ROCKWELL

Rotary
Annealing and Hardening
FURNACES

W. S. ROCKWELL COMPANY

50 CHURCH STREET NEW YORK

(Hudson Terminal Building)

ROCKWELL

Rotary

Annealing and Hardening

FURNACES

For **Annealing, Hardening, Tempering, Blueing** or other **Heat Treatment** of any small pieces of like dimensions in either **Brass, Copper, Steel** or other metals such as:

Cartridge Shells	**Steel Balls**	**Coin Blanks**
Saw Teeth	**Punchings**	**Ferrules**
Buttons	**Springs**	**Eyelets**
Screws	**Rivets**	**Rings**
Bolts	**Tacks**	**Nuts**
Cups	**Caps**	**Etc.**

W. S. ROCKWELL COMPANY

50 CHURCH STREET **NEW YORK**

(Hudson Terminal Building)

August, 1912 Catalog No. 15

ROCKWELL
Rotary Annealing and Hardening Furnaces
Oil or Gas Fuel.

Patented { July 16th 1901 / Nov. 16th 1909

ROCKWELL ROTARY ANNEALING AND HARDENING FURNACES insure, so far as a mechanical device can insure, a uniformly heated and clean product.

To insure such uniformity and cleanliness the material is heated in a cylindrical furnace with a smooth, fire tile lining of helical form, fired internally with oil or gas fuel, rotated at certain fixed speeds and into which the material is charged in bulk, moved forward uniformly and discharged automatically.

The only human parts of the operation are the firing and charging. Both are easy. The use of oil or gas fuel requires observation rather than labor. The charging is mechanical rather than manual. The pyrometer tells the degree of heat, the speed regulator fixes the time of exposure. There you are. All done, all alike. If you start with good material you will have good material when finished. If you do not start with good material you will soon find it out.

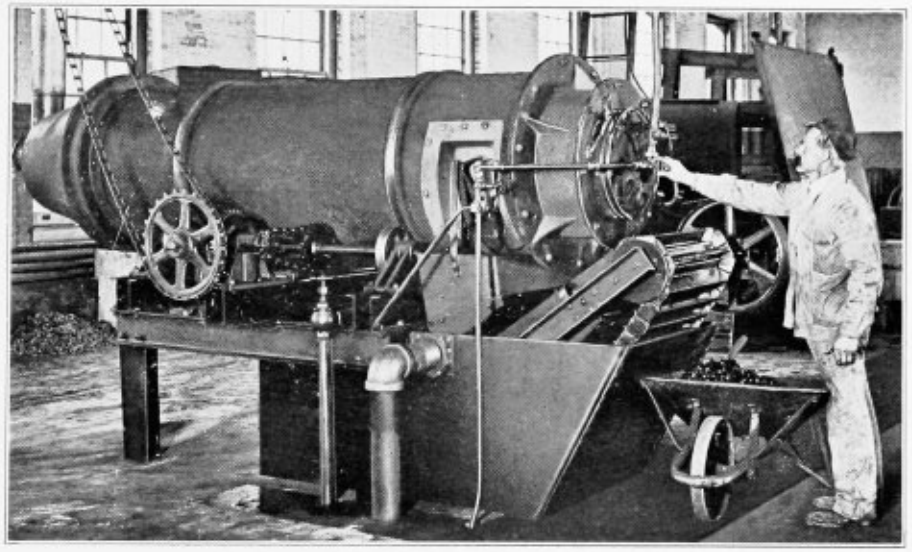


Fig. 1.—Rotary Hardening Furnace—Oil Fuel. Showing Regulation of the Heat.

The material is charged into the charging-drum in bulk and is conveyed thru the furnace automatically to the discharge end where it reaches its ultimate temperature. The material is not only brought up to the desired temperature from its cold condition in a gradual manner so as to afford time for the heat to penetrate its mass without overheating its surface parts, but each individual piece is constantly exposed to the open heat of the chamber and to the ever changing surface of its evenly heated helical lining and is finally discharged at exactly the time it reaches the desired temperature indicated by the pyrometer. This is important in several respects, especially in hardening steel. Also, it prevents or reduces oxidation.

