pay me four tollars a week—"

"Yes, and I really can't pay you any more."

"It's not dot," responded the girl; "but I be villing to take tree tollars till—till your husband gets vork."

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OUR METAL-WORKING PLANT OUTLOOK CONTINUES BRIGHT

AN interesting feature of the Canadian steel situation during the present week has been the intimation by the Imperial Munitions Board to producers that for the present month shipments to the trade must be of secondary consideration because those of shell steel are running behind schedule. The latter circumstance is of course due to the prevailing hot weather at this season of the year, which militates against maximum output on the part of the men employed in the mills. Taken in conjunction with the U.S. steel embargo, which went into effect on the 15th of the month, the position of domestic consumers requiring more or less immediate delivery, is by no means an enviable one.

Price fixing by the American Government is still under consideration, and, judging by appearances, the undertaking is becoming all the time more impossible. Something approaching two months has now elapsed since the propaganda was inaugurated, and the principal result to date has been the dislocation of the market. In the latter, the tendency has been towards a downward readjustment of prices, and doubtless this will be so accentuated in the near future that the much talked of "fixing" will be forestalled and therefore unnecessary.

The curtailment of finished shell production in Canada has so far had but little effect on the labor situation, which goes to show that a great majority of the metal-working plants have been taking time by the forelock in the introduction of other lines of product. It has always been our view that a grossly exaggerated estimate of the number of men employed in munitions making existed, and does still exist, and that meantime it would be more correct to rate the operator constituent in terms of thousands instead of by hundreds of thousands as seems to be the rule.

The impetus given steel shipbuilding in Canada has been the means of absorbing much of the overflow help from munitions-making, besides creating new opportunities for craftsmen who have not been directly involved in that industry. We do not look to see unemployment develop to any great extent as a result of even the complete cessation of munitions machining, steel shipbuilding and its allied industries for the next five years at least, being

of such gigantic proportions as to need all the help—skilled and otherwise that may be procurable.

To what extent Canadian metal-working plants are likely to participate in U.S. Government contracts is meantime problematical, however, private advices from Washington, D.C., indicate that contracts covering a miscellaneous assortment of ship and munitions production equipment are likely to be procurable. Ships' anchors, to mention one line for which contracts are pending, are called for in quantity up to 20,000,000 pounds, and difficulty is anticipated in placing the complete order in the States, plants engaged in the manufacture of these products in the past being under somewhat of a handicap because of each anchor unit being a departure from former practice.

It is understood that some Canadian metal-working interests have already taken action as regards securing American Government war business, with what success, however, we are not at the moment in a position to say. Others are doubtless anxious to bear a part in the work, if they can get opportunity; to which end, information available to this journal is at their disposal.

ACCIDENT PREVENTION

CONSERVATION of life and energy has probably never before been so deeply impressed upon our minds as now. The need of preserving and protecting humanity from the risks of permanent or temporary disablement, arising from industrial activity, has been much emphasized by the knowledge that the past three years has shorn us of much of that man power which is so indispensable to our national development in the arts, crafts and manufactures. What may tend to increase the possibilities of accident, and likewise the responsibilities of the employer and the employed, is the advent of woman labor into the ranks of metal-working plant operators. While the likelihood of accident may be no greater in one case or the other—the female than the male, the fact that the so-called weaker sex must inevitably take a prominent part in post-war development, should be a stimulus to those concerned, to eliminate, or at least constrict the opportunities for injury that have ever been incidental to most phases of manufacture.

While safe-guarding methods and devices are deserving of just commendation they should never be wholly relied upon as an infallible proof of non-liability to injury. No proposed or adopted method of operating or guarding machine mechanisms should be termed fool-proof, even though it has been amply demonstrated that it is practically impossible to tamper with or destroy its intended purpose. The mere statement that a thing is fool-proof implies that it is proof against a fool's meddling, and any fair-minded person would or should resent the implication. It is invariably within the power of the workman to "make" or "mar" any new innovation—providing its effectiveness is being tried for the first time.

It does not pay to "force" protection on factory employees, but it does pay to have them realize the many advantages that are to be derived by adapting themselves to the changed conditions. Some men unfortunately become easily prejudiced, and will for a time do all in their power to deter rather than assist such methods as are advanced for their own welfare and protection. No safety or protective device can be entirely successful without the absolute co-operation of the employees it is intended to serve. If a safety method has any outstanding advantages—and few have not a fair proportion, it should be the duty of the workman to adapt himself as rapidly as possible to the conditions which it presents. The chief beneficiary

ELECTRIC WELD COIL CHAIN B.B.

Table listing electric weld coil chain B.B. with sizes (1/4 in. to 3/4 in.) and prices per 100 lbs.

FILES AND RASPS.

Table listing files and rasps with types (Great Western, Kearney & Lake, etc.) and prices per cent.

COAL AND COKE.

Table listing coal and coke with types (Solves Foundry, Connelville, etc.) and prices per ton.

BOILER TUBES.

Table listing boiler tubes with sizes (1 in. to 4 in.) and prices per 100 feet.

OILS AND COMPOUNDS.

Table listing oils and compounds with types (Castor oil, Machine oil, etc.) and prices per gallon.

Table listing lubricating oils (Lubricating oil, Cylinder oil, etc.) and prices per gallon.

BILLING—NO. 1 OAK TANNED.

Table listing tanned leather with types (Extra heavy, double, etc.) and prices per side.

TAPES.

Table listing various tapes (Chesterman Metal, Larkin Metal, etc.) and prices per 50 ft.

WASTE.

Table listing waste materials (XXX Extra, Delectics, Grand, etc.) and prices per lb.

COLORS.

Table listing various colors (Lion, Standard, New, etc.) and prices per lb.

WOOL PACKING.

Table listing wool packing materials (Autow, Axle, etc.) and prices per lb.

WASHED WIPERS.

Table listing washed wipers with types (Sheet, Washed, etc.) and prices per 100 yds.

RUBBER BELTING.

Table listing rubber belting with types (Standard, Best, etc.) and prices per 100 yds.

ANODES.

Table listing anodes with types (Nickel, Copper, Zinc) and prices per lb.

COPPER PRODUCTS.

Table listing copper products with types (Brass, Copper wire, Copper sheet, etc.) and prices per lb.

BRASS.

Table listing brass products with types (Brass rods, Brass sheets, etc.) and prices per lb.

PLATING SUPPLIES.

Table listing plating supplies with types (Polishing wheels, Buffs, etc.) and prices per lb.

LEAD SHEETS.

Table listing lead sheets with types (Montreal, etc.) and prices per lb.

PLATING CHEMICALS.

Table listing plating chemicals with types (Ammonium chloride, Ammonium sulphuret, etc.) and prices per lb.

The General Market Condition and Tendency

NO official announcement has as yet been made at Washington regarding prices of steel. Although a report is current that the American Government and the Allies will pay \$65 a ton for their requirements. While this is not official, it may prove to be correct. At the same time there may be provisos added to change the character of decision. Questions arising out of the embargo on steel from the United States are under consideration by the leading steel interests in Canada with a view to relieving the somewhat acute situation created. Certain trades, it is hoped, will obtain better treatment than was anticipated in the first instance. With the exception of billets, prices on steel products continue stationary, but with a weaker tendency. The continuance of present price conditions depends largely upon what action the U.S. Government will take in regard to its price-fixing policy. Until something definite is known no material change in the situation may be expected. Pig-iron prices are firm and unchanged. The market continues dull and unsettled, the embargo on iron from the States having caused considerable inconvenience to consumers. Coke prices are small, stationary, but a decrease of price will result from coal. The scrap metal market is dull, but prices are stationary with a weaker tendency. Consumers are keeping out of the market expecting lower prices, while sellers are looking for an advance. Nonferrous metals are firmer and the outlook for the market is brighter. Considerable uncertainty, however, still prevails regarding developments in prices. Tin has advanced one cent, this being the only change to note this week. The machine tool market is a little quiet across the board, but demand for tools for general purposes, replacing the former demand for equipment for manufacturing plants. A number of machine shops are now engaged in building marine engines and auxiliary equipment for ships.

Montreal, Que., Aug. 20, 1917.—The industrial situation has developed no features of interest during the past week, and the markets are still awaiting the announcement of the American Government regarding the finding of the various investigations that have been progressing with a view to adjusting the prices to meet the requirements of the present situation. That these adjustments will affect the present standing of the market is generally understood, but the uncertainty as to actual price figures tends to maintain the market in a very unsettled state. Owing to transportation requirements in America, the recall of rolling stock now on the various Canadian roads, has somewhat disorganized railroad facilities here in Canada, and shippers and consumers are experiencing some difficulty in the delivery of material.

Pig Iron

While any falling off in actual production may be due to weather conditions, the market is still in a state of uncertainty. The situation is generally expected to improve in the near future, but the uncertainty of the situation may have an early future conditions. The market is generally expected to improve in the near future, but the uncertainty of the situation may have an early future conditions. The market is generally expected to improve in the near future, but the uncertainty of the situation may have an early future conditions.

control of raw and semi-finished materials. While there is an undoubted undertone of weakness, the present market continues comparatively firm with all quotations nominal and unchanged. Conditions here are still the same with Canadian quotations withheld.

Steel.

Added to the seasonal dullness, the general market continues to reflect the uncertainty that prevails in all quarters owing to the price fixing plans of the American Government. It is reported unofficially that a flat rate of \$65 per ton is likely to be decided on, as the figure at which steel for war purposes will be supplied to all the Allies, but the impression of the trade appears to be that any adjustment that the Government may make will not be a satisfactory solution to the present situation, as the many plants now working on the production of steel are doing so under greatly varied conditions, which make it very difficult to set a fixed price for steel and iron on the actual cost of production. However, with the steel makers and the Government working hand in hand for the same end, it is possible that some decision will be arrived at that will be agreeable to all concerned. The excessive requirements that have been created by the United States war program have necessitated a partial embargo on shipments of steel into Canada, other than that required for war materials, resulting in a further handicap to the domestic consumer. The demand for steel in Canada for munitions purposes shows a slight falling off and in addition to the stoppage of large shell manufacture, there is a rumor that the production on the 4.5 inch high explosive will shortly be cut, so as to provide increased material and funds for shipbuilding purposes. While the general activity remains the same, the situation is affected by the delay on the part of the U. S. Government in the adoption of the policy that is to control the future sale and distribution of all war materials. The restrictions that have been placed upon the export of steel have recently resulted in an over supply of billets and sheet bars on the American market, and the situation in these commodities has developed an easier tone, aided also by the prevailing uncertainty; the Pittsburgh quotation of \$85 shows a decline of \$5 per ton. A similar decline is noted in rolling and forging billets, the respective quotations being \$100 and \$125 per ton. With the exception of Government work, or that authorized by the Government, structural material is almost at a standstill; the Canadian situation is relatively quiet, but that in the States is very active, more particularly on new plants for munitions or ship building. The plate situation is not so active, but continues to be the feature of the market. The wire market, including rods and wire products, is fairly active, but these, like other commodities, are passing through an unsettled period, during the

investigation into labor and production costs. The local situation shows little change as the trade is still awaiting the outcome of present developments, both on this and the other side of the line. Transportation difficulties continue to be a feature of the existing conditions.

High Speed Steel.—Nothing of importance has developed to alter the situation in the high speed steel market, although the demand is not as brisk as a few months back; the price is nominally unchanged owing largely to the high cost of all raw materials and the higher expense entailed in manufacture.

Metals.

The metal situation is still influenced by the attitude of the United States

a position to announce the prices to be paid for copper and other metals, based on the investigation that has been taking place into the actual cost of production. The near approach to definite action in this direction has left the market in a pronounced state of inactivity, as few are anxious to buy under the present unsettled condition. Nothing is apparently known as to the price set by the Government, but that a figure lower than the present market will prevail seems to be indicated by the weaker tone of the New York market; a decline of $\frac{1}{2}$ c being reported on lake, $\frac{3}{4}$ c on electro, and 1c on castings. American quotations are 29 $\frac{1}{2}$ c, 27 $\frac{1}{4}$ c and 26 $\frac{1}{2}$ c respectively. On a quiet market, prices are unchanged at 34c for lake and electrolytic, and 33c for castings.

Tin.—This market, while not directly in the control of the American Government, has experienced much of the unsettlement that has been so marked in other directions. No active buying has taken place of late as consumers are awaiting developments. It is anticipated and furthermore hoped, that the British Government will reciprocate in connection with tin transactions, in return for the attitude that the American authorities contemplate in the prices that will be set for steel and metals for delivery to the Allies. This uncertainty, however, places the trade in a position where reluctance is one of the features of the present market. Local tin is not active, but quotations are firm at last week's price of 62c per lb.

Spelter.—The market is still reflecting the secrecy of the American Government in connection with the announcement of prices paid for recent purchases and those that are expected to be paid for early future requirements. The accumulation of stocks has made the spot price easier, but the future quotations are strong. New York quotations on spelter have declined $\frac{1}{2}$ c during the week, the price being now a little better than 8 $\frac{1}{2}$ c per lb. Dealers here report a quiet market with a weak undertone; present prices are, however, the same as last week, 11c per lb.

Lead.—The situation is undoubtedly easier, but the apparent absence of heavy supplies continues to retain a relatively firm market. Despite the fact that independents are quoting $\frac{1}{2}$ c lower than last week, the market has remained inactive; this being accounted for by the general uncertainty of the present situation. Local dealers are quoting last week's price of 13 $\frac{1}{2}$ c on a quiet market.

Antimony.—The market is quiet and inactive and is also developing a weak undertone as a result of a falling off in the demand. The New York market is easier, and has declined $\frac{1}{2}$ c to the nominal figure of 15 $\frac{1}{2}$ c per lb. The situation here is quiet and unchanged with prices steady at 20c per lb.

Aluminum.—The situation in aluminum is undoubtedly easier, but no marked change is reported in current quota-

PUMPING EQUIPMENT REQUIRED

Tender forms, specifications and drawings have been received from D. H. Ross, Canadian Trade Commissioner, Melbourne, for the supply and delivery of pumping plant and equipment for the Commonwealth naval dockyard, Cockatoo Island, Sydney, N.S.W., and are open for inspection at the Department of Trade and Commerce, Ottawa (refer to File No. A-1901). Tenders addressed to either the Director of Navy Contracts, Navy Office, Melbourne, or the Director of Naval Contracts, care Commonwealth Naval Dockyard, Cockatoo Island, Sydney, N.S.W., close on October 10, 1917. The particulars are as follows:

Two main dock pumps with vertical spindle motors and control equipments.

One vertical spindle motor and control equipment.

Four sluice valves with four motors and control equipment.

Two drainage pumps with motors and equipment.

Two air exhaust pumps with motors and equipment.

One enclosed motor and equipment for dock caisson.

Government in connection with the setting of prices on the various metals and the control of the sale and delivery to the many consumers. It is not definitely known whether the prices will be the same to all, but it is anticipated that just consideration will be given to maintain harmony in all directions. Copper is inactive and showing a weaker tone. Tin is also quiet, being affected by the uncertainty of general conditions. Spelter is easing off as a result of increased supply. Lead is a little quieter, but is continuing firm. Antimony and aluminum are both quiet and unchanged.

Copper.—It is anticipated that the American Government will shortly be in

tions. Local dealers continue to quote 65c per lb.

Machine Tools and Supplies.

No features have developed in the machine tool situation and dealers report the market much the same as last week, with considerable inquiry still coming in for general equipment suitable for marine work and ship repair. The demand for munitions machinery is almost at a standstill, but the requirements in this direction necessitate a constant demand for all classes of machine shop supplies and small tool accessories; and the prices of such supplies continue very firm and in some instances are still advancing.

Scrap.

The situation has shown little improvement, being still affected by conditions that prevail throughout the general market. No active buying is apparent, the tendency being to await the outcome of pending developments; in the meantime consumers are only buying for their immediate needs. With the exception of heavy melting steel scrap—which is stronger—the trend of American iron and steel scrap is downward. Old metals are comparatively firm. Local dealers report a week of slight fluctuations, but prices at time of writing are relatively the same as last week.

Toronto, Ont., Aug. 21.—There is a decided falling off in activity in the munitions industry. Fewer contracts for shells are being placed, and the output has declined. Machine shops in some cases are turning their attention to other classes of work, with considerable success. Aeroplane motors, marine engines, ship deck machinery, etc., are now being manufactured by several firms, while others are engaged upon general lines. It is possible that Canadian engineering concerns may ultimately obtain orders for work from the U. S. Government. This, however, is not likely to happen except in isolated cases until the plants in the States are filled up with business, which will not be for some time yet.

Steel

According to a report from Washington, a price of \$65 a ton has been fixed on the steel required by the American Government and the Allies. Not being official, details are lacking, but the figure is probably pretty near the mark. Until the official announcement is made, no marked change in the market is anticipated, as nothing is known regarding the position of the ordinary consumer, which is perhaps the most uncertain feature of the whole situation. It is taken for granted that prices of all steel for war purposes will be controlled, but how this will affect the domestic consumer is problematical. It appears to be more than likely that prices of steel other than for war purposes will be allowed to find their own level. At the present time the market is stationary. Although prices have a weaker tendency for some steel pro-

ducts, no marked recession is looked for in the meantime. The enormous demand for steel, which is world-wide, will likely tend to prevent any important decline in prices except for Government requirements. Conditions in the iron and steel trade in Canada are undergoing some adjustment. The effect of the embargo on steel from the States is not yet clear, and its operation is now the subject of considerable discussion among the leading interests concerned. It appears likely that some exception may be made in the case of steel required for specific purposes other than munitions. It is understood that steps are being taken to facilitate the operation of the embargo, so that it will cause a minimum amount of inconvenience to the trade in Canada. Manufacturing users, however, are bound to suffer to a greater or less degree, as little help can be expected from Canadian mills in the meantime. Our mills

in some way with the price fixing investigation now being held at Washington, and may be anticipating Government action. However, no official information has been given out, and the possible effect of the price control is mere guesswork. Prices generally in the meantime are stationary and the market continues unsettled.

Pig Iron

There is no change in the pig iron situation; the market continues dull and prices stationary. "Victoria" foundry iron is still quoted at \$60, being both scarce and firm at that figure. The embargo on pig iron from the United States will inconvenience Canadian consumers, as domestic furnaces are booked up for the remainder of this year. Connellsville coke output gains slightly, but is restricted sharply by labor shortage; the price of prompt furnace fuel continues to range from \$15 to \$16, ovens.

Scrap

The scrap market continues dull and stagnant. Prices are stationary, and have a weaker tendency, but no declines have been made except in heavy copper and copper wire. These materials have dropped one cent, and are now quoted at 25½¢ a pound. The new steel plant at Ashbridge's Bay is buying steel and shell turnings, and the market for these materials is consequently easier. The cause of the quietness in the market is that consumers expect a fall in prices and sellers anticipate an advance, thus comparatively little business is being transacted.

Machine Tools

The feature of the machine tool market now is an increasing demand for tools for general purposes, which is replacing the former activity in equipment for munitions. The output of shells has fallen off considerably, and the engineering plants are turning their attention to other classes of work. The building of marine engines and auxiliary equipment for ships is developing steadily and promises to form an important feature. A local machinery house reports a big demand for tractors and farm oil engines, due largely to the scarcity of labor, but also to the increased efficiency obtained by using power on the farm. The Willys-Overland Co. are equipping a factory for building aeroplane motors, and have already purchased a large number of machine tools. The situation in regard to deliveries is practically unchanged, tool room equipment being particularly difficult to obtain.

Supplies

Prices of machine shop supplies are for the present largely stationary, but quite firm. It is anticipated that supplies from the States will be very difficult to obtain owing to the increasing demand in that market. An advance has been made in the price of wood pulleys, the new discount being 20 per cent., as against 40 per cent. formerly. New list prices have been issued on bit stock and straight shafts. The discount remains at 40 per cent., but the new list prices provide for increases. Grindstones

MARKET LETTER DEVELOPMENT

The attention of metal working plant executives is directed to the enlargement of the scope and usefulness of our Market Letter Department. In New York and Pittsburgh, expert correspondents have been engaged, and are already furnishing each week concise reports of production activities, price movements, etc., within the territory served by each of these important centres. During the next few weeks, further additions will be made to the number of our United States correspondents, embracing other industrial centres, and enlarging thereby the scope of the meantime service being rendered.

will have to concentrate on the production of shell steel for an indefinite period and are unable for this reason to look after their old customers except to the extent of comparatively small tonnages.