For example, out of a certain lot of six tons of steel pieces heated and hardened in this furnace not one piece was found to be imperfect. Material heated in this type of furnace, that is, **wormed** thru a chamber of a certain temperature at a certain fixed speed, is more uniformly heated than is possible in any stationary furnace depending on human observation and manipulation. It is more uniformly heated than is possible in the tumbling-barrel type or in the horizontal bucket-conveyor type of furnace.

It has been proved that a certain quantity of material annealed in this furnace in a period of thirty minutes at the rate of **6½** minutes passage thru the furnace was more uniformly annealed than the same quantity of the same material charged in a cast iron tumbling barrel and revolved for **45** minutes in a hot furnace. Not only was the material more uniformly annealed but it was cleaner and more uniform in color. The difference in time is explained by the fact that some of the pieces of material in the tumbling-barrel type of furnace are always in the interior of the mass and cannot receive any **direct** heat; they must wait their turn in the operation of tumbling over each other to come to the inner surface of the barrel and receive that degree of heat which is assured to **each piece** in the Rockwell Rotary Furnace **all the time** during its travel thru the furnace.

ANNEALING: When used for annealing only, the furnace is generally built without the quenching tank and conveyor, the annealed material being discharged directly into a truck, wheelbarrow or other conveyance. See Figs. 10 and 13. The furnace body, however, and the method of charging, driving, firing, etc., remain the same as when used for hardening. Intending purchasers should state clearly the purpose for which the furnace is to be used and whether the quenching tank and conveyor will be required or not. See tables of details on page 13. For annealing bolts, rivets, screws, and similar material the tank and conveyor can be used to good advantage to give the material a rust-proof black finish. See Figs. 2 and 4. With the quenching tank and conveyor in place the furnace may be used for either annealing or hardening. And it may be used for blueing and other purposes either with or without the tank and conveyor.

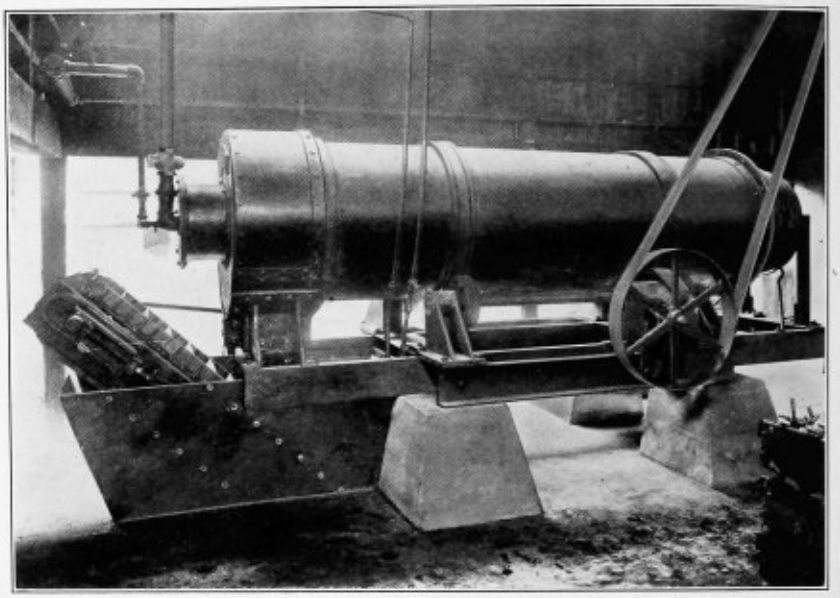


Fig. 2.—Rotary Annealing Furnace—Gas Fuel. Annealing Bolts, Rivets, Screws, Etc.

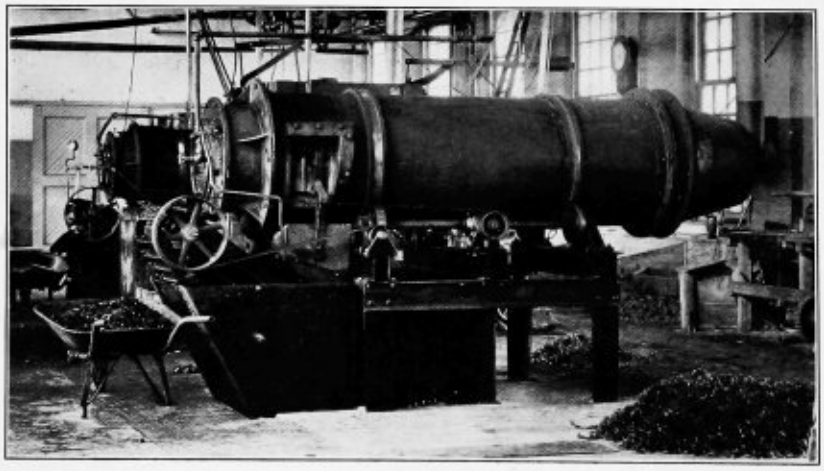


Fig. 3.—Rotary Hardening Furnace—Oil Fuel. Hardening Small Steel Pieces.

HARDENING: When the furnace is to be used for hardening, a quenching tank provided with a conveyor is fitted under the discharge spout. For convenience in varying the speed of the conveyor without varying the speed of the furnace independent drive is preferred. As the material is discharged from the furnace into the quenching tank it is caught on the conveyor, brought out and discharged over the end of the tank into a truck or wheelbarrow—see Figs. 3 and 4. Practically none of the bath is carried over with the material, provision for drainage being made. Provision is also made to prevent material from falling into the tank outside of the conveyor or from catching in the conveyor or from lodging in the furnace, so that there is no possibility

of different kinds of material becoming mixed. The conveyor is so arranged in the tank that by the simple removal of two bolts it may be drawn out bodily and replaced in a few minutes. In this way free access to the tank may be had for cleaning or other purposes.

DESIGN: The design of the furnace is that of a rotating horizontal cylinder with a refractory spiral lining, so that when material is charged in bulk into the charging-drum at one end it is gradually and automatically conveyed thru numerous convolutions and at gradually increasing temperature to the other end where it is automatically discharged at the exact time that it reaches its required temperature. A concentric hood serves to automatically close the discharge opening except at the lowest point of revolution and time of discharge. The hood also serves to guide the material as it leaves the furnace.

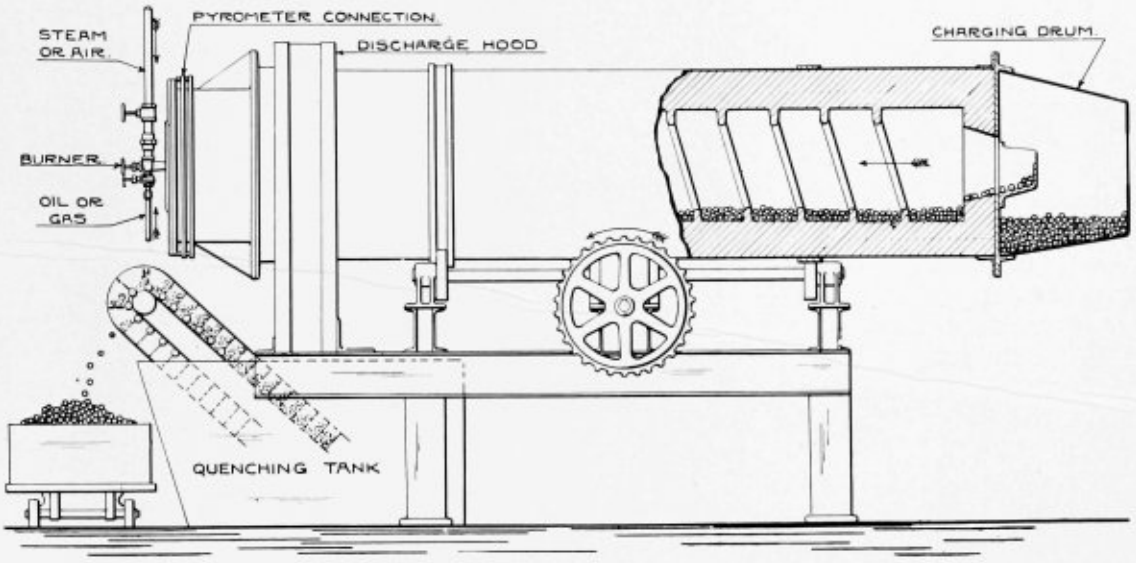


FIG. 4.—ROTARY ANNEALING AND HARDENING FURNACE—OIL OR GAS FUEL.
Showing section of furnace and charging-drum, method of quenching and removal of material from bath.