The sheet market remains in a sold-up condition, and there is little new business being accepted. Government requirements are getting heavier, and the available supply for the ordinary consumer is correspondingly less. The latter are holding off placing orders, as there is an impression that prices have reached the top, and that they will be able to buy lower than obtains at present. This seems to be highly probable, as sheet bars have again declined, although recovering part of the loss, and are now being quoted at \$95 Pittsburgh. This material was as high as \$105 less than four weeks ago.

A temporary decline in semi-finished steel seems to foreshadow a recession in prices of steel products at no distant date. Bessemer and O.H. billets declined \$5 early in the week, but have since recovered, and are now quoted at \$90 a ton Pittsburgh. This may be connected

have advanced 10c per 100 lbs. For those over 40 pounds and 2-inch thick, the price is now \$1.90, while those under 40 pounds are quoted at \$2 per 100 lbs. Pennsylvania crude oil continues to advance on account of the constantly growing demand for light grade crude oil and increased cost of production. Producers are unable to keep up with the present demand.

Metals

The metal markets continue to be dominated by the attitude of the American Government in regard to its price fixing policy. Although, on this account the markets have been quiet, prices are exhibiting a higher tendency, and the outlook in the trade generally is brighter. The war demand for metals continues very strong, and will be greatly increased as the American Government requirements become heavier. This in itself will tend to stiffen the market in spite of the present high level of prices. There is considerable secrecy regarding the prices the Government are paying for its requirements, which introduces an element of uncertainty into the situation. A recent report states that the Government is willing to pay 22½c for copper, which is about 4c over a tentative price previously fixed. This seems to indicate that the Government action in regard to prices will not be as drastic as was anticipated. The local market is firm, and business continues active. Tin is a shade higher, otherwise prices are unchanged. Babbitt metals now range in price from 18c to 70c.

Copper.—The market continues unsettled, and must remain so until some definite knowledge is obtained as to what the Government intentions are as to price and volume of future purchases. The position of copper, however, is favorable, as the consumption of the red metal for war purposes continues enormous, and is on the increase. The rumor that the American Government has advanced its prices on its purchases of copper to 22½c has improved the outlook in the market, but quotations are unchanged and nominal. Lake and electro are quoted at 35c and castings at 34c per pound.

Tin.—Although prices are firmer, the market continues unsettled owing to the uncertainty regarding future developments in their effect on prices. Because of this, business is light, and little interest is being shown in the market by consumers. Tin has advanced one cent locally, being quoted at 64c per pound.

Spelter.—There is no change in the situation in regard to spelter, and the market is stagnant. Developments in regard to prices are being followed closely by the trade, but no hint has as yet been given out as to what the Government will pay on its latest purchase of spelter. Local quotation unchanged at 11c per pound.

Lead.—The market is a shade easier on account of the continued indifference on the part of consumers, but prices are unchanged. The U. S. Government is not saying what it is paying for lead, which keeps the market unsettled, and con-

sumers consequently are not showing much interest. Local quotation, 13c per pound.

Antimony.—No improvement is noted in the demand for antimony, which has been quiet for some time. The market, however, shows no sign of weakness, and quotations are unchanged at 20c per pound.

Aluminum.—Little interest is being shown in the market, which is a shade weaker, although quotations are unchanged at 64c per pound.

New York, Aug. 20.—Vitality surging through the machinery industry as a result of the gigantic war preparations is expressed in further large purchases of machine tools by shipbuilders, by ord-

another new manufacturer of big guns—the Tacony Ordnance Co. of Tacony, Pa., in the purchase of forge and machine shop equipment for installation in the new \$1,500,000 plant now undergoing construction at Tacony.

In the Central West, two ordnance makers, the Inland Ordnance Co., Cleveland, O., and the Root & Van Dervoort Engine Co., East Moline, Ill., are sounding the market for machinery, and are making imperative calls upon manufacturers of machine tools.

The Federal Shipbuilding Co., the new subsidiary of the U. S. Steel Corporation, has awarded contracts for dredging, pile driving, building of ship ways and construction of shops and other buildings, to cost about \$4,000,000, and is now buying \$1,000,000 worth of tools for a huge plate and angle shop. The plate mill will be 1,000 feet in length. Inquiries are also out for yard and shop cranes and for machine shop tools that are needed in addition to the tools now being built at the shops of the American Bridge Co. The buildings now under contract will cover ten acres. It is designed to make this plant on Newark Bay the largest shipbuilding plant in the world. Some of the shipways now being constructed—450 to 500 feet in length—will be extended later to 1,000 feet to build the largest craft afloat.

The Foundation Co. which, in conjunction with the Liberty Steel Products Co., is building and equipping a large number of boats, including mine sweepers, for the United States and French Governments, is in the market for \$100,000 worth of machinery for a plate shop, and will also buy cranes and machine shop equipment. The Harriman interests, that control the shipyards at Chester and Bristol, Pa., have reorganized the Chester Shipbuilding Co., and organized the Merchants' Shipping Corporation to operate the Bristol yards. Cranes and other machinery are wanted for both of these plants. Twelve shipways are being built at Bristol and six additional ways at Chester. The Newburgh Shipyards, Inc., Newburgh, N.Y., and the American U-Boat & Arms Corporation, which is equipping a yard at City Island, are placing contracts for machinery.

Manning, Maxwell & Moore, Inc., have received a contract from the Curtiss Aeroplane & Motors Corporation for equipment for the new plant now being built at Buffalo. The U. S. Government is reported to have placed a contract for 10,000 airplane engines with Henry M. Leland, who is equipping a plant at Detroit. The Dayton-Wright Aeroplane Co. has given a large order to Cincinnati manufacturers for drilling machines. The Nordyke-Maron Co., Indianapolis, has an order to build 1,000 airplane engines for training machines for the Government.

Tractor manufacturers are overwhelmed with business and are extending plants and buying machine tools constantly. Henry Ford & Son, with an order for 7,000 tractors for the British Isles, is building an addition to its Dearborn, Mich., plant, as the Cork Island plant construction has been delayed.

AUXILIARY MACHINERY REQUIRED.

Tender forms and specifications have been received from D. H. Ross, Canadian Trade Commissioner, Melbourne, for supply and delivery of auxiliary machinery for the Flinders naval base, via Melbourne, Victoria, and are open for inspection at the Department of Trade and Commerce, Ottawa (refer to File No. A-1901). Tenders addressed to the Director of Navy Contracts, Navy Office, Melbourne, close on October 24, 1917. The particulars are as follows:

Two electrically-driven air pumps, with complete set spare parts.

One steam driven air pump, with complete set of spare parts.

Two small circulating pumps.

One large circulating pump.

One large feed pump, with complete set of spare parts.

One small feed pump, with complete set of spare parts.

One oil fuel pump with complete set of spare parts.

nance and ammunition manufacturers, by airplane and engine builders, and by makers of tractors and of other agricultural implements.

In response to United States Government appeals, several additional steel-working manufacturers have entered the ordnance field, and one of the new concerns—the Symington-Anderson Co., of Rochester, N.Y.—has been awarded a contract for three thousand 6-inch guns; each piece of ordnance will cost \$8,000 to \$10,000. This company recently purchased \$1,000,000 worth of shop equipment. The War Department has awarded a contract for 20,000 Browning machine guns to the Colt Patent Firearms Co. of Hartford, Conn. The contract price is upward of \$15,000,000. The War Department is also giving active support to

Pittsburgh, Aug. 18.—The week has been singularly devoid of concrete developments suggestive of the future of steel demand and prices. The only definite and important item of news is that since the enactment of the Food Control Law, which was signed by the President on August 10, the coke producers have been required by the Federal Trade Commission to furnish statements of their cost of production, both for the year 1916 and for the month of June last. This is taken to indicate that the Administration intends shortly to fix the price of coke, the food bill giving it authority over prices of coal, coke, petroleum and gasoline. The reports are now being compiled, and preliminary figures indicate costs averaging about \$4 per net ton for the Connellsville region. The average of spot sales in May and June, 1915, was \$1.50. They were below cost, and costs are higher now. The common idea is that if the Government fixes a price it will be about \$4.50 or \$5. In the past week the spot market has gone up to \$15.

The question is what good the fixing of prices on coke will do the ultimate consumer, for about 81 per cent. of the coke produced is used in the manufacture of pig iron, and the pig iron is sold far ahead, practically all the prospective make for the balance of this year and from 35 to 60 per cent. of the make in the first half of next year, the pig iron contracts on books ranging from \$25 to over \$50. Doubtless the pig iron market would eventually decline, and that would help some.

The Export Embargo

The export embargo covers scrap, pig iron, billets and sheet bars, structural shapes and plates, and became effective July 15. From then until August 15 it was merely necessary to secure a license to export, but from August 15 the licenses will not be granted unless it can be shown that the material is directly intended for prosecuting the war. This prevents exports of plates and other shipbuilding material to Japan, a large tonnage being under order. The Japanese mission is in Washington, and an arrangement may be concluded whereby the steel will be allowed to go forward in return for Japan diverting a number of ships to the trans-Atlantic trade. The plate mills are in a quandary, as they do not know whether to continue rolling export material or resell it. There have been some offerings of plates in the past week at lower prices than formerly quoted, but not enough to establish a new market level.

Iron and steel exports in June totalled 624,711 gross tons, against 537,000 tons in May, and 414,700 tons in the month before, the record month for exports. July exports will probably prove to have been nearly, if not quite, as large, but on account of the enforcement of the embargo August will doubtless show a material falling off.

Scrap

Last week the Pennsylvania Railroad System started an embargo against all

movement of scrap on its rails in open top cars, except under special permit, the permit to be applied for by the prospective consignee. There is very little scrap movement in this district that does not involve travelling part of the journey over Pennsylvania rails and permits do not seem to be obtainable easily. The scrap market has been made still quieter, but prices have not declined, and heavy melting steel is higher, with one or two sales reported at \$37 and a number of dealers readily bidding \$34, these limits comparing with \$32 to \$33 quotable as the market ten days ago.

Pig Iron

The pig iron market is absolutely stagnant, there being scarcely any inquiry, and then only for very small lots for prompt shipment. When the market once stopped advancing, about the close of June, prices yielded a trifle from the extreme, but have since held steady, so far as furnace quotations are concerned, at \$55 for Bessemer, \$52 for basic, and \$53

CANADIAN GOVERNMENT PURCHASING COMMISSION

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

for No. 2 foundry and malleable, f.o.b. Valley furnaces. These, however, can hardly be called even asking prices when there is no inquiry. Some resale lots have been offered for less, particularly in the case of Bessemer.

While production has been curtailed in the past few weeks on account of high humidity, there is less rather than greater pressure for deliveries on contract, and consumers are evidently better supplied than was assumed. Buyers are evidently expecting a very considerable drop in the market, before they have occasion to make further purchases.

Unfinished Steel

A week ago a decline in unfinished steel was recorded, and in the past week there has been a further softening. A lot of 1,000 tons of open-hearth sheet bars has been sold at \$85, the top of the market having been \$105 to \$110. The ordinary market price is paid only on odd lots purchased by mills, or by sheet consumers who wish to have the steel converted. The deliveries to sheet mills, on long term contracts, are at about \$60. Wire rods have sold in the past week at \$20 a price probably unobtainable a fortnight ago. There are further offerings of bars at \$20 and \$20 is quoted. Until recently the market was all of

Finished Steel

While there have been declines in accession in scrap, pig iron, and unfinished steel, the declining tendency has not yet reached finished steel products, and this is in accordance with precedent. The mills fully expect declines, but know that they could not force sales by cutting prices, and are interested in maintaining same as long as possible so as to stimulate specifications on existing contracts. There is no buying in the open market to speak of.

Notes

Production of pig iron in the United States is officially reported at 19,258,235 tons in the first half of this year, against 19,815,275 tons in the second half of last year, and 19,619,522 tons in the first half. The decline is in the face of a material increase in capacity, and is due to shortage of coke.

Production of coke in the United States in 1916 is officially reported by the Geological Survey at 35,464,224 short tons of beehive and 19,069,261 tons of by-product, a total of 54,533,585 tons, representing increases over the 1915 production of 29 per cent. in beehive, 35½ per cent. in by-product, and 31 per cent. in the total.

Production of iron ore in the United States in 1916 is reported by the Survey at 63,735,088 gross tons from the Lake Superior region, and 11,432,584 tons for all other districts, a total of 75,167,672 tons, against 55,526,490 tons in 1915, and 61,980,437 tons in 1913, hitherto the record year.

The Bridge Builders' and Structural Society report fabricated steel contracts let in July equal to 41½ per cent. of a month's fabricating capacity, against 47½ per cent. for June and 57½ per cent. for May.

SUPPLEMENTARY ESTIMATES TABLED IN HOUSE

SUPPLEMENTARY estimates for the fiscal year ending March 31 next, to the amount of \$50,542,472.35, were tabled in the Commons, Ottawa, by Sir Thomas White on August 17. They bring the total amount of appropriations for the fiscal year up to \$178,824,236.99, exclusive of statutory expenditures aggregating \$74,691,001.24. Of the supplementary votes now brought before Parliament, \$18,361,930 is chargeable to income and \$32,180,542 is chargeable to capital account.

Among the items is \$7,500,000 to be loaned to the G.T.P. Railway to meet the cost of the new passenger cars of the Grand Trunk Pacific Railway, and \$1,000,000 for the purchase of 100,000 feet of steel for the Canadian Government's Railways, \$25,000,000 for the purchase of 100,000 tons of steamers McKee and Drummond, acquired by the Government, and now enquired to be constructed. The purchase of 100,000 tons of steel for the building of two wooden ships for use

in connection with the Government Railways system, \$600,000 is asked. Among the sums voted at a previous session and now to be revoked are \$1,020,000 for the construction of the Quebec, Montmorency and Charlevoix Railway, the Quebec and Saguenay Railway and the Lotbiniere and Megantic Railway.

THE SUBMARINE LOSSES

BELOW will be found the official weekly returns issued by the Press Bureau and compiled by the Liverpool "Journal of Commerce," relating to the war losses of British merchant shipping, and the arrivals and sailings of merchant vessels of all nationalities (over 100 tons net), at and from United Kingdom ports. Fishing and local craft are excluded from the sailings and arrivals. This return invariably includes all mercantile tonnage known to have been sunk by mine or submarine either employed on Government service or otherwise:—

tons was as follows: Sault Ste. Marie, 16,813,649; Welland, 2,544,964; St. Lawrence, 3,368,064; Chambly, 398,977; St. Peter's, 9,629; Murray, 46,680; Ottawa, 237,651; Rideau, 105,430; Trent, 45,000; St. Andrew's, 13,438.

The traffic as analyzed is as follows:
Tons.

Agricultural products	5,178,806
Animal products	11,342
Manufactured products	834,266
Forest products	1,388,873
Mine products	16,170,204

The total volume of Canadian wheat moved through the canals of Canada and the United States at Sault Ste. Marie in 1916 was 185,003,667 bushels. Of this quantity, 82,807,342 bushels passed through the Canadian canal. Larger accommodation on the American side of the St. Mary's river probably accounts for the preference given that channel.

The growth since 1895 in the volume of Canadian wheat annually carried

The distribution of Canadian wheat moved through the Canadian and American canals at Sault Ste. Marie from Port Arthur-Fort William in 1916 was as follows:—

To Montreal, 1,233,982 bushels; to Georgian Bay ports, 46,406,749 bushels; to other Canadian ports, 28,029,847 bushels; to Buffalo, 106,349,943 bushels; total, 182,020,521 bushels.

To account for all the Canadian wheat shipped eastward by water in 1916 there must be added the quantity passed through Duluth in bond. The complete statement would, therefore, be as follows:—

From Port Arthur-Fort William and Duluth, to Montreal, 1,686,482 bushels; to Georgian Bay ports, 48,007,361 bushels; to other Canadian ports, 28,029,847 bushels; to Buffalo, 107,279,977 bushels; total, 185,003,667 bushels.

STEEL PRICES FIXED AT \$65

A REPORT from Washington states that an agreement between the War Industries Board and the steel interests as to the price of steel for the United States and her allies will be arranged shortly, according to an authoritative source. The terms of the agreement likely will be:

1. The price of steel will be fixed at approximately \$65 a ton.
2. The steel interests will agree to furnish material to this Government and the allies for the same price.
3. An informal agreement will be made that, if the steel men furnish their product at the agreed upon price, the excess profits tax will be modified.
4. The steel interests shall retain the right to collect bonuses from allied Governments for early delivery of contracts.

Week ending	British Merchant Ships			
	All Nationalities Arrivals	Sunk by Mine or Submarine		Fishing Vessels Sunk
		1,600 tons gross or over	Under 1,600 tons gross	
Feb. 24	2,280	16	6	5
Mar. 4	2,528	15	8	2
" 11	1,985	12	4	3
" 18	2,528	15	8	2
" 25	2,311	20	7	18
April 1	2,281	17	14	3
" 8	2,406	17	2	7
" 15	2,379	19	9	11
" 22	2,585	21	15	2
" 29	2,716	22	27	7
May 6	2,374	19	22	15
" 13	2,568	17	5	3
" 20	2,664	19	9	3
" 27	2,719	18	2	2
June 3	2,693	2,642	15	9
" 10	2,767	2,822	10	20
" 17	2,897	2,993	25	37
" 24	2,876	2,923	5	19
July 1	2,745	2,846	15	13
" 8	2,996	2,798	14	13
" 15	2,828	2,920	15	4
" 22	2,791	2,791	3	12
" 29	2,747	2,776	18	9

*Including three attacked during week ended July 22.

Italian Losses

The following are the figures of the movements of merchant vessels of all nationalities in Italian ports during the week ending Sunday, July 29:—

Arrivals	810	412,045
Departures	536	401,168

This is exclusive of fishing boats and coasting vessels.

Losses of Italian ships on all seas were:—Four sailing vessels, only one over 250 tons. One steamer was attacked and damaged, but was able to be saved.

TRAFFIC THROUGH CANADIAN CANALS

J. L. PAYNE, comptroller of statistics, reports that the traffic through the canals of Canada in 1916 showed an increase of 8,384,688 tons. The total volume was 23,583,491 tons, though this tonnage includes duplication, which means that the same cargo quite frequently passes through two or three separate canal systems. After eliminating all duplication, the net tonnage is given as 21,011,905 tons. The distribution of gross traffic in

through the Canadian canal at Sault Ste. Marie is seen from these figures: 1895, 1,087,800 bushels; 1900, 5,573,267 bushels; 1910, 51,774,833 bushels; 1913, 101,066,133 bushels; 1916, 82,807,342 bushels.

Then comparison of 1915 and 1916 is as follows:—

	1915	1916
Through the Bus.		Bus.
Can. canal	48,727,911	82,807,342
Am. canal	121,389,950	102,196,325
Totals	170,117,861	185,003,667

Canadian wheat moved in the form of flour must also be brought into the account. The total quantity brought down in 1916 was 3,805,384 barrels, as compared with 2,215,098 barrels in 1915. At 4½ bushels to the barrel, this would represent 17,124,228 bushels of wheat.

The total volume of water-borne wheat in 1916 would thus be made up as follows:—

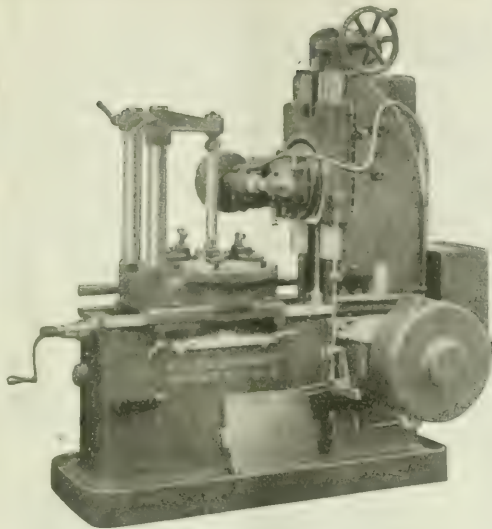
Through the Can. canal....	82,807,342
Through the Am. canal....	102,196,325
In the form of flour	17,124,228
Total	202,127,895

COAL CONTROL PLAN TO BE ANNOUNCED

PRESIDENT WILSON will announce formally in a few days the plan under which the American Government will take over control of the coal supply of the country, fix prices and regulate production and distribution under the powers contained in the food control law.