Fuel in the form of oil or gas is introduced directly into the cylinder at the opposite end, where combustion occurs and where the heat is at its maximum. As the hot gases from combustion pass onward toward the charging end they meet the incoming cold material to which they give up their heat until there is practically none left at the vent thru the charging-drum.

ECONOMY: In this way two important advantages are obtained: the material is brought up to its required temperature from its cold state in a uniformly progressive manner, and the heat derived from the fuel is practically all utilized.

OTHER ADVANTAGES: The horizontal position of the cylinder and the spiral lining are very essential features of the furnace. Together they determine with absolute certainty the time of travel of the material thru the furnace, thus causing all the material to be heated exactly the same as well as exactly right. This would be impossible in a cylindrical furnace with a smooth lining and inclined position. In such a furnace some of the material would run ahead, some be retarded, causing under-heating and over-heating. The horizontal position also admits of simple drive, easy charging and easy discharge as well as greater durability. For hardening, and also for annealing certain kinds of material, the design includes a quenching tank and conveyor located under the discharge end of the furnace.

A pyrometer is located in the discharge end of the furnace and shows the temperature of the material just as it is discharged.

CONSTRUCTION: The furnace body consists of a cylindrical steel shell with one longitudinal seam and with steel flanges at each end to which the cast iron end pieces are bolted. The casting on the discharge end has an opening thru the axis for the introduction of the fuel from the burner and for the admission of atmospheric air for combustion, regulated by a revolving damper, the casting on the charging end is flanged and the steel charging-drum is bolted to it. It is also provided with an opening or passage for the delivery of the material from the drum to the furnace chamber, so that a fixed or regulated quantity of material is admitted every revolution. This opening also serves as a vent for the escape of the spent gases of combustion. These gases carry but little heat, the advancing cold material having already absorbed most of it. This action is both a source of economy and a means of preserving the iron work at this end of the furnace. The charging-drum is provided with a round opening thru the axis for the charging of material in quantity. The furnace requires no chimney. A hood to carry off fumes from the oil in the quenching tank or from machine oil on the material is sometimes desirable.

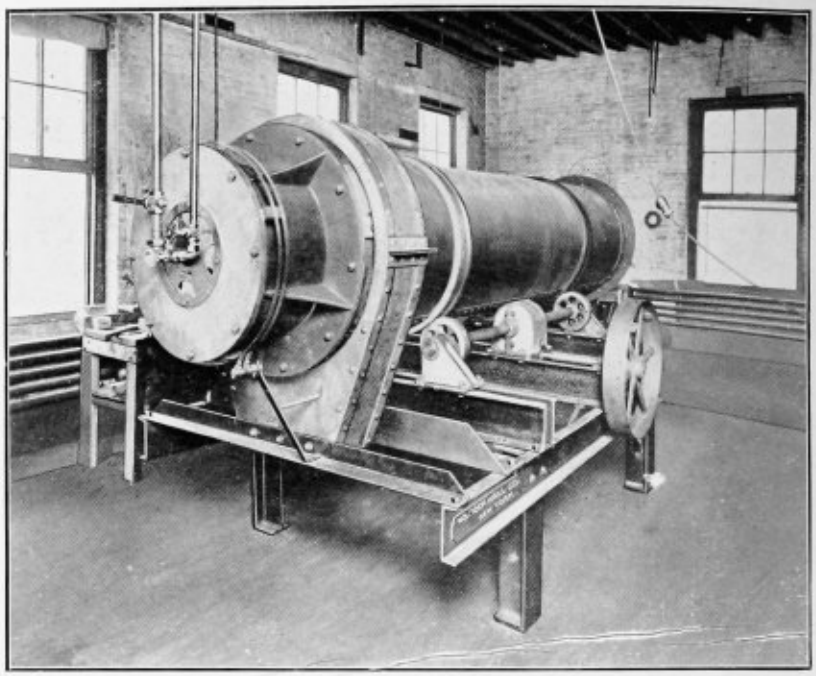


Fig. 5. — Rotary Annealing Furnace — Oil Fuel. Showing Firing and Discharging End.

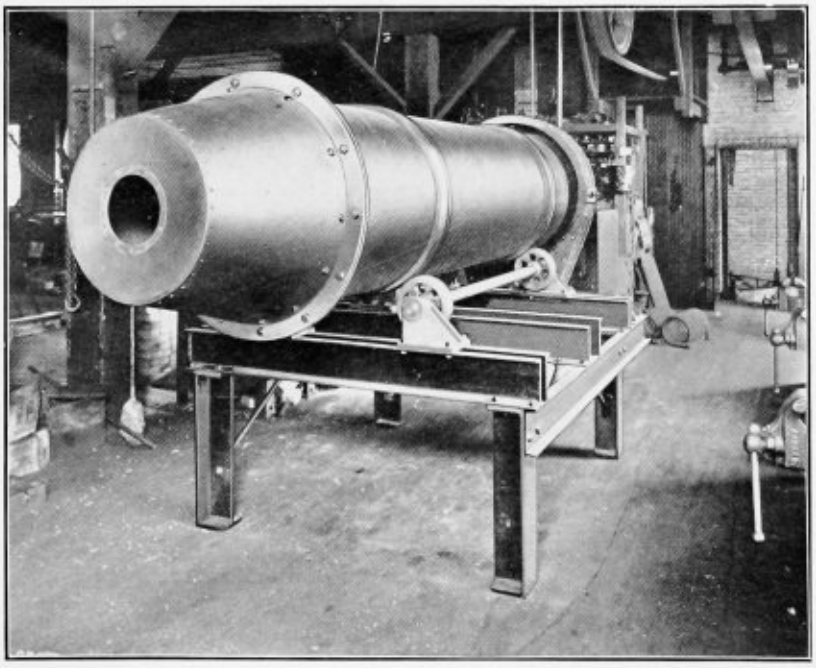


Fig. 6. — Rotary Annealing Furnace — Oil Fuel. Showing Charging End.

LINING: The lining of the furnace is one of its chief features. It is helical in form and consists of a sectional thread laid between hard, smooth, refractory fire tiles of simple design. The tiles form the body of the lining between the threads. They are the same in size and shape from one end of the furnace to the other, the same as the thread, so that only one shape of tile and one shape of thread make up the entire lining, excepting the tiles in the simple combustion chamber at the discharge end.

The lining will endure well under both heat and abrasion.

Owing to the character of the furnace and the location of the greatest heat at the discharge end, only a few of the threads at that end are subject to material wear. Repairs, when necessary, are therefore, mostly limited to this end of the furnace.

For material requiring temperatures higher than about 1,800 degrees F. (1,000 degrees C.) a special lining will be furnished.

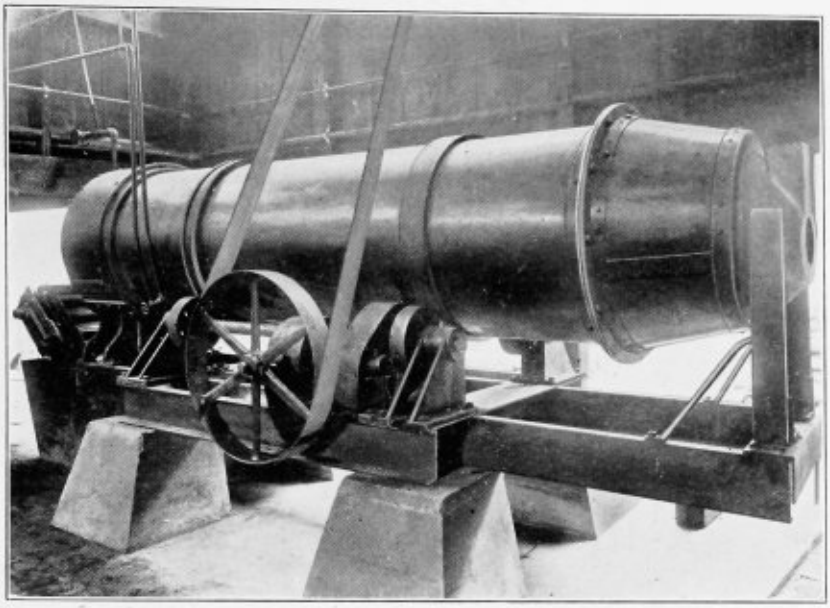


Fig. 7.—Rotary Annealing Furnace—Gas Fuel. Annealing Bolts, Rivets, Screws, etc.