It is said that the Trade Commission, while not advocating the requisition and operation of mines as an immediate step, believes that the price of \$3 a ton at the mouth of the mine for bituminous coal is radically high, and that production and distribution systems are faulty. A system of commandeering and pooling the output for distribution by a Government agency is said to have been recommended.

In connection with anthracite coal, the commission in former reports has indicated that in its belief the price at the mouth of the mine agreed to by operators was not exorbitant, and some of the officials have intimated that high prices to the consuming public were due largely to the middlemen and faults of distribution.



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Automatic therefore Economical

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For gears up to 120" diameter.

Catalogue describing full line of Gear-cutting, Hobbing, and Rack-cutting machines on request.

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The A. R. Williams Machinery Company, Limited

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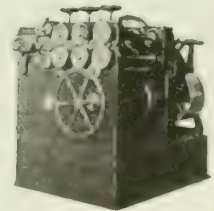


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More Than Forty Standard Spring Making Machines.

High-Speed Automatics for Making Fuse
and Small Arms Springs.

Flexible Metallic Tube and Casing Coilers.



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INDUSTRIAL ^A_ND CONSTRUCTION NEWS

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

ENGINEERING

Elmira, Ont.—The Elmira Transmission Co. will build an extension to their foundry.

Sidney, N.S.—A report is current here that the steel plant at Trenton, N.S., will be moved to Sidney.

Chicoutimi, Que.—The Chicoutimi Pulp Co. will build an extension to their mill, which will include a machine shop.

Tillsonburg, Ont.—The Maple Leaf Harvest Tool Co. propose building a factory here to cost approximately \$50,000.

Toronto, Ont.—The Cluff Ammunition Co. are rebuilding their plant on Sterling Road, which was destroyed by fire some time ago.

Oshawa, Ont.—The Richmond Mfg. Co., of Toronto, have written the Council regarding a proposal to establish a factory here.

Blenheim, Ont.—Five acres of land have been purchased by the Pere Marquette Railway for a reservoir. A new pump-house will be erected and new equipment installed, and a tank built.

New Westminster, B.C.—H. A. Bayfield, formerly superintendent of dredges here, was in the city recently inspecting possible sites for the assembling shop which the Imperial Munitions Board will probably establish somewhere on the Coast to assemble machinery and engines for the vessels now being built at various shipyards. Sites will also be inspected at Victoria and Vancouver.

Rigaud, Que.—A violent explosion at the powder factory of Curtis & Harvey Co., on Aug. 18, destroyed the entire plant. The monetary loss is placed at \$2,000,000. The plant was comprised of a large number of small buildings and the structures alone cost several million dollars. The stock of raw material for making explosive was also particularly expensive. The plant, with adjacent grounds, covered five miles square.

Windsor, Ont.—Plans have been filed with the Canadian Government by a local law firm, acting for the Canadian Steel Corporation, for docks at Ojibway to cost \$250,000. It is stated that the plans include a marine slip, harbor, docks, and wharves. A canal running through the corporation's property for 2,500 feet, which will be 200 feet wide and 25 feet deep, will be dredged to accommodate boats. It is proposed to build docks on the banks of the canal, while another dock a thousand feet long is planned for the river front.

ELECTRICAL

Bloomfield, Ont.—A by-law passed recently authorized an expenditure of \$8,000 on the development of electric pow-

er at Cookstown, Ont.—The Hydro by-law was passed here Monday by a majority of 91. The enabling by-law was also passed on the same vote.

Toronto, Ont.—The Hydro-Electric Commission have been granted a permit to build an addition to the terminal station on Strachan Avenue, to cost \$1,100.

Wellington, Ont.—A by-law will be submitted to the ratepayers on Aug. 31 to authorize the expenditure of \$10,000 for the purpose of development, transmission and distribution of electrical power and energy.

MUNICIPAL

Lawrencetown, N.S.—The Town Council are considering installing a hydro-electric power plant.

Portage la Prairie, Man.—The Town Council contemplate installation of one 100-h.-p. boiler with mechanical stoker, costing about \$5,000, for the electric station.

Stratford, Ont.—At a meeting of the Public Utilities Commission, it was recommended, in Mr. Mason's report, that estimates for the proposed storage basin for surplus artesian well water be asked for.

Stratford, Ont.—The Public Utilities Commission have decided to accept the quotation of Petrie's, Ltd., of Toronto, for an air compressor at a cost of \$415, and a 15 h.p. gasoline engine at a cost of \$400, to be installed in the pump house as soon as possible.

Montreal, Que.—The Board of Engineers, composed of H. E. Vautelet, Arthur St. Laurent and T. B. McRae, have prepared a supplementary report on the aqueduct scheme, in which they recommend that the waterworks improvement be continued along new lines. Upwards of \$3,000,000 has already been spent on the aqueduct.

TENDERS

Winnipeg, Man.—The Board of Control are receiving tenders up to August 22 for 3,000 feet of 3½ inch cotton rubber-lined fire hose.

Sherbrooke, Que.—Tenders will be received until August 22 for high-tension line and equipment, costing \$150,000, from Weedon to Sherbrooke, for the Gas and Electric Department, City Council.

Hamilton, Ont.—Tenders are being received until September 4 by the engineer, E. R. Gray, for pumping equipment for Beach pumping station. The cost is estimated at \$130,000.

Oakshella, Sask.—Tenders are required for the supply of material and constructing thirteen miles of bracket line, also placing two circuits on the Government

lead on six-pin crossarms. For plans and specifications, apply to James Wiggins, secretary-treasurer, Last Chance Telephone Co., Oakshella, Sask.

Cobalt, Ont.—Tenders will be received up to Sept. 18, for the supplying of material and labor necessary in the installation of a complete telephone system in the Town of Cobalt, and in part of the adjoining Township of Coleman. Further particulars will be furnished by R. L. O'Gorman, Town Clerk.

Winnipeg, Man.—Tenders, addressed to the Chairman, Board of Control, will be received up to August 28 for the supply of 2,400 feet of 6-in. cast iron water pipe, class "C," delivered f.o.b. cars, city yards. Specification and form of tender may be obtained at the office of the City Engineer, 223 James Avenue.

Toronto, Ont.—Tenders will be received, addressed the Chairman, Board of Control, City Hall, Toronto, up to August 28, for the supply and installation of mechanical stokers, at the Main Pumping Station. Specifications and forms of tender may be obtained at the Works Department, Room 12, City Hall.

Winnipeg, Man.—Tenders, addressed to the Chairman, Board of Control, will be received up to August 24, for the supply and complete installation of one mechanical chain grate stoker for the Municipal Hospital Power House, Morley Avenue. Specification and form of tender may be obtained at the office of the City Engineer, 223 James Avenue.

Toronto, Ont.—Tenders addressed to the Secretary-Treasurer of the Board of Education will be received until August 24, for completion of carpentry work in Park School New Building, local telephones, cabinet work, repair work in various trades. Specifications may be seen and all information obtained at the office of the Superintendent of Buildings, 155 College Street.

Monteith, Ont.—Tenders will be received until August 27 for heating and plumbing in the men's residence in connection with the Training School, Experimental Farm, Monteith. Plans and specifications can be seen at the office of the Director of Agriculture, New Liskeard, and at the Department of Public Works, Toronto, Ont.

Winnipeg, Man.—Tenders, addressed to the Chairman, Board of Control, will be received up to August 28 for the supply and delivery of one set high efficiency street lighting equipment. Instructions to bidders, specification and form of tender may be obtained at the office of the City Light and Power Department, 54 King Street.

Toronto, Ont.—By direction of the Hon. the Minister of Militia and Defence, the following Old Stores are for sale by Public Tender at Toronto:

ECONOMY

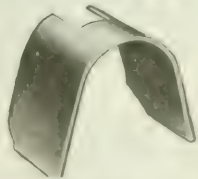
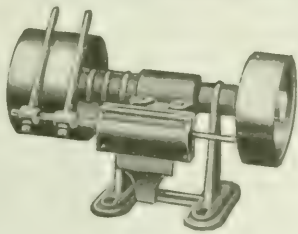
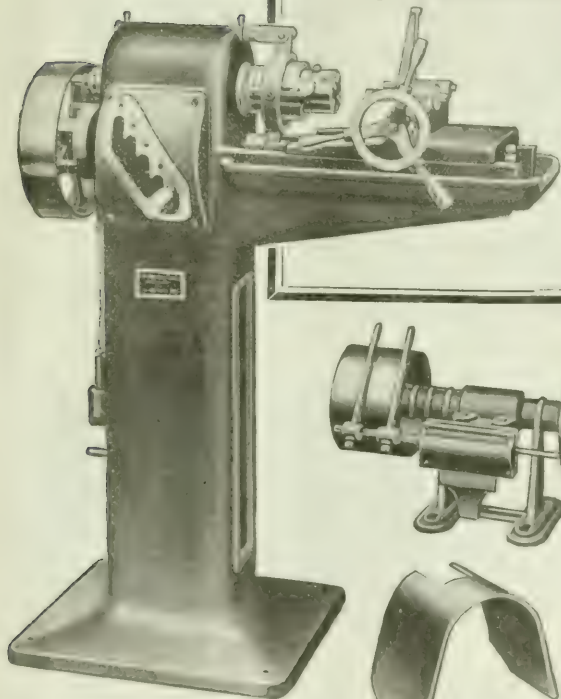
That is the lesson we are slowly learning

Here is a machine—the Geometric Threading Machine—which has been economizing in screw thread production for a number of years. Busy automatic screw machines cannot profitably be slowed down to cut threads when there is a Geometric Threading Machine at hand. Especially since a Geometric Threading Machine costs one-tenth the price of automatics.

Geometric Threading Machines are employed on a large class of small threaded parts that cannot be produced economically on the ordinary screw machine.

Made in three sizes—to cut $\frac{1}{8}$ to $\frac{1}{2}$ inch, $\frac{1}{4}$ to $\frac{3}{4}$ inch, and $\frac{3}{4}$ to $1\frac{1}{2}$ inch diameter threads. The carriage is mounted on slides and on the largest size machine is moved back and forth by rack and pinion, and in the smaller sizes by hand.

Spindle speed changes readily made, adapting the machine to the diameter and material of the work. An adjustable stop assures accurate length of thread, and automatically opens the die head, permitting of drawing the work straight back.



A line from you brings full details regarding this machine. Tell us your threading requirements—let us recommend the proper Geometric Collapsing Tap or Self-Opening Die.

THE GEOMETRIC TOOL COMPANY NEW HAVEN CONNECTICUT

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

Leather, old, 21,271 lbs; brass, old, 25,977 lbs. This produce may be seen on application to the Senior Ordnance Officer, Toronto, Ont. Tenders for the purchase of all or any of these lots will be received until Aug. 25.

Winnipeg, Man.—Tenders, addressed to the Chairman, Board of Control, will be received up to August 22, for the following supplies for the Fire Department, namely, 3,000 feet 3½ inch cotton, rubber-lined fire hose, 221 (more or less) pairs rubber boots, 221 (more or less) waterproof coats. Specifications and forms of tender may be obtained at the office of the Chief of the Fire Department, Central Fire Station.

Quebec, Que.—Tenders will be received until August 28, for the construction of a steel bridge (two spans), over sluice ways in St. Charles River, at Quebec, P.Q. Plans and forms 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, Shaughnessy Buildings, Montreal, P.Q., Post Office Building, Quebec, P.Q., and Equity Building, Toronto, Ont.

St. John, N.B.—Tenders will be received until August 31, for the construction of an extension of and repairs to the Negro Point breakwater, St. John Harbor, St. John County, N.B. Plans and forms of contract can be seen and specifications and forms of tender obtained at the Department of Public Works, Ottawa, and at the offices of the District Engineers at St. John, N.B.; Halifax, N.S.; Shaughnessy Building, Montreal, P.Q., and Equity Building, Toronto, Ont.

Woodstock, N.B.—Tenders will be received until August 28 for the following improvements to the water system:—Mechanical gravity filter plant. Additions and alterations to the pumping station, new boiler, steam turbine-driven centrifugal pumps, gasoline engine-driven centrifugal pump, and sundry machinery and appurtenances. Plans and specifications may be obtained from J. C. Hartley, Town Clerk, Woodstock, N.B., or R. S. & W. S. Lea, 809 New Birks Building, Montreal, or A. K. Grimmer, St. Andrews, N.B.

Ottawa, Ont.—Tenders will be received until August 27 for plumbing pipes and fixtures required in the reconstruction of the Parliament Buildings. All tenders to be based on the execution, erection and completion, including all labor and materials required for the installation of the plumbing system, together with all fixtures, apparatus and appliances as called for in the plans and specifications. Plans, specifications and any other information can be obtained at the office of the general contractor, P. Lyall & Sons, Construction Co., Ottawa.

GENERAL

Gravenhurst, Ont.—The National Potash Co., Toronto, will build a plant here.

Toronto, Ont.—The Canadian National Carbon Co. will build a power house at their factory here.

Hudson, Que.—The Canadian Ice Co. will rebuild their plant, which was destroyed by fire a few weeks ago.

Orangeville, Ont.—Fire last Monday destroyed the Alton Knitting Mills, owned by J. M. Dods. The building and machinery were valued at \$110,000 and were fully insured. The mill will be rebuilt as soon as possible.

INCORPORATIONS

The St. Maurice Foundries, Ltd., has been incorporated with a capital of \$49,000 to carry on a foundry business at Three Rivers, Que.

Murray Engines, Ltd., has been incorporated at Victoria, B.C., to carry on the business of machinists and engineers at Vancouver, with a capital of \$25,000.

The Merchants Shipbuilding Corporation has been incorporated at Victoria, B.C., to carry on a shipbuilding business at Vancouver, with a capital of \$500,000.

PERSONAL

John Lang has been appointed superintendent of the factory at Oshawa, Ont., recently taken over by the McClary Mfg. Co., of London, Ont.

W. G. Ross, Chairman Montreal Harbour Commission, has been presented with a special decoration by the Navy League in recognition of valuable services on behalf of the naval service and Navy League.

J. E. McAllister has been appointed vice-president and general manager of the National Street Car Co., Hamilton, Ont., succeeding Basil Magor, who has held the position for several years. Mr. McAllister was born in Hamilton.

A. T. Perrin, assistant chief draughtsman of the Dominion Bridge Co., of Lachine, P.Q., has resigned his position to become manager of the Iberville, P.Q., plant of the Rapid Tool & Machine Co., the head offices of which are located at Lachine, P.Q.

Maj. R. Falshaw Morkill, signal engineer of the Grand Trunk Railway System, and now serving overseas in the British army, has been appointed by the Director-General of Transportation, to take over all signaling work in the area occupied in France and Belgium by the British forces, and is now at general headquarters.

CONTRACTS

Walkerville, Ont.—The Maxwell Motor Car Co., of Detroit, have let the contract for steel work for their new factory here to the Canadian Bridge Co., of Walkerville.

Fort William, Ont.—George McLeod of Winnipeg has been awarded the contract for the new C. N. R. station here. The contract price is in the neighborhood of \$50,000. J. Scholfield of Winnipeg is the company's architect.

Brampton, Ont.—The High School Board have accepted the tender of C. M.

Sackrider, of Brampton, to erect a new school building at a cost of \$65,921. The board has decided to build the school at the south end of the present grounds.

BUILDINGS

Toronto, Ont.—The Swift Canadian Co. have taken out a permit for the erection at the corner of Keele Street and St. Clair Avenue of a reinforced brick and concrete cooling building to cost \$120,000.

Ottawa, Ont.—The votes for public buildings in Quebec are: Farnham public building, addition, \$5,000; Grosse Isle, quarantine station, \$148,000; Three Rivers, new public building, \$20,000; Quebec Post Office, \$15,000.

TRADE GOSSIP

Oshawa, Ont.—The Canada Malleable Steel Range Co., has been purchased by the McClary Mfg., Co., London, Ont.

The Globe Engineering Co. has been incorporated, with a capital of \$100,000, and will take over as a going concern the assets and liabilities of the Globe Electric Machine Co., of Hamilton, Ont.

Hardwood of Canada.—Generally speaking, the hardwoods are produced in the eastern provinces of Canada, Ontario and Quebec being the main sources of supply. The four leading hardwoods—birch, maple, basswood, and elm, have occupied their relative positions for several years, but in the 1916 list poplar replaces ash in fifth place.

Hamilton, Ont.—It is reported here that the National Steel Car Co., have recently received substantial orders from the French and United States Governments. The French orders are chiefly for regulation army wagons, while the U. S. orders include freight cars as well as other army equipment.

Appropriation for Industrial Research.—The Dominion Government has appropriated the sum of \$91,600 for the Bureau of Industrial Research, to be expended as follows: Salaries and expenses, collection and distribution of information, \$43,600; studentships to be established, \$12,000; fellowships, \$5,000; special problems, \$25,000, and forestry studies, \$6,000. There is an appropriation of \$24,620.

Lower Marine Rates.—It is reported from New York that in spite of the rather less favorable report of the British Admiralty there are indications of lower rates even to Europe. Some houses have lowered their schedules to Spain, Denmark, Norway, Sweden and Holland for neutral steamers by 1 per cent. Rates on off-submarine routes continue to be easier without marked changes. To Great Britain 8 per cent. on outward cargoes remain the general minimum.

Russian Car Order for Canada.—The Canadian Car & Foundry Co., Montreal, are negotiating with the Russian authorities for a large proportion of the big Russian order which will soon be distributed to the Canadian companies, to



Aikenhead's New Chuck

Will stop you losing your drilling profits

Minutes mean profit—are you losing minutes? There is no loss of time in tool changes when you use a

WAHLSTROM CHUCK

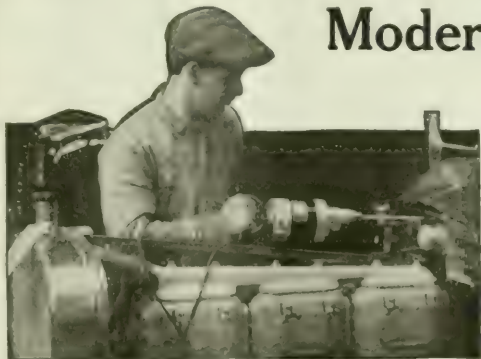
It is entirely automatic in its action — tool changes may be made without stopping the spindle—just grasp the shell of the chuck with one hand and make the tool change with the other. The change is made in a tenth of the time required with the ordinary chuck—and the tool automatically centers itself.

The Wahlstrom comes in two types—one for straight shank tools—the other for Nos. 1, 2 and 3 M.T. shank tools—they are both "Production Increaseers," which demands your attention. Write for information now.

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Modern Drilling Methods



By constructing the "Van Dorn" Portable Drill 100% overstrength, we have made great strides in promoting the efficiency and utility of a shop.

The "Van Dorn" Universal Portable Drills consume power only when in operation, and may be attached to any lamp socket.

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The switch is quick acting.

Sticking and fusing of contacts practically eliminated.

Phosphor bronze and ball bearings. Hardened gears.

We will gladly forward any information you may desire regarding portable drills, grinders, blowers, die filers, riveters, etc. Write us to-day.

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Shell Forging Production

WITHOUT AN EQUAL FOR
BOTH FIRST AND
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PUNCHES.

Comes to you heat-treated
and ready for use.

It does not stick to the
work.

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

It means more shells, per
machine per day.

**STEEL OF EVERY
DESCRIPTION.**

**Hawkridge Brothers
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THE IRON WORKS
LIMITED

Owen Sound Iron
Works

Owen Sound
Ont.

Engineers

Boiler-
makers

Founders

Machinists

Tank Work
Smoke Stacks,
Grey Iron and
Brass Castings,
Special
Machinery
Made to
Order

talling, it is said, 10,000 freight cars. The Canadian Car Co. is now working on an order for 2,000 Russian freight cars, which will be ready for delivery in October, and the order will be a big help in keeping up the present working capacity of the Canadian Car plants.

Ottawa, Ont.—The appropriations for public works in Ontario include: Elmira, public building, \$2,000; Galt, drill hall, grading, paving, etc., \$8,000; Kingston, R.M.C., enlargement of educational block, \$150,000; Kingston, R.M.C., to complete new dormitory by adding two wings, \$100,000; Palmerston, public building, \$2,500; Prescott, public buildings, repairs and renewals, \$3,000; Stayner, public building, \$10,000; Whitby public building, to pay Government's share of cost of local improvements, \$2,165.88; Windsor, public building, repairs and improvements, \$4,500.

Coal Embargo Now Removed.—Fears of a coal shortage have been dispelled by the announcement that the Lehigh Valley Railroad Company has lifted the embargo against coal cars for Canadian points. The removal of this embargo is of the greatest importance to the City of Toronto generally, and to the Province at large, and was aided by the coal section of the Retail Merchants' Association and the Toronto press, which had fought hard to bring about an understanding whereby coal shipments into Canada could be continued. The embargo was due to the fact that cars were being held for unduly long periods at Canadian points.

Marine Machinery Contracts in B.C.—That since the letting of the winch contracts, nothing definite had been done toward arranging for the manufacture of engines, auxiliary machinery and ships' fittings for the 27 vessels being built in British Columbia for the Imperial Munitions Board, was the news given out on his arrival in Vancouver by Mr. George Bushby, president of the British Columbia Metal Trades' Association, who has been in Victoria for the past two weeks in conference with the British Columbia representatives of the Board, R. P. Butchart and Capt. J. W. Troup. It appears unlikely that any main engines will be built on the coast owing to the high cost of production.

MARINE

British Mercantile Marine Losses.—Since the outbreak of the war, 6,627 officers and men of the British mercantile marine, exclusive of those in the pay of the Admiralty, have lost their lives, according to a statement made in the British House of Commons on August 20 by Sir Albert Stanley, President of the Board of Trade.

St. John, N.B.—J. M. Smith, engineer for the St. John Shipbuilding Co., was in the city recently and surveyed the site for the proposed shipyards. He expressed himself as well satisfied, with that chosen, and left for Montreal, where he will prepare blueprints for laying out the yards. In a week or so tenders will

be called for the erection of buildings, grading, etc., and the work of getting the yards ready will be rushed as rapidly as possible.

Lake Shipping for Atlantic in Winter.—A report from Washington, D.C., states that the use of 1,000,000 tons of Great Lakes shipping in the Atlantic during the lakes' closed season is under consideration by the Shipping Board. It is planned to cut the larger lake vessels in two, and tow the parts through the Welland Canal, re-assembling them on the seaboard. The size of the canal locks forbids passing of larger ships through whole. Cutting the big steel freighters has proved practicable in several cases. To replace the tonnage, the Board plans to expedite shipbuilding on the lakes to be ready for use there when the season opens next year.

Concrete Ships Being Built in Montreal.—Concrete shipbuilding has begun in Montreal under auspices which are likely to bring it to a successful issue, if the scheme proves at all practicable. The work of construction is being carried out by the Atlas Construction Co., which has had a great deal of experience in the handling of cement and reinforced steel from which the hulls of the boats will be made. One boat is now under construction at the Montreal Dry Dock Co.'s plant, and will be ready to travel under her own steam about the 15th of October. She is about 200 feet long, the hull having a thickness of 3 to 5 inches.

Port Authorities' Convention Plans.—The annual convention of the American Association of Port Authorities will be held at Cleveland, Ohio, from September 11 to 14. Delegates will attend from every important port and terminal in the United States and Canada. The meeting is regarded as especially important, because it will be devoted almost exclusively to considering definite recommendations for legislation, requiring common carriers to separate their terminal and through charges, and also to require common carriers and steamship lines to use their terminal facilities in such joint manner as will promote the utmost efficiency in the handling of all commodities.

Harbour Appropriations for Ontario.—The Dominion Government appropriations for harbours and rivers in Ontario include: Bayfield, repairs to piers, \$10,700; Bruce Mines, dredging, \$21,000; Burlington Channel, in full and final settlement of all claims of D. G. Stewart in connection with his contract for construction of revetment wall, \$10,441.59; Burlington Channel, repairs to pier, \$1,050; Collingwood, harbour improvements, re-vote \$72,600, \$75,000; Goderich, harbour improvements, \$51,000; Kingston, dry dock, renewal of revetment walls, \$33,000; Oshawa, repairs to pier, \$2,100; Owen Sound, repairs to wharf, \$4,000; Port Colborne, repairs to east breakwater, \$1,750; Port Dover, repairs to piers, \$6,000; Port Hope, harbour improvements, \$13,500; Sault Ste. Marie, wharf improvements, \$1,500; Thornbury, repairs to pier, \$2,000.

Eighty Lake Boats Will Go to Atlantic.
A representative of the United States Shipping Board was in Cleveland recently definitely initiating Government plans to commandeer lake freighters for coastwise and trans-oceanic war trade. Figures tabulated by the Government agent, in conference with local shipping experts, owners, builders and tugmen, show that upward of 80 lake boats can be taken to salt water. The Shipping Board's decision will rest upon the report to be made by its representative. The plan is to take every boat possible of passing through the Welland Canal, and thence through the St. Lawrence River to the Atlantic before lake traffic is ice-bound. The Shipping Board is now making a list of boats under 260 feet length and 43 feet beam, which can pass through the Welland Canal without alteration. Boats up to 520 feet length and not more than 43 feet beam will be cut in two, bulkheaded and towed by tugs through the canal and river.

Harbour Appropriations for Quebec.—The Dominion Government appropriations for harbours and rivers in Quebec include the following: Anse-aux-Gascons, repairs to wharf, \$5,000; Anse-aux-Griffon, repairs to piers, \$1,500; Baracoin de Malbaie, repairs to approach to the training pier, \$1,200; Cap Chat River, improvements, \$5,000; Cape Cove, repairs to pier, \$500; Cascades Rapids, reconstruction of anchor pier, \$1,500; Chaplain, repairs to wharf, \$4,500; Chicoutimi, repairs to wharf, \$2,500; Cross Point, repairs to wharf, \$1,000; Graham, reconstruction of wharf, \$3,500; Grindstone, M. I., repairs to wharf, \$2,600; Grosse Isle, quarantine station, repairs to wharf, \$4,000; Grosse Isle, quarantine station, extension of wharf, \$50,000; Isle-aux-Coudres, wharf improvements, \$1,200; Laprairie, repairs to wharf and completion of approach, \$4,000; Malbaie, repairs to pier, \$900; Newport, repairs to breakwater, \$1,500; Norway Bay, to repair and improve wharf, \$5,000; Point Shea, M.I., repairs in the wharf, \$1,500; Riviere-a-la-Pipe, reconstruction of wharf, \$5,000; Sabre-vois, repairs to wharf, \$1,460; St. Anne de Beaupre, repairs to wharf, \$600; Ste. Anne de Chicoutimi, repairs to wharf, \$2,800; St. Charles de Caplan, removing debris and rebuilding outer end of wharf, \$2,500; St. Jerome, repairs to wharf, \$2,500; St. Ulrich, repairs to wharf, \$1,200; St. Zotique, reconstruction of wharf, \$2,000; Three Rivers, repairs to wharf, \$9,500; Vercheres, partial reconstruction of wharf, \$4,700; Woburn, repairs to wharf, \$1,500; Yamaska, reconstruction of dam, \$1,500; Yamaska, repairs to dam across Little Channel, \$750.

RAILWAYS—BRIDGES

Victoria, B.C.—The C. P. R. has asked the Board of Railway Commissioners to approve of the company's plans for the proposed bridge across the Fraser. The bridge will cost about \$1,000,000.

St. John, N.B.—The Provincial Government has cancelled the contract for the construction of the northern section of the Valley Railway.

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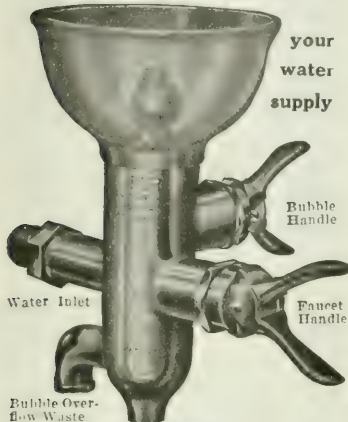
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was made by F. B. Carvell, K.C., at the Valley Railway enquiry. The contract was made by the late Government after the last general elections were announced and provided for an increase in the cost of the work of about \$76,000.

CATALOGUES

The Canadian S K F Ball Bearing Co., Toronto, have for distribution among their friends a handy pocket rule in English and metric measurements. The rule is 6¼ inches long and will be gladly mailed to anyone interested in ball bearings.

The S. K. F. Ball Bearing Co., Hartford, Conn., have issued a folder containing photographs and statements from a number of prominent machine tool manufacturers giving their opinion concerning the use of S K F ball bearings on the machines which they make.

Feed Water Treatment.—The Dearborn Chemical Co., of Canada, Ltd., Toronto, are distributing a bulletin describing the Dearborn scientific treatment of boiling feed waters. The bulletin gives a list of the substances commonly held in solution in feed waters and describes their action either in the formation of scale or corrosion of the boiler plates. The bulletin also deals with the Dearborn method and boiler preparations.

Darling Bros., Ltd., of Montreal, Que., manufacturers of steam appliances, have recently issued a special catalogue for distribution abroad. This booklet is 6 by 9 in. in size, containing 24 pages, and printed in French on high-quality calendar stock. Many of the lines manufactured and handled by this firm are profusely illustrated and described, with the data and prices arranged and compiled to meet the requirements of foreign countries familiar with the French language.

Electric Lamps.—Bulletin No. 78 describes the Cooper Hewitt electric lamps for photographic purposes. The bulletin gives full particulars and prices of the various outfits and different apparatus used in connection, accompanied by illustrations. The bulletin also contains suggestions as to the proper outfit to be used for various purposes in photography with illustrations showing studio arrangements. Copies of the bulletin may be obtained from The Cooper Hewitt Electric Co., Hoboken, N.J.

Steam Specialties—The V. D. Anderson Co., Cleveland, Ohio, have issued a new and well gotten up catalogue entitled "Anderson Steam Specialties," which include steam and air traps, steam and oil separators, water columns, pressure oil filters, copper floats, etc. The construction and operation of each product is fully described, accompanied by illustrations showing exterior and cross sectional views. Tables are also included giving the principal dimensions and other data for each size of trap or separator, etc. The catalogue also contains plates showing three arrangements of the Anderson oiling system.

Mechanical Rubber Goods, Valves.—Catalogue and price list No. 8 deals with an interesting line of valves, packings, and mechanical rubber goods manufactured by Jenkins Bros., Ltd., Montreal. This is a useful catalogue to have on file for reference, as it covers a full line of the above products and contains considerable descriptive matter about each in addition to the price lists. The catalogue is fully illustrated, while the concluding section No. 8, contains a price list of parts, tables of weights, and dimensions, together with diagrams, and also provincial registration numbers for the various types of valve. In this section is also included diagrams in connection with the dimension tables. The catalogue contains 252 pages, including a complete index and is bound in substantial cloth covers.

BOOK REVIEW.

Cold Storage Architecture.—To meet an ever-increasing demand for information respecting the construction of ice-houses and small cold storage systems for farmers, country storekeepers, milk producers, hotel-keepers, owners of country homes and others, the Dominion Department of Agriculture has issued Bulletin No. 49, of the Dairy and Cold Storage Branch, entitled "Small Cold Storages and Dairy Buildings," the immediate sponsors for which are J. A. Riddick, Dairy and Cold Storage Commissioner, and Joseph Burgess, Cold Storage Inspector. The bulletin is a complete handbook on cold storage construction of a comparatively simple and inexpensive kind. Besides minute explanatory details of plans and material required for construction of ice houses and refrigerators, a series of drawings prepared by the Architect's Branch of the Department of Public Works is presented, of which blue prints on a scale of one inch to two feet can be had free on application to the Dairy and Cold Storage Commissioner, while the bulletin itself can be had, also free, by writing to the Publications Branch, Department of Agriculture, Ottawa. If the information herein contained were extensively made use of, not only would much waste be avoided and financial profit accrue, but considerable benefit would be derived in health and the enjoyment of life enhanced. Five different plans are given in the bulletin quantities with complete specifications for each and a statement of quantities of ice that can be stored.

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FOR SALE—THE TORONTO ELECTRIC COMMISSIONERS have for sale a quantity of second-hand 60-cycle meters and transformers recently in service, also quantity of electrical supplies. List of material and full particulars may be obtained on application to the Purchasing Agent, 15 Wilton Avenue. The quantities are not guaranteed, and all are subject to prior sale. No tender necessarily accepted. Toronto Hydro-Electric System, 226 Yonge St., Toronto. c7m

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WANTED—AIR COMPRESSOR — MUST BE in good condition; give full particulars as to make, size and price. Box 324, Canadian Machinery. c27m

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- 12' x 6' Prentice, high speed.
- 22' x 8' Pratt & Whitney.
- 17' x 10' Conrardson, D.B.G.
- 24' x 2' Lodge & Shipley.
- 26' x 8' Lee & Scott, 1845.
- No. 2 Warner & Swasey, plain head.
- No. 6 Warner & Swasey, friction head.

ENGINE LATHES

- 12' x 6' Filsmith, D.B.G.
- 15' x 6' Lodge & Shipley.
- 12' x 8' Automatic back geared.
- 16' x 8' McDougall, back geared.
- 17' x 8' Horizontal, incongeared.
- 18' x 6' New Haven, back geared.
- 18' x 10' Putnam, back geared.
- 20' x 8' Ertel, incongeared.
- 21' x 8' Bawden, heavy duty.
- 24' x 11' Penn back geared.
- 30' x 10' Ames, back geared.
- 21' x 12' Federal, high geared.
- 18' x 32' x 12' C.M.G. gap.
- 21' x 20' x 20' Durand, gap.
- 28' x 30' x 24' Durand, gap.

DRILLS

- 13" Perfect, 2-spindle.
- 14" Excelsior, sensitive.
- 16" Barr, sliding head.
- 18" Bushie, post drill.
- 20" Perfect, lever feed.
- 22" Silver, back-gear.
- 22" Barnes, back-gear.
- 24" Kerckhoff, sliding head.
- 40" Bickford, back gear.
- 40" Cadey-Otto, wall radial.
- No. 10a Baush, 16-spindle.
- No. 1/2 Avey, ball-bearing, bench.

GRINDERS

- No. 1 Wilmarth & Morman.
- No. 1 Cincinnati, universal tool.
- No. 2 Isomits.
- No. 2 Sellers, universal.
- No. 2 Modern, universal.
- No. 14 Besly, with shell holder.
- 26" Gardner, disk.

IRON PLANERS

- 24" x 20" x 5' Bertram.
- 24" x 24" x 6 1/2' Bertram.
- 25" x 20" x 12' Isomize & Davis.
- 26" x 20" x 10' Stevens 4 heads.
- 40" x 10" x 12' New Haven, power feed.

MILLING MACHINES

- No. 0 Burke, hand feed.
- Brown, plain.
- Brown & Sharpe, power feed, plain.
- Fitchburg, geared, plain.
- No. 2 Ford-Smith.
- No. 4 Wellington, hand feed.

SHAPERS

- 14" Canada, Motor Corp.
- 24" Hendey.
- 18" Queens, iron head geared.
- 20" Cincinnati, back geared.
- 20" Green & White, back geared.
- 20" Morton, draw cut.

MISCELLANEOUS

- 22" x 12' Green & White Hand Hammer.
- 22" x 12' Green & White Hand Hammer.
- 6" Kennedy Cutting-off Machine.
- 12" Ball Pipe Machine.
- 12" x 12" x 12" Green & White Hand Hammer.
- 12" x 12" x 12" Green & White Hand Hammer.
- New 22' Buffing Machine, 8" Dia. Grinding Stone.
- New 22' Buffing Machine, 8" Dia. Grinding Stone.
- New 22' Buffing Machine, 8" Dia. Grinding Stone.
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- New 22' Buffing Machine, 8" Dia. Grinding Stone.

H. W. PETRIE, LTD.
FRONT STREET WEST, TORONTO

RIVERSIDE Machinery List

We Own Every Tool Offered

- ENGINE LATHES**
 1—No. 10 Hamilton Standard Engine Lathe, with turret.
 1—No. 8 Putnam Standard Engine Lathe.
 1—No. 11 Putnam Standard Engine Lathe.
 1—No. 19 Reed Standard Engine Lathe.
 1—No. 8 Reed Standard Engine Lathe.
 1—No. 18 x 8 Springfield Engine Lathe.
 1—No. 16 x 8 Springfield Engine Lathe.
 1—No. 11 x 8 Springfield Engine Lathe.
 1—No. 8 Jones & Lamson Standard Engine Lathe.
 2—No. 8 Reed Stud Lathes.
 1—No. 8 Porter Standard Engine Lathe.
 1—No. 8 Suburban Standard Engine Lathe.
 1—No. 6 Springfield Engine Lathe.
 1—No. 6 Prentiss Engine Lathe.
 1—No. 4 Suburban Engine Lathe.
 2—No. 4 Van Werk Engine Lathes.
 1—No. 3 Hartlage Bench Lathe.

- TURRET AND SCREW MACHINES**
 1—No. 3 Gisholt Turret Lathe.
 2—No. 3 A. Porter & Johnson Automatic Lathe.
 1—No. 3 A. Jones & Lamson Flat Turret Lathe, S.G.H.
 1—No. 3 Jones & Lamson Flat Turret Lathe, no head.
 1—No. 4 Foster E.G.H. Hand Screw Machine.
 1—No. 4 Spurr & Kimon Hand Screw Machine.
 1—No. 1 Porter E.G.H. Hand Screw Machine.
 4—New 14" Pierce Turret Lathes.
 2—New 14" Pierce Hand Screw Machines.
 2—New 14" Pierce Automatic Screw Machines, upper feed.

- MILLING MACHINES AND GRINDERS**
 1—No. 2 Hensley Plain Milling Machine.
 3—New No. 1/2 American Plain Milling Machines.
 1—No. 200 Garen Plain Milling Machine.
 1—No. 8 Brown & Sharpe Plain Milling Machine.
 1—No. 1 Cincinnati Plain Milling Machine.
 2—No. 13 Pratt & Whitney Lincoln Type Milling Machines.
 5—No. 12 Kresht Milling & Drilling Machines.
 3—Fox Hand Milling Machines.
 1—Gavin Hand Miller.
 1—No. 6 Dodge Bench Millers (new).
 1—No. 2 1/2 Bath Universal Grinder.
 1—No. 2 Wilmarth & Morman Surface Grinder.
 1—No. 3 Wilmarth & Morman Surface Grinder.
 1—Alma Valley Universal Cutter Grinder.
 1—No. 10 Wells Cutter Grinder.

- DRILL PRESSES**
 1—No. 3 Mueller Plain Radial Drill.
 1—No. 3 Mueller Plain Radial Drill, old type.
 1—No. 30 Baker H.D. Drill.
 5—No. 30 Buffalo Wilson Drill Presses.
 1—No. 30 Wilson Drill Press with Henry & Wright High Speed Drill.
 4—No. 30 Wilson High Speed Drill Presses.
 4—No. 30 Wilson High Speed Drill Presses.
 1—No. 30 Wilson High Speed Drill Presses.
 3—No. 30 Wilson High Speed Bench Drills.

- SHAPERS AND PLANERS**
 1—No. 24 Ohio H.D. B.G. Crank Shaper.
 1—No. 1 Lathes & Dies Crank Shaper.
 1—No. 18 Hensley Gear Shaper.
 1—No. 12 New Springfield B.G. Crank Shapers.
 1—No. 12 New Springfield Planer, S.H.
 1—No. 16 x 16 x 5 Hensley Planer, S.H.
- PRESSES AND HAMMERS**
 1—Waltham-Farrall O.B.I. Press, geared.
 1—No. 10 Perkins Drawing Press.
 1—No. 3 CAV Bliss Wiring Presses.
 1—No. 10 B & S Roll Board Hammer.
 1—No. 10 B & W Roll Board Hammer.
 1—No. 10 Seranton Belt Tammer.
 1—No. 10 Pradler Tote Hammer.

- AIR COMPRESSORS**
 1—No. 18 x 12 Union Steam Pump Co. steam driven air compressor.
 1—No. 8 Westinghouse Steam Air Compressor.
 1—No. 10 Clayton Belt Driven Air Compressor.
 1—No. 8 Fairbanks-Morse Electrical Driven Air Compressor.
 1—No. 8 Gasliner Single Belt Driven Air Compressor.
 1—No. 8 Union Steam Pump Co. Belt Driven Air Compressor.
 1—No. 8 G. Chicago Pneumatic Tool Co. Belt Driven Air Compressor.
- We also carry a large stock of Steam Engines, Steam Pumps and Electrical Equipment of all kinds.
 We are in the market to purchase machines and both large and small.

RIVERSIDE DEPOT
 17-29 St. Aubin Avenue
 DETROIT, MICH.

GOOD USED EQUIPMENT

ELECTRIC TRAVELING CRANES.

- 20-Ton, 50' 3" span, three motor, 110 volts, D.C.
 25-Ton trolley, three motor, 220 volt, D.C.
 15-Ton, 40' span, 30' lift, three motor.
 5-Ton, 47' 0" span, three motor, 110 V., D.C.
 2, 11 and 1 1/2 H.P. Shaw crane motors, 220 volts, D.C.
 10 H.P. Akron crane motor, 220 volts, D.C.
 10-Ton hand crane, 20' 0" span.
 20-Ton hand crane, 20' 0" span.
 2-Ton hand cranes, 22' span.

PUNCHES AND SHEARS.

- Lever Shear (double), cap. 25' sq.
 32' throat (single), cap. 3 1/2" (belt).
 36' throat (single), cap. 13 1/2" (belt).
 48' throat (single), cap. 3 1/4" (std.cm).
 3' throat (single), cap. 1 1/2" (belt).
 3" throat (single), cap. 1 1/2" (belt).
 3" throat (single), cap. 3/4 x 3/4" (belt).
 12' throat (single), cap. 3 1/2" (hand).
 10' throat (double), cap. 1 1/2 x 1" (belt).
 Squaring Shear, 30" cap, 14 gauge.
 Angle Shear (double), cap. 58 1/2" (belt).
 Plate Shear (Untr.), 18" blade, cap. 1/2".
 Rotary splitting, 30" throat, cap. 1/2".
 Rotary bevel, 5' throat, cap. 1/2".
 Guillotine & McCandless, cap. 3 1/4", spring steel.
 Guillotine, Perkins, No. 6, cap. 2 1/2" sq.

MISCELLANEOUS.

- Bulldozer, No. 12 Ajax, 30" stroke.
 Bending Roll, 6', drop end, 6 1/2 and 8" rolls.
 Lathe, 24" x 10", cast iron, 14' bed, std.
 Grinder, No. 10 B. & S. Plain.
 Grinder, No. 13, B. & S. Universal and Tool.
 Rotary Planer, 30", Cleveland No. 2.
 Fixed class condition—quick shipments.
 Saw, cold, 20" blade, 48" travel.
 Press (trimming) No. 11 Perkins, 15,500 lbs.

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 Office and Warehouse:
 216-218 Penn Ave., Pittsburgh, Pa.

Federal Machinery Sales Company

18 No. Jefferson St., Chicago, Ill.

Rebuilt Tools—Immediate Shipment

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 20" Hofer, upright, sliding head, b.g., p.f.
 25" Hamilton, sliding head, b.g., p.f.
 2-spindle 20" Barnes, cast, 10-1/2 p.f.
 Silver, 20", wheel and lever feed (15), new.
 Silver, 20", b.g., p.f., automatic stop (30), new.
- GEAR CUTTERS**
 Gould & Eberhardt, 2 1/2" x 5 1/2" pitch, auto spur and bevel.
 Whiton 2 1/2" Automatic Spur Gear Cutter.
- GRINDERS**
 No. 2 Oakley Universal Cutter and Tool Grinder, new.
 No. 2 American Surface Grinders (2), new.
 Landis 8" x 20" Universal.
 Landis 16" x 20" Crank Grinder with extra plain heads if desired.
- LATHES**
 16 and 17" x 8' Engine Lathe (6), Porter, Cincinnati, etc.
 16" x 8' South Bend (2), new.
 18" x 12" American, c.r., h.s.
 17" x 8' National, quick-change gear, c.r., h.s.
- MILLING MACHINES**
 No. 12 Grand Rapids, back-gear, plain.
 No. 13 Brown & Sharpe Mfg., plain.
 4-spindle Warner & Swasey Valve Miller, good as new.
- PRESSES**
 No. 5 Cleveland, open back, inclinable, plain, new.
 Cl. Ferrante, open back, inclinable, plain, new.
- SCREW MACHINES AND TURRET**
 2 1/2" Acme, fric. grad. head, p.f. to turret.
 Bardons & Oliver No. 1, 15-1/2" cap.
 Hamilton, 20" swing x 8' bed, fric. head, eng. tar. lathe, pan bed, power feed turret on bed.
 12" and 10" Heavy Duty Rapid Turret Lathe, geared head.
 Jones & Lamson 3" x 36" Grd. Sliding Head Turret Lathe, bar equipment.
- SHAPERS**
 20" Hensley Friction Shaper.
 20" Cincinnati Back-gear Shaper.
 20" Smith & Post Cold Saw.
 10 1/2" Rock River Geared Power Splitting Shear.
 60" Bensch Foot Power Gap Squaring Shear.
 Send for complete list. c8m

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43-51 E. Larned St.,
DETROIT, MICH.

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 No. 3 Barnes Horizontal Radial Drill.
 Henry & Wright Sensitive Drilling Machines.
 No. 1-3 Garvin B. G. Horizontal Drill with Pump and Trip.
GRINDERS.
 Wells No. 100 Cutter and Reamer Grinder.
 Capitol Internal Grinder with water attachment.
 No. 2 Diamond Auto. Surface Grinder, belt driven.
 No. 3 Wilmarth & Morman Surface Grinder.
 No. 3 La Salle Grinder, complete.
 Geometric Chaser Grinder, with countershaft.
 No. 4 and No. 6 Gardner 17" Bearing Disc Grinder.
 No. 2 Diamond Wet Tool Grinder with wheel truing device.

- LATHES.**
 No. 10-K Seneca Falls 9" x 4' Bench Lathe.
 14" x 6' Monarch Q.C., S.B.G. Engine Lathe.
 17" x 8' Sidney Q.C., D.B.G. Engine Lathe.
 19" x 8' Sidney Q.C., D.B.G. Engine Lathe.
 16" x 7' Oliver Q.C., D.B.G. Lathe, with pan and pump.

- SCREW MACHINES.**
 No. 1 New Howe Pl. Hd. Screw Machine, with auto. chuck.
 15" Dresser Screw Machine, F.B.G., Power Feed.

MILLING MACHINES.

- Wisconsin Hand Miller on column, complete.
 No. 6 Whitney Hand Miller, complete with countershaft.
 No. 1 U.S. Hand Miller, complete with shaft.
 H. B. Smith Hand Miller, complete with shaft.
 No. 1 Standard Hand Miller, with oil pump equipment.
- PRESSES.**
 Atlas Presses, No. 0 to No. 5 inclusive.
 Greenleaf Arbor Presses, No. 1 to No. 5 inclusive.
 No. 5 Toledo Geard O.B.I. Power Press.
 Manhattan Ratchet Type Screw Press.

THREADING MACHINES.
 Geometric 3/8" Threading Machine.
 No. 38 Curtis & Curtis Hand Power Pipe Machine.
 No. 10 Fie Merrill Comb. Hand and Power Pipe Machine.

C. W. CULLEN MACHINERY CO.

LEADER-NEWS BUILDING
CLEVELAND, OHIO

- Bickford 4 1/2" Plain Radial Drill, cone drive.
 No. 3 Lapointe Broaching Machine, new.
 2—P. & W. No. 2 Cutting-off Machines.
 Bement Miles & Co. 7 1/2" Vertical Spindle Crank Drilling and Boring Mill, 68" swing.
 Detroit Japanning Ovens, 8' 10" x 8' x 15 1/2".
 Pratt & Whitney 48" Gap Lathe.
 Hanna 30-ton Riveter, 12" reach.
 Farnshorn Sand Blast, 90" rotary table, M.D.
 3—800-ton Gen. El. Hydraulic Double Action Presses.
 3 2 1/2" Cleveland Automatics; prac. new.
 10 3/4" B. & S. Automatics.
 Allis Chalmers 150 H.P. Corliss Engine, 12' F.W.
 Bruce MacBeth 150 H.P. Gas Engine; new.
 2—Rathmann Jones Gas Engines, 125 and 225 H.P.
 80" Niles Vert. Boring and Turning Mill, 2 heads, slotting attachment.
 Ingersoll-Rand Air Comp., 342 cu. ft., steam driven, inter-cooler, complete.
 Bertsch Straightening Rolls, 7" x 84" x 3" vert. adj. M.D.
 Kelly Springfield 10-ton Road Roller, rebuilt.
 Vulcan 1 cu. yd. Steam Shovel, traction; weight 35 tons; new flues.
 62-ton Baldwin Consolidation Locomotive.
 Ajax No. 1 Tender Forging Rolls, 50 strokes.
 One No. 5 S-3 Cold Langelier Swadger.
 3—No. 7 H.S.-6 Lanzeller Swadger.
 1—Bolt and Rivet Header, hand feed, 5/8" x 3 1/2" rivets.
 Bolt and Rivet Header, hand feed, 3/4" x 4" rivets.
 70-C Bicyrus Steam Shovel, St. G.
 R. Is. Locomotive, 45 tons, St. G.

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Eastern Machinery & Equipment Co., Inc.

319 COMMERCIAL TRUST BUILDING

PHILADELPHIA, PA.

NEW TOOLS FOR IMMEDIATE DELIVERY

- 1 No. 22 Bickford Vertical Miller.
- 1 1/2" x 2" Bradstreet Grinders.
- 1 1/2" x 7" Win Sellers Tool Grinder.
- 2 1/2" x 8" Turning and Boring Lathes.
- 1 Inside Head Sullivan Grinders.
- 1 1/2" x 12" Pittsburgh Engine Lathes.
- 1 1/2" x 10" Shilper Turret Lathe.
- 1 3/4" x 11" Am Part. Eng. Lathe.

USED MACHINERY

ENGINE LATHES

- 1 1/2" x 12" American Gear A.L.
- 1 1/2" x 8" 1 1/2" & 3/4" Sliprest ground head, 4 gear.
- 1 1/2" x 9" Bullard.
- 1 1/2" x 9" Bullard.
- 1 1/2" x 11" American.

TURRET LATHES

- 1 1/2" x 11" Jones & Lamson Turret Lathe.
- 1 1/2" x 11" Jones & Lamson Turret Lathe.
- 1 1/2" x 11" Jones & Lamson Turret Lathe.
- 1 1/2" x 11" Jones & Lamson Turret Lathe.
- 1 1/2" x 11" Jones & Lamson Turret Lathe.

BORING MILLS

- 1 1/2" x 6" Lodge & Shipley Turret. Backgeared.
- 1 1/2" x 6" Lodge & Shipley Turret. Backgeared.
- 1 1/2" x 6" Lodge & Shipley Turret. Backgeared.

TURNING MILLS

- 1 1/2" x 6" swing Bement Miles T.M. Turning Mills.
- 1 1/2" x 6" swing Bement Miles T.M. Turning Mills.
- 1 1/2" x 6" swing Bement Miles T.M. Turning Mills.

VERTICAL LATHES

- 1 1/2" x 12" Bullard Vertical Turret Lathe.
- 1 1/2" x 12" Bullard Vertical Turret Lathe.
- 1 1/2" x 12" Bullard Vertical Turret Lathe.

TOOL EQUIPMENT

- 1 1/2" x 12" Bullard Boring Mill 50 heads.
- 1 1/2" x 12" Bullard Boring Mill 50 heads.
- 1 1/2" x 12" Bullard Boring Mill 50 heads.

PHANERS

- 1 1/2" x 12" Bellrock open side.
- 1 1/2" x 12" Bellrock open side.
- 1 1/2" x 12" Bellrock open side.

GEAR CUTTERS

- 1 1/2" x 12" Fellows Gear Shaper.
- 1 1/2" x 12" Fellows Gear Shaper.
- 1 1/2" x 12" Fellows Gear Shaper.

1-34" Brainard automatic Gear Cutter.

1-34" NEW Elathor, latest pattern automatic gear cutting machine.

2-30" Fellows Gear Shapers.

SREW CUTTING MACHINES

1-2" Cleveland automatic.

1-No. 55 National Acme 4 spindle, good as new.

1-No. 54 National Acme 4 spindle, good as new.

SLOTTERS AND SHAPERS

1-9" Bement Slotter.

1-12" Bement Slotter.

1-20" Wharton Slotter.

1 3/8" Gould & Eberhardt Shaper. B.G. Vise.

C.S.

FOX LATHES

1-16" Dresser friction clutch back gear.

2-16" American Monitor back gear carriage and control.

2-34" L. E. Hall Turret Monitors, back gear.

DRILL PRESSES

1-4" Bickford Radial, with Tapping attachment, motor drive, with motor.

1-5" Bickford Radial Drill, complete with gear box, single pulley drive, plain box table machine in first-class condition.

1-5" Bliss Radial Drill Press, geared for motor drive, but no motor, in first-class condition.

FOUNDRY EQUIPMENT

4-Foundry Lathes, 4 to 10 ton.

10-Foundry Core Cars 10 and 15 ton.

MISCELLANEOUS

10-Special Steel Shafting.

1-Hollow Boring Lathes 30" x 12" capacity.

1-Automatic Tube Grinding and Polishing Machines.

2-Bement Miles Axle Turning Machines, motor drive.

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If you need machinery in a hurry, here is where you will find the names of firms equipped to supply your needs. And if you have old machinery which has outgrown its usefulness to you, tell Canadian Machinery readers about it in these pages.

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Canadian Machinery

Classified Advertising Section

143 University Ave. - Toronto

PRESS EQUIPMENT FOR SALE

- 50—No. 18 Bliss Type Inclinable Presses.
- 6—No. 19 Bliss Type Inclinable Presses, with roll feeds.
- 1—Double Acting (Michigan) Press.
- 1—Double Acting (Rhodes England) Press.
- 1—Brown-Boggs Multiple Power Shears.

A large number of these presses are equipped with Dial Feeds. Have only been used for a few months—good as new. Will be sold at a bargain if purchased at once.

Apply 702 Excelsior Life Building TORONTO

c10m

Single Purpose and Shell Lathes

- 22—18" x 8' Battle Creek Lathes, single back gear, 2-step cone with counter shaft.
- 6—18" x 9' Chard Lathes, 3-step cone, double back gear, compound rests, semi-quick change with face plates, steady rests and counter shafts.
- 3—20" x 8' Mershon Lathes, 3-step cone, double back gear, compound rest and counter shafts.
- 4—20" x 8' Oakley Lathes, 3-step cone, double back gear, compound rests with oil pumps and pan and counter shafts.
- 1—20" x 10' Oakley Lathe, 3-step cone, double back gear, compound rests with oil pumps and pan and counter shafts.
- 4—20" x 8' Bullard Projectile Turret Lathes.

If you can use all or a part, we will be pleased to have you communicate with us promptly.

EAST DAYTON MACHINERY COMPANY
Dayton, Ohio

c6m

You Want A Good Man

for that position you have open, don't you? Then why not advertise for him in the paper he reads? Only the mechanics who are ambitious and who are capable of filling the responsible positions subscribe to CANADIAN MACHINERY. Your "Help Wanted" ad in CANADIAN MACHINERY will bring responses from this class.

Prove it to your satisfaction and benefit

Canadian Machinery
Classified Advertising Section
143 University Ave., Toronto

STEEL BUILDING CRANES

Can be seen in operation

Steel Building or Coal Shed, 108 ft. x 298 ft., maximum height 40 ft., containing approximately 450 tons of structural steel.

Two Brown Patent Bridge Tramways, hoisting and conveying apparatuses, consisting of a bridge tramway with tracks permitting a movement of 300 ft.; distance between movable piers 180 ft., with end cantilevers 92 ft. and 36 ft. Each bridge has in its house, Brown Patent Hoisting Engine with the most modern operating mechanism, together with all necessary fittings and connections for complete operation, together with six Brown Patent Automatic Self-dumping Coal Tubs of 42 cu. ft. capacity; two single rope buckets of 48 cu. ft. capacity; four skips of 2 ton capacity; and also automatic clam shell bucket. Both these outfits are practically in new condition.

New York Machinery Exchange, Inc.

50 Church Street . . . New York City

We Have for Immediate Delivery the Following Second-hand Machinery in Good Operative Condition

- 1 Landis No. 3 Universal Grinder 12" x 42", complete equipment, less internal grinding attachment. . \$1,500
- 1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft \$2,200
- 1 Gisholt Turret Lathe, 21", complete with boring bar equipment and countershaft \$1,800

These machines are particularly good value, and may be seen at our works.

A. B. JARDINE & COMPANY HESPELER, ONT.

Rebuilt Machines For Sale

PLANERS

- 1-24x36 Powell.
- 1-42x42x10' Pond.
- 5-Sellers 25x35x6'.
- 1-Sellers 25x35x8'.
- 1-Putnam 24x24x8' 6".
- 1-Wheeler Heavy 30x30x8' 6".
- 1-Lathe Morse 24x24x5' 6".
- 1-New Haven 24x24x7'.
- 1-Putnam 42x40x12' 6".

GRINDERS

- 1-Miami Universal Tool and Cutter Grinder.
- 1-4x10" Universal Tool and Cutter, power feed, same as new.
- 1-Bridgeport Plain Grinder, 16x36.
- 1-No. 3 Landis Universal Grinder.
- 2-No. 6X Diamond Double Disc Grinders.
- 1-Ford Smith Plain Grinder.

AUTOMATICS

- 1-3/4" Grindis, Belt Drive.
- 1-15/16" National Acme Double Belt Type.
- 1-No. 55 National Acme.
- 1-1" National Acme, four spindle.
- 2-No. 34 National Acme, four spindle.
- 3-2" Cleveland.
- 1-2 1/4" Cleveland.
- 2-2 1/4" Grindley Single Spindle Motors.
- 1-3 1/4" Grindley Single Spindle Motor.

LATHES

- 1-32x12' Draper Lathe, C.R., H.S.
- 3-18x8' Putnam, C.R., taper.
- 6-18x8' Porter, C.R., semi quick, taper.
- 2-18x8' Davis, C.R., pan, pump, taper.
- 5-15x8' Greaves-Klusman, C.R., pan, pump.
- 9-20x6' Perkins Plain Turning, pan, pump.
- 1-14x5' Porter, C.R.
- 1-30x8' LeBlond, C.R.
- 14-20x6' Perkins Lathes, pan bed, chuck, Fay & Scott Turrets.

MISCELLANEOUS

- 1 No. 2 Barrett Horizontal Cylinder Boring Machine, 5' bar.
- 1 5' Cincinnati Bucktond Plain Radial, single pulley.
- 1-No. 5 Becker Vertical Miller.
- 2-No. 310 Baker Drills.
- 1-No. 18 Bliss Press.
- 1-No. 4 Garvin Plain Miller.
- 1-3" Industrial Works Shetter.
- 1 2 1/2" Aurora Sliding Head Back Geared Drill.
- 3-Premice 2 1/2" Sliding Head Drills.
- 2-Industrial 4 1/2" Drills.
- 1-Western Hydraulic Banding Machine.
- 1-Jencks Band Turning Lathe, with 3" Universal Chuck.
- 1-36" Aurora Drill
- 1-12" Resonant Travelling Head Shaper.
- 1-Sellers Slab Miller, 24x24x12".
- 1-No. 21 Lee-Simplex Saw.

This is only partial list—Send for full list

Simmons Machine Company, Inc.

NEW YORK, 1001 Singer Bldg., Telephone Cortlandt 6575
ALBANY, N. Y., 985 Broadway, Telephone Main 4876

ReMANUFACTURED - (ORIGINATED BY US) - MACHINE TOOLS

None But a ReManufactured Tool Has as Broad a Guarantee



Showing part of a lot of 24-in. Gisholts, as listed below

Very Latest Models—None Over 2 Years Old

TURRET MACHINES

- 25—21" Gisholts, 3 1/2" hole, 2-step, 5 belt.
- 20—21" Gisholts, 3 1/2" hole, motor arrangement.
- 13—24" Gisholts, 4 1/4" hole, 3-step, 4 belt.
- 38—24" Gisholts, 6" hole, 2-step, 6" belt.
- 41—24" Gisholts, 6" hole, motor arrangement.
- 2—2 1/4" x 26" Greenlee Flat Turrets.
- 2—2 1/2" x 26" Pratt & Whitney Gd. Hd. Turrets.
- 4—3-A Warner & Swasey (bar machines).

ENGINE LATHES

- 24—22" x 8' Hamilton, D.B.G., C.R., Semi-Q.C.
- 5—22" x 8' Hamilton, D.B.G., Turret tool post.
- 4—22" x 8' Davenport, D.B.G., Turret tool post.
- 7—22" x 10' Hamilton, D.B.G., C.R., Semi-Q.C.G.
- 2—22" x 10' Hamilton, D.B.G., turret tool post, Semi-Q.C.G.
- 20—22" x 10' Davis, D.B.G., C.R., Q.C.G.
- 8—24" x 10' Lodge & Shipley, D.B.G., C.R., Q.C.G.
- 8—24" x 10' Lodge & Shipley, Selective Gd. Hd., C.R., Q.C.G.
- 11—26" x 10' American, D.B.G., C.R., and carriage turret.
- 2—26" x 10' American, D.B.G., carriage turret.
- 19—26" x 12' Putnam, carriage turret, semi-Q.C.
- 9—26" x 12' Putnam, C.R., Semi-Q.C.
- 2—26" x 12' Wickes, D.B.G., C.R., Semi-Q.C.G.
- 10—28" x 10' Niles, Bement, Pond, D.B.G., Q.C.G.
- 4—28" x 14' Lodge & Shipley, Select. Gd. Hd., motor drive, C.R., turret and taper.
- 3—30" x 16' Lodge & Shipley, D.B.G., C.R., turret and taper.
- 10—40" x 18' Pittsburgh, triple-g geared, Q.C.G.

Our Guarantee

Your money back if you return a machine within 30 days from date of shipment, freight prepaid. **No Excuses Necessary.**

PLANERS

- 1—76" x 18" x 18" Woodward & Powell, 2 hds.
- 1—48" x 18" x 16" Bond, 2 hds.
- 1—32" x 12" x 10" Gray, 2 hds.
- 1—32" x 12" x 8" Gray, 2 hds.
- 1—30" x 10" x 7" Powell, 4 hds.
- 1—26" x 26" x 7" Gray, 1 hd.
- 1—20" x 20" x 6" American.
- 1—24" x 24" x 10" Lodge & Shipley.
- 1—24" x 24" x 6" Cincinnati.
- 2—24" x 24" x 5" Gray.
- 1—24" x 24" x 4" Gray.
- 1—22" x 22" x 6" American.
- 1—20" x 20" x 6" Flather.

HORIZONTAL BORING MACHINES

- 1—P. & W. 2-spindle Rifle Barrel Drilling.
- 1—2-spindle Beaman & Smith Cylinder Boring.
- 1—No. 4 Newton 2-spindle, 4"
- 1—Bemis 2 1/2" bar.
- 1—Bement 2 1/2" bar.
- 1—Beaman & Smith 2 1/2" bar.

VERTICAL BORING MACHINES

- 1—42" Colburn.
- 2—44" Colburn.
- 1—20" Revere.
- 1—30" Baum.

RADIAL DRILLS

- 1—4' Niles Full Universal.
- 1—3 1/2' Gang.
- 1—3' Mueller.
- 1—3' Prentice.
- 1—2 1/2' Doane.
- 2—2 1/2' Mueller.
- 2—2 1/2' Powers.

MILLING MACHINES

- 1—No. 2 Beaman & Smith Combination Horizontal and Vertical.
- 1—Beaman & Smith 12 cutting table, 1 1/2" cross bor. hd.

- 1—100" x 18" x 8" Cincinnati
- 2—30" Pratt & Whitney
- 1—30" Beaman & Smith
- 1—No. 2 Cincinnati & Company
- 1—No. 2 Cincinnati Universal
- 1—No. 1 Beaman & Smith
- 1—No. 1 Beaman & Smith
- 1—No. 1 Beaman & Smith
- 1—No. 1 Beaman & Smith

GRINDERS

- 1—No. 1 American & White Grinding Wheel
- 1—No. 1 American & White Grinding Wheel
- 1—No. 1 American & White Grinding Wheel
- 1—No. 1 American & White Grinding Wheel
- 1—No. 1 American & White Grinding Wheel
- 1—No. 1 American & White Grinding Wheel
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HILL, CLARKE & CO. OF CHICAGO

625 WASHINGTON BLVD., CHICAGO, ILL.

SPECIAL MACHINERY

Special Machinery, Jigs, Fixtures, Punches and Dies, Small Tools, Screw Machine Products, Gauges, Forgings, Etc.

CONTRACT WORK

ACCURACY



The discriminating buyer is the one we like to meet—the one who insists on accurate product. He will eventually buy "GALT" Cap and Set Screws because they measure up to his standard.

Your rush orders for S. F. Hex. nuts taken prompt care of. Better finished nuts—try a sample.

**THE
GALT MACHINE SCREW CO.,
GALT, ONTARIO** LIMITED

Eastern Representatives: The Canadian B. K. Morton Company, Limited, 49 Common St., Montreal, Que.

Homer & Wilson Stamping & Tool Works

WE MAKE THE TOOLS
AND
PRODUCE THE STAMPINGS

Let us quote on your requirements.



1-3-5 Lancaster Street
Hamilton, Ontario



CUT GEARS

Rawhide — Steel — Brass — Cast Iron

Try our W-G Rawhide Silent Gear. Designers and Builders of Special Machinery.

Winnipeg Gear & Engineering Co.
197-199 Princess St., Winnipeg, Man.

We Make GAUGES and TOOLS

All Work Executed Promptly and Guaranteed

**THE MONARCH BRASS MFG.
COMPANY, LIMITED**

71 BROWNS AVE.

TORONTO, ONT.



Overhead Trolley Systems

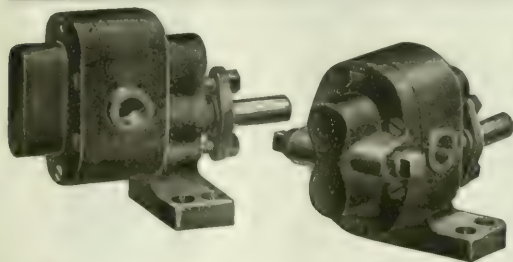
are invaluable in light work foundries for delivering molten metal, collecting and delivering castings, and distributing

flasks and supplies, etc.

Any point in foundry or shop is easily reached, even remote corners. Extensions readily made. Save labor, time and floor space.

Send for Catalog No. 111

**Complete Foundry Equipments
Cranes of all kinds**



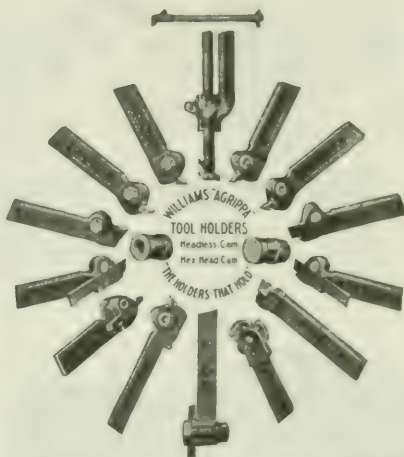
Circulating Pumps

Eliminate the separate relief valve and its necessary piping by installing the Roper Circulating Oil Pump. But, you say, why install a new system when the present is good enough? This "good enough" article may appear to be giving satisfaction, *but*, is it giving the best to be obtained. Can you speed up without any fear? With a Roper you need not have any fear of any kind. The oil flows from it in a steady, even stream, and there you can speed up to full capacity and let her go feeling confident.

Inquire. You will get valuable information anyway.

C. F. ROPER & CO.
Hopedale : Mass. : U.S.A.

WOULD THEY?



Would successful manufacturers squander time and money introducing a new line of tool holders for the dealers and consumers who market and use their older products if uncertain of superior mechanical design?

Unless convinced of increased future demand would the competition for the small volume of tool holder renewals warrant such effort?

Would you afterwards demand other Williams' tools if the tool holders they endorsed failed to succeed?

Do stable companies risk their past reputation and their future prospects on untried or unproven innovations?

No, there is a reason, and their trial proves

Williams' "AGRIPPA" Tool Holders

"THE HOLDERS THAT HOLD"

excel and endure

We guarantee all "AGRIPPA" Tool Holders

J.H. WILLIAMS & CO.

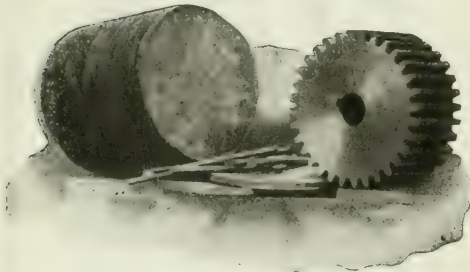


Descriptive circulars upon request

CUT GEARS



Use Quiet Rawhide Pinions for Motor Drives



Rawhide Pinions up to 14-in. diameter

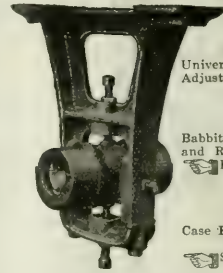
Our large stock of
rawhide pinion material
is at your service for
quick delivery.

Write us for quotations.

Hamilton Gear & Machine Co.
Van Horne Street, TORONTO

If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

Speed Up—



Universal
Adjustment

Babbitted
and Reamed
Bearings

Case Hardened
Steel
Set Screws

IN War Times you should get all the speed out of your machines possible.

You can do this by using BOND Hangers. From the day you put a BOND Hanger on the job it starts saving your oil, your power, and your patience.

It is an investment that yields a steady return with every revolution of your shafting.

The sturdy, braced construction makes for smooth running without vibration. Its design permits full accessibility for adjustments or erection.

The Bond Hanger Book tells about everything we make in the line of power appliances.

Your files are not complete without it.

CANADIAN BOND HANGER & COUPLING CO.

ALEXANDRIA

Limited

ONTARIO

There's a man

advertising on page
72 for a position.

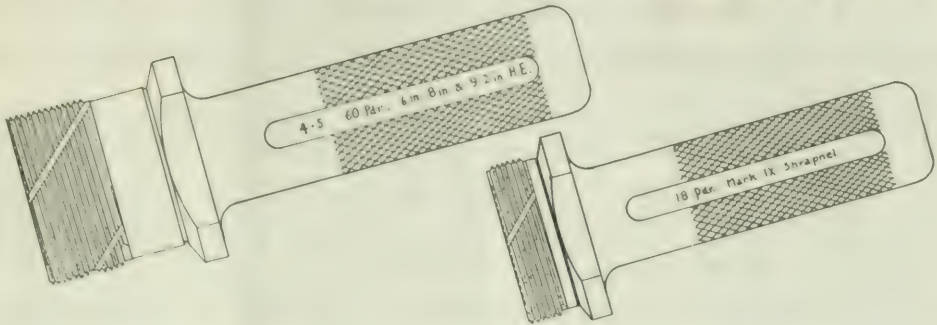
Have you a position
open that he could
profitably fill? If you
have, write him. If
you have the position
and don't think he can
fill it, advertise for one
who can.

Canadian Machinery

Classified Advertising Section

143 University Avenue, Toronto

FUSE HOLE GAUGES



Manufacturing and inspection fuse hole gauges for all size shells. A surplus stock enables us to ship immediately.

Windsor Machine & Tool Works
Windsor, Ontario

Increased Production Means Increased Profits



Large Millers
for large work
—STEPTOE
MILLERS
for small work.



Large Planers
for large work
—STEPTOE
SHAPERS
for small work.



Will result in increased production; less money invested in machinery, and increased profits.

THE JOHN STEPTOE COMPANY
CUMMINSVILLE, CINCINNATI, OHIO, U.S.A.

Canadian Representatives: Garlock-Walker Machinery Co., Toronto, Ont.



Did you ever notice somebody starting a conversation in a low voice with the two words "They say"? The moment you hear it you know it is gossip, scandal, and most likely a lie. But when you hear everyone saying that HARRIS HEAVY PRESSURE is the best BABBITT METAL they can use for all general machinery bearings, isn't it about time to believe them?

Send for our wearers' factory for a trial free.

Manufactured and guaranteed by

The Canada Metal Company, Limited
Hamilton Montreal TORONTO Winnipeg Vancouver

If any advertisement interests you, tear it out and place with letters to be answered.

MACLEAN'S

FOR SEPTEMBER

is a magazine of the very best type and rank. It is made for Canadians, and so has a value and appeal to Canadians possessed by no other magazine in the world. MACLEAN'S circulation is getting greater each month. It is now 50% larger than a year ago. The inference is inevitable.

Northcliffe

Lord Northcliffe will be a contributor to the September MACLEAN'S. The general theme of his article will be Canada's position at the present time in relation to the war and to the Empire afterwards. Be sure to read what the brilliant and dominant man has to say about our country. Get an outsider's viewpoint.

MacLean

John Bayne MacLean, publisher, editor, publicist, clear-seeing and far-seeing, has another strong article in the September MACLEAN'S. Colonel MacLean has proved himself to be as clear-sighted as Kitchener in many matters pertaining to the present war; and he is doing a needed work now in THE FINANCIAL POST and other newspapers, to arouse Canadians to a proper sense of the perils that lie ahead.

Ronald

Another smuggling revelation!

A certain Canadian town offered a big bonus to a factory. An American supplied the desired factory, smuggled into Canada the whole plant required,—and was afterwards found out and brought to book. J. D. Ronald tells the whole amazing story in the September MACLEAN'S. Mr. Ronald is contributing to MACLEAN'S a series of Canadian "inside" smuggling stories—true ones. This is great stuff.

Leacock and Laut

Stephen Leacock and Miss Agnes C. Laut are contributors as usual to the September MACLEAN'S. Leacock's humor is bubbling, sparkling and refreshing—like spring water. Miss Laut provides another of her well-informed vigorous, and revealing articles on a phase of the war in relation to Canada and the United States. Miss Laut makes us think and wonder!

Jacobs and McGrath

W. W. Jacobs contributes one of his inimitable short stories to the September MACLEAN'S. "Their Wives Went Along." Harold McGrath, world famous story-writer, who wrote "The Man on the Box," provides a complete novelette. It is a story of adventure and mystery.

Allenson and Moorhouse

A. C. Allenson contributes a short story, "A Flutter in Diamonds;" and Hopkins Moorhouse, "Their Tents like the Arabs." These two men are Canadians—winning fame, and adding lustre to Canada's record for producing short story writers of the first-class.

Hendryx

James B. Hendryx's serial, "The Gun Brand," continues in the September MACLEAN'S. A great story of the Canadian Northwest. The Movie-makers are filming Hendryx's work. So you can be sure that he's writing the right sort of stuff.

Women and Their Work

This is the title of a new department in MACLEAN'S. In the September issue, this department will contain:

Reducing my household cost.

The Care of the Child—an article by Dr. George E. Smith.

A sketch of Mrs. W. M. Davidson, a prominent Western woman, engaged with her husband in editing the Calgary Albertan.

Cooking the Cheaper Cuts,—an article on economy in the kitchen.

This new department will prove of first-class interest to all women.

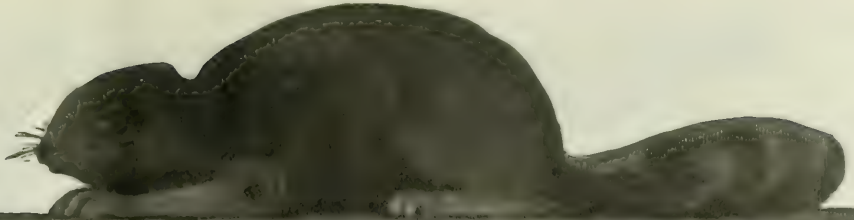
Review of Reviews

One of the best liked and most valuable features of MACLEAN'S MAGAZINE is its Review of Reviews Department where the best and most significant articles appearing in current literature are condensed for the busy reader, and for the one who wants to know what other magazines are printing. Here one gets a cross-section of the world's best thought.

At All

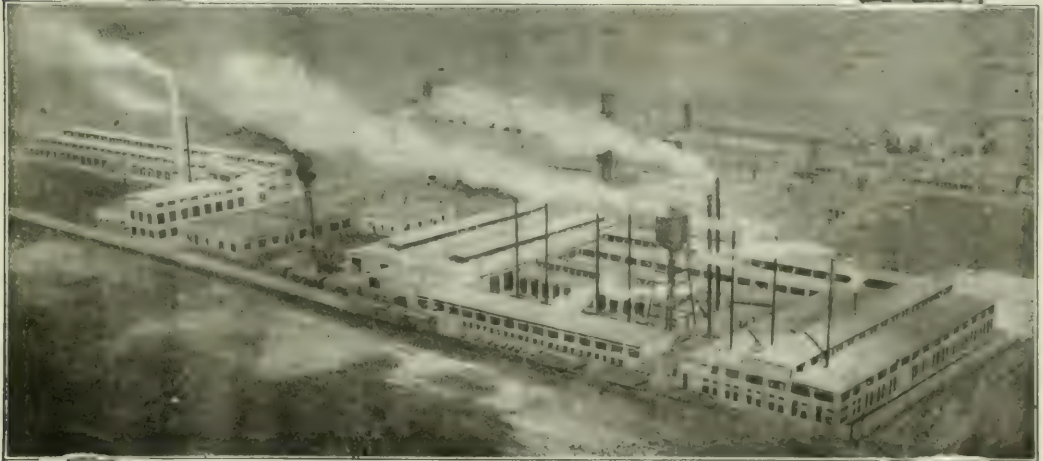
Newsdealers

15 cents



BROWN'S

BEAVER BRAND METALS
BRASS, BRONZE,
CANADA SILVER and GILDING METAL
In Sheets, Rolls, Plates and Rods



Brown's Copper & Brass Rolling Mills, Limited

General Offices and Works:
New Toronto, Ontario, Canada



If any advertisement interests you, tear it out now and place with letters to be answered

Jacobs

IMPROVED

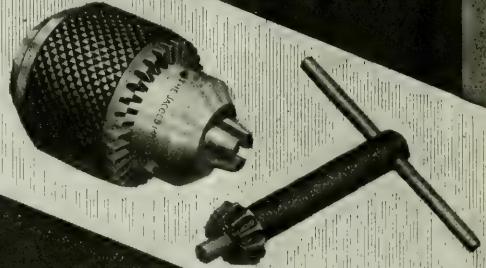
Drill Chuck

A Winner By Sheer Merit

Jacobs Improved Drill Chucks are recognized as the STANDARD the world over. Once tried—always used.

Try them and see for yourself.

MADE BY
**The Jacobs
Manufacturing Co.**
Hartford, Conn., U.S.A.



Think of it—A 20 to 90% Increase in Production

THE M. E. C. Three-Jaw Air-operated Chuck shown herewith eliminates the waste usually experienced in ordinary chucking processes. It takes all classes of work of the hand-operated chuck, but grips much better and gives top-notch service day in and day out. Only the best materials obtainable go into its manufacture. It is made entirely of steel, including the body. A special process steel is used in making the actuating levers and all parts subjected to strain. The M.E.C. Three-jaw Chuck will do good work long after others have been discarded. Take it on thirty days' free trial.

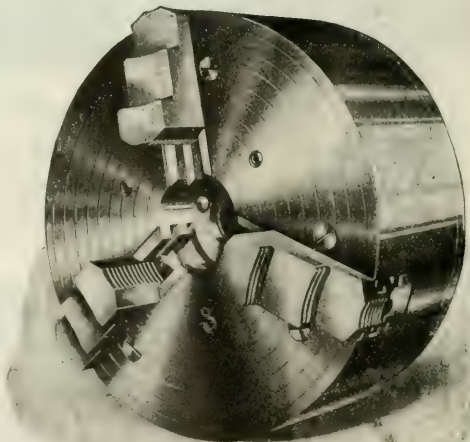
Write for catalog on all M.E.C. Labor-Saving Devices.

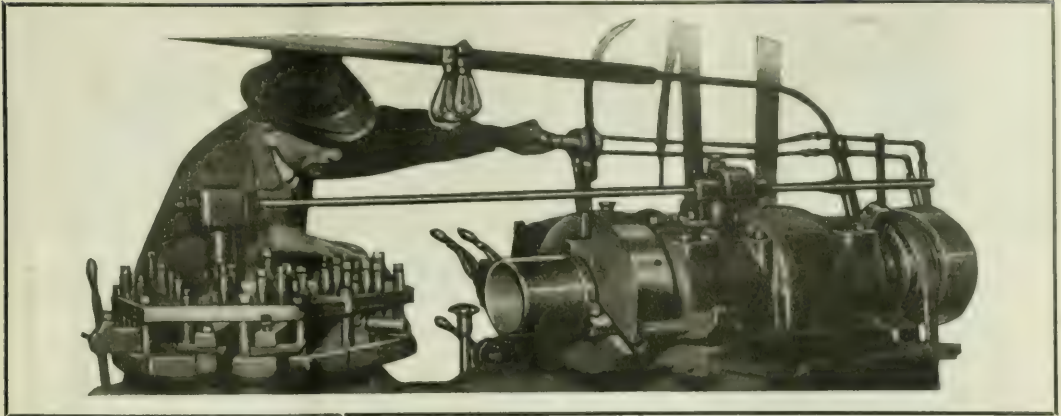
Manufacturers Equipment Co.
171 N. Jefferson Street, Chicago, Ill.

Also makers of M.E.C. Two and Three-Jaw Air-Operated Chucks, Expanding Mandrels, and Collapsible Taps.

CANADIAN AGENTS:

J. R. Stone Tool & Supply Co., Goebel Bldg., Detroit, Mich.





The Woman in the Shop Has Come to Stay

Thrust into the industrial field by unprecedented world conditions, women have more than made good. Lacking masculine brawn, they have by instinct the deft, sure touch and quick perceptions that go to make a highly skilled operator; aided by modern labor-saving devices they equal, and in many cases surpass, the output of the expert workman.

One of the woman machinist's chief helps is the Hannifin Air Chuck, by means of which work is chucked and rigidly gripped by simply turning a lever. Another turn effects the release. The Hannifin Chuck is almost instantaneous in action, holds securely, cannot slip, saves labor, and saves time to the extent of increasing output 20 to 100 per cent.

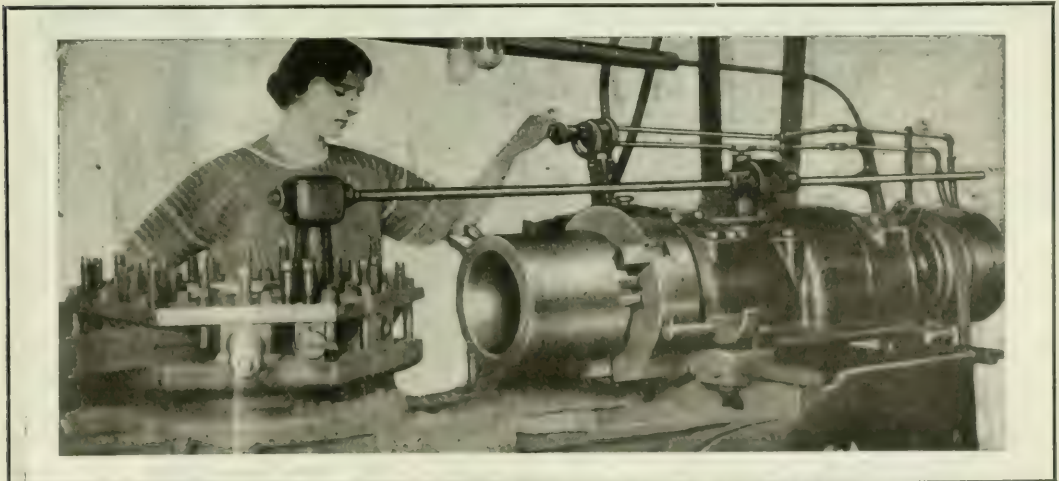
Every argument is in favor of the Hannifin Air Chuck. Order one on trial and let it prove its own case.

HANNIFIN Air Chucks

Write for catalogue covering Air Operated Chucking and Clamping Equipment.

HANNIFIN MFG. COMPANY, Chicago, U.S.A.

REPRESENTATIVES—R. E. Ellis Engineering Co., Chicago; Coats Machine Tool Co., New York City; A. R. Williams Machinery Co., Toronto; Williams & Wilson, Montreal; The Canadian Fairbanks-Morse Co., Montreal; EUROPEAN REPRESENTATIVES: Coats Machine Tool Co., Ltd., London; Fenwick Irwin & Co., Paris; Izmoskoff & Co., Petrograd.



It is our advertisement's intention to give you the best value for your money with service to be depended on.



Murchey

EQUALS 10 SOLID TAP LIVES

That point alone is sufficient to stamp Murchey adjustable taps as the undisputed leader of its class.

The point is this: when a chaser on a Murchey Tap is ground it can be adjusted to compensate for wear; with a solid tap this cannot be done with the fineness, the finish, the absolute accuracy that characterizes our adjustable taps. A solid tap will lose its accuracy, and the more grindings the greater the inaccuracy. We maintain a special chaser service for our clients.

The Murchey Adjustable Tap has other features which we will gladly furnish upon request.

MURCHEY MACHINE & TOOL CO.

75 Porter St.

Detroit, Mich.

The Coats Machine Tool Co., Ltd., Caxton House, Westminster, London, S.W., England
Fenwick Freres & Co. 16 Rue Fenelon Paris, France

For Positive Accuracy—



*and Big
Time Saving*

VICTOR Collapsible TAPS

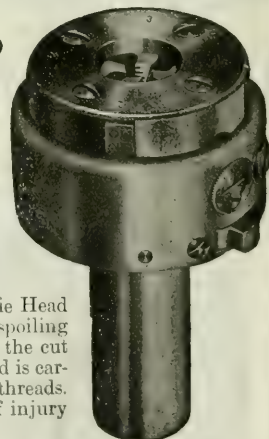
"Victor" Collapsible Taps are simple in construction; the few parts can be made large and strong; the body is machine steel, and the chasers are high-speed; screw adjustment from front end makes it easy to maintain close accuracy; trip is automatic; reset by means of lever. The above features

and others—make the "Victor" a time and money saver for severe service. It is being used by many shell manufacturers.

Victor Tool Company
Waynesboro, Pa., U.S.A.

H & G

Safe and Rapid Production



You can speed up with H. & G. Automatic Self-opening Die Head without any fear of spoiling work. At the end of the cut the die head opens and is carried back free of the threads. There is no chance of injury thereby.

*Chasers Stay Set—Don't Change Size
in Opening and Closing*

Solid dies often spoil work when run off the threads too rapidly. Not so with the H. & G.—double your production by using the H. & G. Can be attached to any automatic single or multiple spindle. Write for our catalog.

Eastern Machine Screw Corp.
New Haven, Conn., U.S.A.

Every Butterfield Tap comes to you ready for long, hard service.

It is made by expert workmen—from the finest materials obtainable—and thoroughly tested before shipment.


For the tap that is uniformly dependable in service — specify Butterfield.

Butterfield & Co., Inc.

Rock Island :: Quebec

Toronto Office:
1505 Traders Bank Building Phone Main 1382
H. A. HARRISON, Manager

Catalogue No. 19
listing the complete
line of Butterfield Taps
is available upon request.

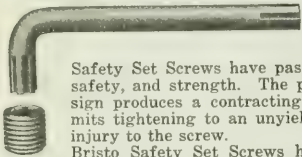


BUTTERFIELD

If any advertisement elsewhere gives you an idea what kind of a tap to buy, please refer to this one.

HINTS TO BUYERS

BUILDERS OF MACHINERY WHAT SET SCREWS DO YOU USE ?



TRADE MARK
BRISTO
REG. U. S. PAT. OFF.

Safety Set Screws have passed every test for safety, and strength. The patented fluted design produces a contracting effect which permits tightening to an unyielding grip without injury to the screw.

Bristo Safety Set Screws have been adopted as the standard by many prominent machinebuilders. Ask for free samples and Bulletin I-809.

THE BRISTOL CO., Waterbury, Conn.
U. S. A.

Eliminate All Guesswork

Make sure you are getting the quality and standard you are paying for. Our International Bureau of Inspection, Tests and Consultations is at your disposal.

CANADIAN INSPECTION AND TESTING LABORATORIES, LIMITED

Head Office and Main Laboratories—MONTREAL

Branch Offices and Laboratories:
TORONTO. WINNIPEG. EDMONTON. VANCOUVER.
NEW GLASGOW.

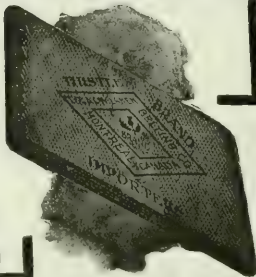
"THISTLE" BRAND RUBBER BELTING

"Maintenance of Quality"

is our motto, and our experience in the manufacture of belting since the year 1856 should be invaluable to you. Let us tell you all about this friction faced belting. The price will appeal to you.

Write to-day.

**J. C. McLAREN BELTING
CO., LTD.**
TORONTO, MONTREAL, WINNIPEG



STEEL CASTINGS

We are well equipped to make all kinds of steel castings, 100 lbs. to 50,000 lbs.

Dominion Steel Foundry Co.

HAMILTON LIMITED ONTARIO

IS YOUR RIVETING PROFITABLY DONE?

Our Elastic Rotary Blow Riveting Machine does profitable work, because one machine will do the work of several hand riveters, and do it better.

Every head is perfectly formed, any shape, round, flat, oval, rectangular, etc.

Catalogue C tells more about it.

The F. B. SHUSTER COMPANY
New Haven, Conn.

Formerly John Adt & Son. Established 1866.

Also makers of Wire Straighteners and Cutter, Cotter Pin Machines, etc.



RIVETED STEEL TANKS FOR EVERY PURPOSE



OIL STORAGE - GASOLINE TANKS - AIR RECEIVERS
PNEUMATIC WATER SUPPLY TANKS - SMOKE STACKS
BOILER BREECHING - RIVETED STEEL PIPE - BINS & HOPPERS

**Northern
Crane Works**
LIMITED
WALKERVILLE
ONTARIO

Electric Cranes
Hand Cranes
Foundry Equipment



NORTHERN CRANES

CRANES
MADE IN
CANADA

Electric Hoists
Air Hoists
Cupolas
Ladles



If what you need is not advertised, consult our Buyers' Directory and write advertisers listed under proper heading.

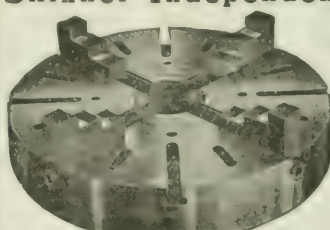


RICHMOND

CHUCKS
Universal Geared Scroll Type with either one or two sets Jaws.

Richmond Mfg. Co., Ltd.
 183-185 George Street TORONTO, CAN.

Skinner Independent Chucks
 FOR HIGH SPEED WORK
 IRON OR STEEL BODY



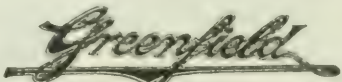
The last word in chuck construction. Wide jaws hardened and ground. Adjusting screws of large diameter, threaded full length. Jaws ground after hardening, etc.

Write us to-day for prices.

THE SKINNER CHUCK COMPANY, New Britain, Conn.
 New York Office: 94 Reade St., N.Y.
 London Office: 149 Queen Victoria Street
 San Francisco Office: Rialto Building.

Zenith Coal & Steel Products Limited
COAL COKE HACK SAW BLADES
CARBON STEEL MACHINERY STEEL
HIGH SPEED STEEL

Royal Bank Bldg., Toronto; McGill Bldg., Montreal, Quo.




Trade Mark Reg. U. S. Pat. Office



A Universal Grinder with a Complete set of attachments for handling all kinds of tool sharpening, cylindrical, internal and surface grinding. **STURDY, DEPENDABLE, ACCURATE, RAPID.** Catalog No. 6 on request.

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

Oxy-Acetylene Welding and Cutting Apparatus
Carter Welding Co., General Toronto
 For Davis-Bournonville Oxy-Acetylene Apparatus
General Office and Factory, Jersey City, N.J.
Canadian Factory, Niagara Falls, Ont.
 Sales Offices: New York, Boston, Philadelphia, Pittsburgh, Cleveland, Cincinnati, Chicago, Detroit, St. Louis, San Francisco, Seattle.



For Hardness Testing
 in shop and laboratory use the **Standard Scleroscope**

Universally adopted, direct reading, mechanical, and the only instrument that across wide ranges of the kind in all parts of the world, thus saving the problems of ordering materials for specifications.

BOOKLET FREE

Heat Indication
 The PYROSCOPE is fast becoming the correct thing. The PYROSCOPE can record the position. Perfectly automatic, temperature, no electricity used. Built to stand rough usage and from common sense lines. Used by the Government and best firms.

Shore Instrument & Mfg. Co. 555-7 W. 22nd St. New York
 Agents for Canada: A. R. Williams Machy, Co., Ltd., Toronto, Can.

CLUTCHES
 Combined Jaw and Friction. Friction only
 Gas Engine Clutches. Jaw Clutches.

Write for interesting printed matter.

The Positive Clutch & Pulley Works, Ltd., Canada
MONTREAL Factory: Aurora, Ont. TORONTO

TAKE ALL THE GRIND OUT OF GRINDING WITH
WILMARTH & MORMAN GRINDERS
 CATALOGUE ON REQUEST
WILMARTH & MORMAN COMPANY, 1200 Monroe Avenue, N. W.
GRAND RAPIDS, MICH., U. S. A.
 Manufacturers of Drill Grinders, Surface Grinders, Universal Grinders

You want Tool Holders that have made good
ARMSTRONG TOOL HOLDERS
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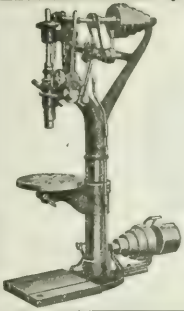
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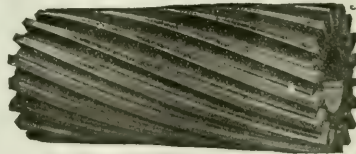
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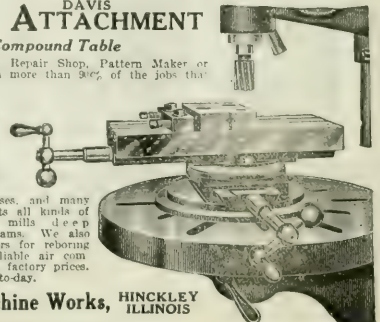
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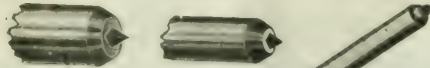
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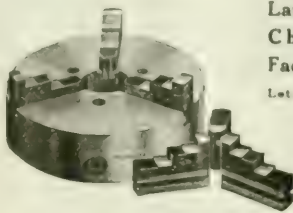
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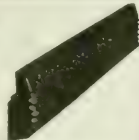
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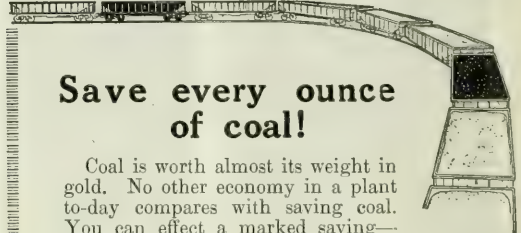
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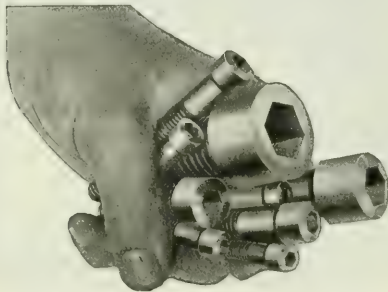
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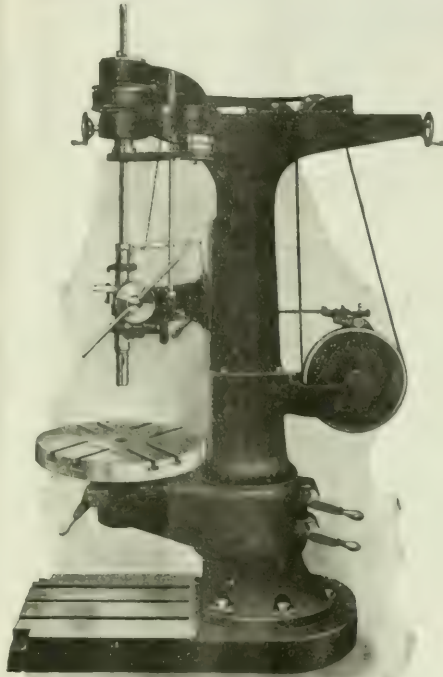
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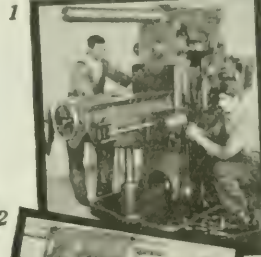
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knee and a wide-bearing table, or because the
overhanging arm is massive and rigidly sup-
ported that B & S Heavy Service Milling Machines
give year-in-and-year-out efficient service on the
heaviest milling within the province of a column and
knee type machine—it is because each machine is a
perfectly balanced unity of rugged, well-proportioned
parts.



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are built throughout to stand up under the severe service demanded under present conditions. They have the power, the ruggedness and the ease of operation that modern milling demands.

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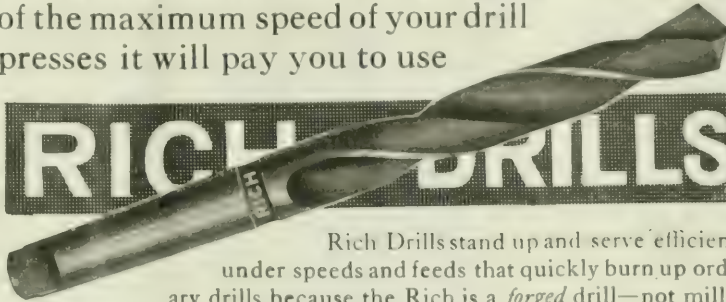
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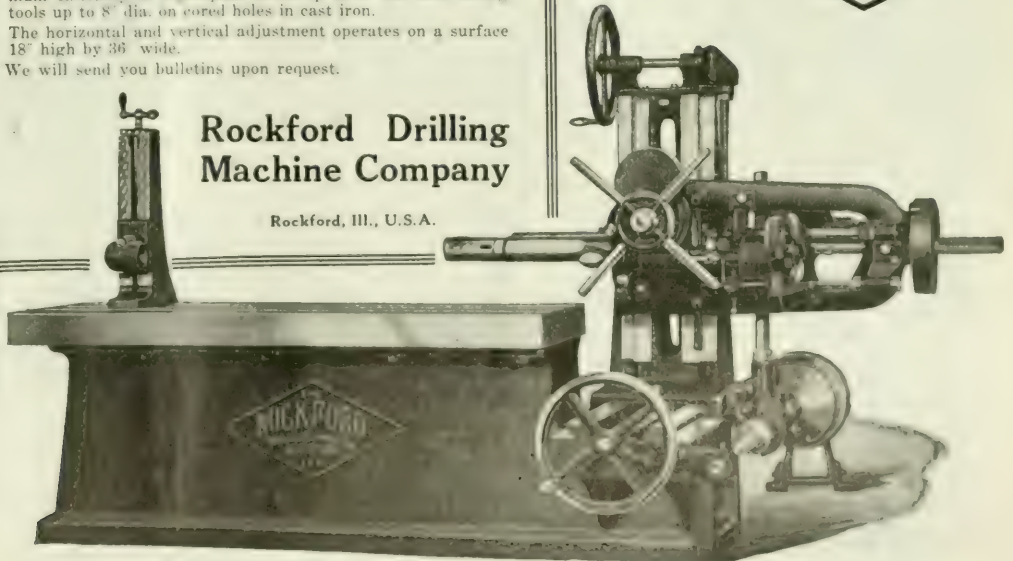
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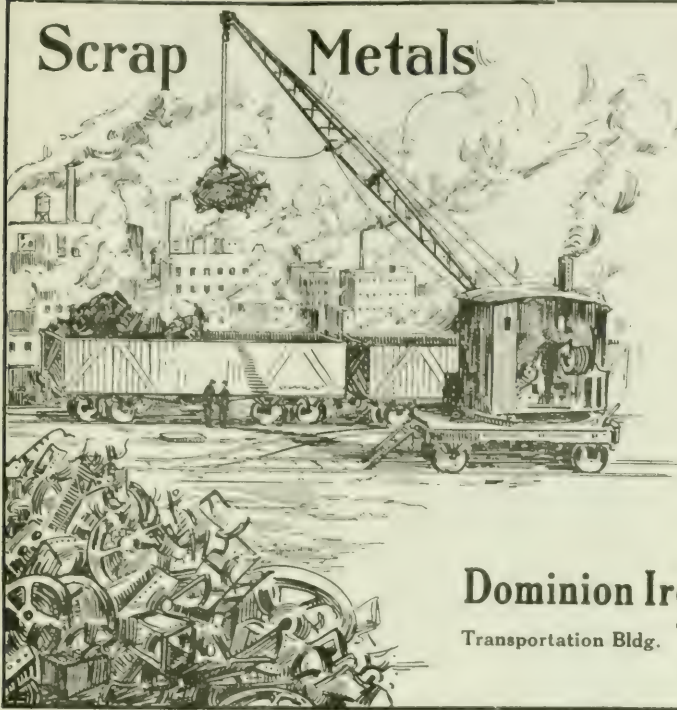
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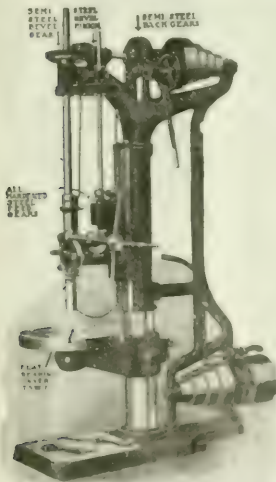
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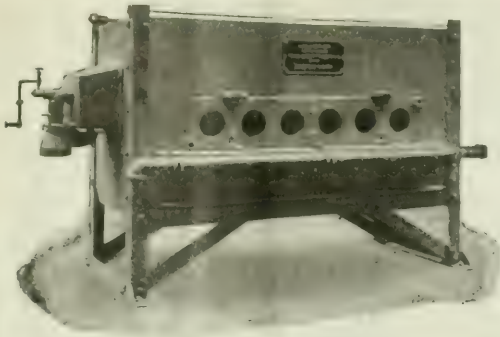
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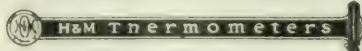
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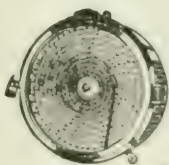
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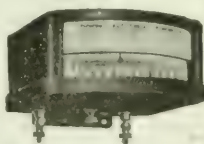


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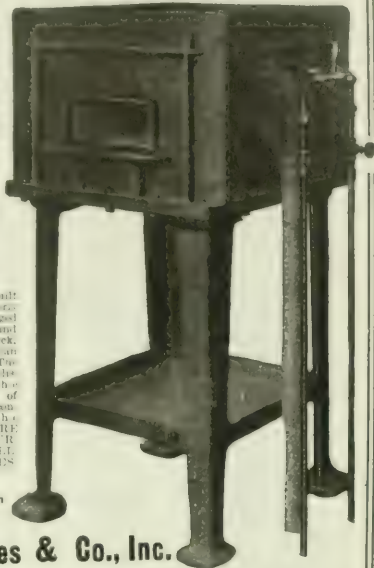
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SHEARS, SQUARING
 Brown, Boggs & Co., Hamilton, Canada.

SHEET METAL WORKING TOOLS
 Baird Machine Co., Bridgeport, Conn.
 Bliss, E. W., Co., Brooklyn, N.Y.
 Brown, Boggs & Co., Hamilton, Can.
 Peck, Stow & Wilcox, Cleveland, O.
 Steel Rolling Brake Works, Ltd., Chatham, Ont.

SHEET METAL STAMPINGS
 Dominion Forge & Stg. Co., Walkerville, Ont.

SHEET BANDING MACHINES.
 Hydraul. Chapman Double Ball-Bearing Co., Toronto, Ont.
 Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
 The Jencks Mach. Co., Ltd., Sherbrooke, Que.
 Metalwood Mfg. Co., Detroit, Mich.
 Perrin, Ltd., W. R., Toronto, Ont.
 West Tire Setter Co., Rochester, N.Y.

SHEET PAINTING MACHINE
 Can. Blower & Forge Co., Kitchener, Ont.
 Sheldon, Ltd., Galt, Ont.

SHELL RIVETERS
 Grant Mfg. & Machine Co., Bridgeport, Conn.
 High Speed Hammer Co., Rochester, N.Y.

SHRAPNEL SHEET MARKER
 Brown-Boggs Co., Hamilton, Ont.
 Noble & Westbrook Mfg. Co., Hartford, Conn.

SIDE TOOLS
 Armstrong Bros. Tool Co., Chicago.
 Baxter & Co., Ltd., Montreal, Que.
 Can. B. K. Morton, Toronto, Montreal.

SIGNS, ENAMEL
 Strong, Kennard & Nutt Co., Cleveland, Ohio.

SILVER SOLDER
 Geo. H. Lees & Co., Hamilton, Ont.

SKATE SHARPENERS
 Can. Bond Hanger & Cplg. Co., Alexandria, Ont.

SLEDGES
 Aikenhead Hardware Co., Toronto, Ont.
 Whitman & Barnes Mfg. Co., St. Catharines, Ont.

SLOTTERS
 Garvin Machine Co., New York
 National-Acme Co., Cleveland, Ohio.
 Niles-Bement-Pond Co., New York.
 Rhodes Mfg. Co., Hartford, Conn.

SMOKERACKS
 The Jencks Mach. Co., Ltd., Sherbrooke, Que.
 MacKinnon, Holmes Co., Sherbrooke, Que.

SOCKETS
 Brown & Sharpe Mfg. Co., Providence.
 Clark Equipment Co., Buchanan, Mich.
 Cleveland Twist Drill Co., Cleveland.
 Keystone Mfg. Co., Buffalo, N.Y.
 Modern Tool Co., Erie, Pa.
 Morse Twist Drill & Machine Co., New Bedford.
 A. H. Williams & Sons, Brooklyn, N.Y.

SOCKET HEAD CAP SCREWS
 Allen Mfg. Co., Hartford, Conn.

SOLDERING IRONS
 Aikenhead Hardware Co., Toronto, Ont.
 Prest-O-Lite Co., Inc., Toronto, Ont.
 Brown, Boggs & Co., Hamilton, Can.

SOLDERS
 Aikenhead Hardware Co., Toronto, Ont.
 Tallman Brass & Metal Co., Hamilton.

SPECIAL MACHINERY
 Baird Machine Co., Bridgeport, Conn.
 Bandfield, Edwin, Toronto.
 Bandfield, W. H., & Sons, Toronto.
 Bertram, John, & Sons Co., Dundas.
 Bliss, E. W., Co., Brooklyn, N.Y.
 Brown, Boggs & Co., Hamilton, Can.
 Can. Fairbanks-Morse Co., Montreal.
 Charles F. Elmer, Eng., Chicago.
 Ferracute Mach. Co., Bridgeton, N.J.
 Garlock-Walker Machy. Co., Ltd., Toronto, Ont.
 Garvin Machine Co., New York.
 Gooley & Elliott, Inc., Concord, N.Y.
 Grant Mfg. & Machy. Co., Bridgeport, Conn.
 John H. Hall & Sons, Brantford.
 Gray Mfg. & Mach. Co., Toronto, Ont.
 Hinnof Machine Co., New York, N.Y.
 Hyde Engineering Works, Montreal, Que.
 Jephth, A. H., & Hespeler.
 The Jencks Mach. Co., Ltd., Sherbrooke, Que.
 McLean & Son, F. W., Niagara Falls, Ont.
 National-Acme Co., Cleveland, Ohio.
 D. McKenzie Machinery Co., Guelph, Ont.
 Mulliner & Enlund Tool Co., Syracuse, N.Y.
 Prest-O-Lite Co., Inc., Toronto, Ont.
 Rhodes Mfg. Co., Hartford, Conn.
 Riverside Machinery Depot, Detroit, Mich.
 Sleeper & Hartley, Inc., Worcester, Mass.
 Smart-Turner Machine Co., Hamilton, Ont.
 T. M. Mfg. Co., Harrison, N.J.
 Victoria Foundry Co., Ottawa, Ont.
 William R. Wain, Ltd., Toronto, Ont.
 Winnipeg Gear & Eng. Co., Winnipeg, Man.

SPRINGS, MACHINERY
 James, Wallace, Co., Bristol, Conn.
 Can. Steel Foundries, Ltd., Montreal, Que.

Cleveland Wire Spring Co., Cleveland.
 Jas. Steele & Co., Quebec, Ont.

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 Baird Machine Co., Bridgeport, Conn.
 Garvin Machine Co., New York.
 Sleeper & Hartley, Inc., Worcester, Mass.

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 Sleeper & Hartley, Inc., Worcester, Mass.

SPIRAL CONVEYORS
 Can. Matthews Gravity Carrier Co., Toronto, Ont.

SPROCKETS, CHAIN
 Grant Gear Works, Boston, Mass.
 Morse Chain Co., Ithaca, N.Y.
 Philadelphia Gear Works, Philadelphia, Pa.

SOLDER
 Jobborn, Geo. A., Hamilton, Ont.

SPOCKET WHEELS, CAST
 Perrin, Wm. R., Toronto.

STAIRS, IRON
 Canada Wire & Iron Goods Co., Hamilton, Ont.

STAMPINGS
 Dillott Mfg. Co., Oshawa, Ont.
 Dom. Forge & Stg. Co., Walkerville, Ont.
 Homers & Wilson, Hamilton, Ont.

STAMPING MACHINERY
 Brown, Boggs & Co., Hamilton, Can.
 Canada Machine Corp., Galt, Ont.
 Ferracute Mach. Co., Bridgeton, N.J.
 Noble & Westbrook Mfg. Co., Hartford, Conn.

STAMPS, STEEL ALPHABET, FIGURES
 Matthews, Jas. H. & Co., Pittsburgh, Pa.
 Noble & Westbrook Mfg. Co., Hartford, Conn.
 Pritchard-Andrews Co., Ottawa, Can.

STAPE MACHINES
 Sleeper & Hartley, Inc., Worcester, Mass.

STEAM SEPARATORS AND TRAPS
 Can. Fairbanks-Morse Co., Montreal, Que.
 Can. Morehead Mfg. Co., Woodstock, Ont.
 H. W. Petrie, Toronto.
 Sheldon, Ltd., Galt, Ont.
 The Smart-Turner Machine Co., Hamilton.
 Sturtevant Co., B. F., Galt, Ont.

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 Colonial Steel Co., Pittsburgh, Pa.
 Latrobe Electric Steel Co., Latrobe, Pa.
 Osborn (Canada), Ltd., Sam'l, Montreal, Que.
 Vanadium-Alloy Steel Co., Pittsburgh, Pa.
 Vulcan Crucible Steel Co., Alquippa, Pa.
 Zenith Coal & Steel Products, Montreal, Que.

STEEL, COLD ROLLED
 Can. Drawn Steel Co., Hamilton, Ont.
 Union Drawn Steel Co., Hamilton, Ont.

STEEL DRUMS
 Smart-Turner Machine Co., Hamilton, Ont.

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 Can. Blower & Forge Co., Kitchener, Ont.
 Can. Fairbanks-Morse Co., Montreal, Ont.
 T. M. Mfg. Co., Harrison, N.J.
 Sturtevant Co., B. F., Galt, Ont.

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 Can. Fairbanks-Morse Co., Montreal.
 Can. R. K. Morton, Toronto, Montreal.
 Century Steel Co. of America, New York.
 Colonial Steel Co., Pittsburgh, Pa.
 Can. Drawn Steel Co., Hamilton, Ont.
 Fairley Davidson Steel Co., New York, N.Y.
 Hewitsons Bros. Co., Boston, Mass.
 Latrobe Electric Steel Co., Latrobe, Pa.
 Marshall, Geo. A., Lombard, Toronto.
 Osborn (Canada), Ltd., Sam'l, Montreal, Que.
 H. W. Petrie, Toronto.

Standard Alloy Company, Pittsburgh, Pa.
Vanadium Alloy Steel Co., Pittsburgh, Pa.
Vulcan Crucible Steel Co., Alquippa, Pa. (referred to in Canada by Norton, Callard & Co., Montreal, Que.)
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STEELS, HIGH STRENGTH, HOT-WORKING, DIE, MAGNET
 Fairley Davidson Steel Co., New York, N.Y.

STEEL VANADIUM
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 Vanadium Alloy Steel Co., Pittsburgh, Pa.
 Vulcan Crucible Steel Co., Alquippa, Pa.

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 Stokes & Dies, Toronto, Ont.
 Wells Bros. Co. of Canada, Galt, Ont.

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 Standard Steel, Shaw, Toronto, Ont.
 New Britain Mach. Co., New Britain, Conn.

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 MacKinnon, Holmes & Co., Sherbrooke, Que.

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 Jencks Mach. Co., Sherbrooke, Que.
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 Osborn (Canada), Ltd., Sam'l, Montreal, Que.
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 Modern Tool Co., Erie, Pa.
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 Osborn (Canada), Ltd., Sam'l, Montreal, Que.
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 Can. Fairbanks-Morse Co., Montreal, Que.
 Cleveland Twist Drill Co., Cleveland.
 Foss & Hill Machy. Co., Montreal.
 Geometric Tool Co., New Haven, Conn.
 A. B. Jardine & Co., Hespeler.
 Morse Twist Drill & Machine Co., New Bedford.
 Murray Machine & Tool Co., Detroit, Mich.
 Osborn (Canada), Ltd., Sam'l, Montreal, Que.
 Petrie of Montreal, Ltd., H. W., Montreal, Que.
 H. W. Petrie, Toronto.
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 Allen Mfg. Co., Hartford, Conn.

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THERMOMETERS, ALL KINDS
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 Bellevue Industrial Furnace Co., Detroit, Mich.

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 Toronto Testing Laboratory, Toronto.

THREAD-CUTTING MACHINES
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 Curtis & Curtis Co., Bridgeport, Conn.
 Garlock-Walker Machinery Co., Toronto, Ont.
 Geometric Tool Co., New Haven, Conn.
 Landis Machine Co., Waynesboro, Pa.
 National-Acme Co., Cleveland, Ohio.
 National Machy. Co., Tiffin, Ohio.
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 Pratt & Whitney Co., Dundas, Ont.
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 Telford Co., New York, N.Y.
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 Can. B. K. Morton, Toronto, Montreal.
 Deloro Smelting & Refining Co., Toronto, Ont.
 Modern Tool Co., Erie, Pa.
 Pratt & Whitney Co., Dundas, Ont.
 J. H. Williams Co., Brooklyn, N.Y.

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 Sleeper & Hartley, Inc., Worcester, Mass.
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 Can. B. K. Morton, Toronto, Montreal.
 Colonial Steel Co., Pittsburgh, Pa.
 Deloro Smelting & Refining Co., Toronto, Ont.
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United States Elec. Tool Co., Cincinnati, O.

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Can. Ingersoll Rand Co., Sherbrooke, Que.
Cleveland Pneumatic Tool Co. of Canada, Toronto
Carter Pneumatic Machinery Co., St. Louis, Mo.
Garlock-Walker Machinery Co., Toronto, Ont.
Independent Pneumatic Tool Co., Chicago, Ill.

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American Ross Tool Co., Chicago.

TOOLS, SCREW MACHINE
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Armstrong Whitworth of Canada Ltd., Montreal
Foster Machine Tool Co., Toronto, Ont.

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Can. Dryden Steel Co., Hamilton, Ont.
Hamilton Gear & Mach. Co., Toronto.
Morse Chain Co., El Paso, N.Y.
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Northern Crane Works, Walkerville.
Telford Brass & Metal Co., Hamilton.

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A. R. Williams & Co., Toronto.
National Machine Co., Tiffin, O.
Canada Machinery Corp., Galt, Ont.
Niles-Bennet Found. Co., New York.

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Petrie of Montreal, Ltd., H. W., Montreal, Que.
H. W. Petrie, Ltd., Toronto, Ont.
A. R. Williams Mach. Co., Toronto.

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Smart-Turner Machine Co., Hamilton, Ont.

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Graton & Knight Mfg. Co., Montreal.

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Sausman & Co., B. P., Galt, Ont.
A. R. Williams Mach. Co., Toronto.

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Becker Milling Machine Co., Boston, Mass.
Foss & Hill Machs., Ont., Montreal.
New Britain Machine Co., New Britain, Conn.
H. W. Petrie, Ltd., Montreal.
H. W. Petrie, Toronto.

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Butterfield & Co., Rock Island, Que.
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Whiting Chuck Co., New Britain, Conn.

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National Machy Co., Tiffin, Ohio.

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Barnes Wallace, Co., Bristol, Conn.
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London Bolt & Nut Works, London, Ont.
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Sheep & Hartley, Inc., Worcester, Mass.

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Garlock-Walker Machinery Co., Toronto.
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Sheep & Hartley, Inc., Worcester, Mass.

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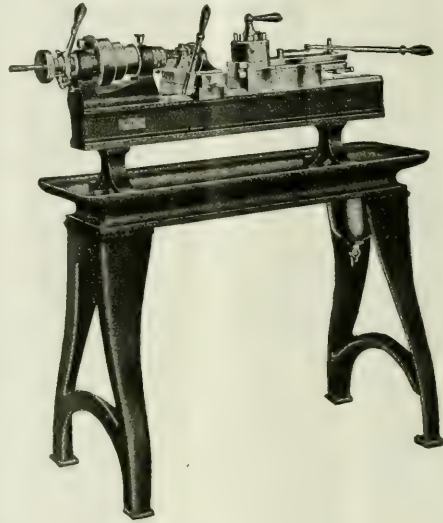
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A weekly newspaper devoted to the machinery and manufacturing interests.

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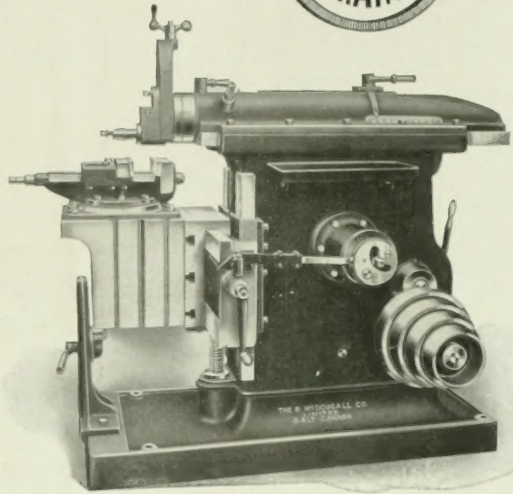
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