DRIVE: The furnace body is driven from a pulley or sprocket thru a set of gears giving a large reduction of speed from pulley or sprocket to furnace. This arrangement admits of good belt speeds and insures a satisfactory drive from variable speed countershaft, friction cone or other speed regulating device. The power required varies from about ½ H. P. for the smaller size to about 1½ H. P. for the larger size. This includes the power required for independent drive of conveyor in the quenching tank.

SPEED: The speed may be varied according to the kind, shape and quantity of material being heated and is under control of the operator. Ordinarily from one to seven revolutions of the furnace per minute is the practice, and the time of travel of material thru the furnace from 2 to 10 minutes.

CHARGING: The material to be heated may be either shoveled into the charging-drum, dumped in bodily from buckets carried by tramrail as shown in Fig. 8, conveyed thru chutes from an overhead platform or upper floor as shown in Fig. 10 or charged in other manner as may be preferred. In any case the material will be gradually and automatically transferred from the charging-drum to the furnace chamber and carried forward by the internal thread thru many convolutions, slowly tumbling over itself and increasing in temperature as it proceeds until it reaches the discharge opening at the opposite end. In this way the time of heating is definitely fixed and the amount of heat supplied to the material is uniformly the same. The result on the material must be, therefore, exactly that which is required.

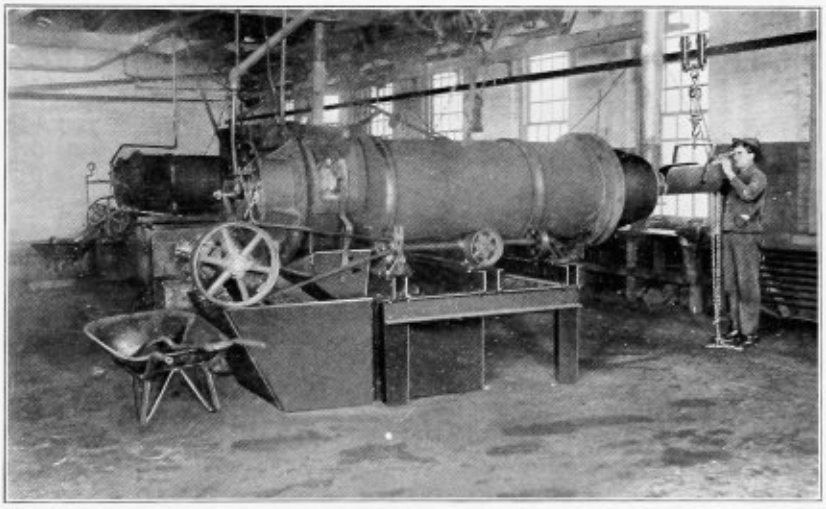


Fig. 8.—Rotary Hardening Furnace—Oil Fuel. Showing Trolley Method of Charging.

DISCHARGE: The discharge of the material is thru an opening at the extreme end of the chamber opposite the charging end. This opening is enclosed by a concentric cover or hood except when the opening is at the lowest point of revolution, at which point and time the material is automatically discharged by its own gravity as shown in Fig. 4.

TEMPERATURE: The temperature may be varied to suit the kind and character of material to be heated. For material requiring temperatures higher than about 1,800 degrees F. (1,000 degrees C.) a special lining will be furnished.

PYROMETER: The pyrometer is located in the discharge end and the thermo-couple inside is directly at the discharge opening, so that the temperature of the material just as it leaves the furnace is definitely known. Continuous readings are obtained.

CLASS OF WORK: The furnace is intended to handle, either for annealing, hardening, tempering, blueing or other heat treatment, any small pieces of like dimensions in either brass, copper, steel or other metals such as cartridge shells, eyelets, ferrules, buttons, caps, cups, coin blanks, steel balls, saw teeth, tacks, screws, rivets, rings, springs, nuts, punchings, etc., in fact, any small pieces which will travel freely and pass thru the openings without choking.

CAPACITY: The capacities of the different size furnaces depends upon the weight, shape and character of the work and kind of material. Weights given in the printed tables on page 13 are fair averages taken from actual operation. Also the figures in the table of comparisons on page 10 are from actual operation of No. 76 size, annealing brass cartridge cups, and may be accepted as right for that material.

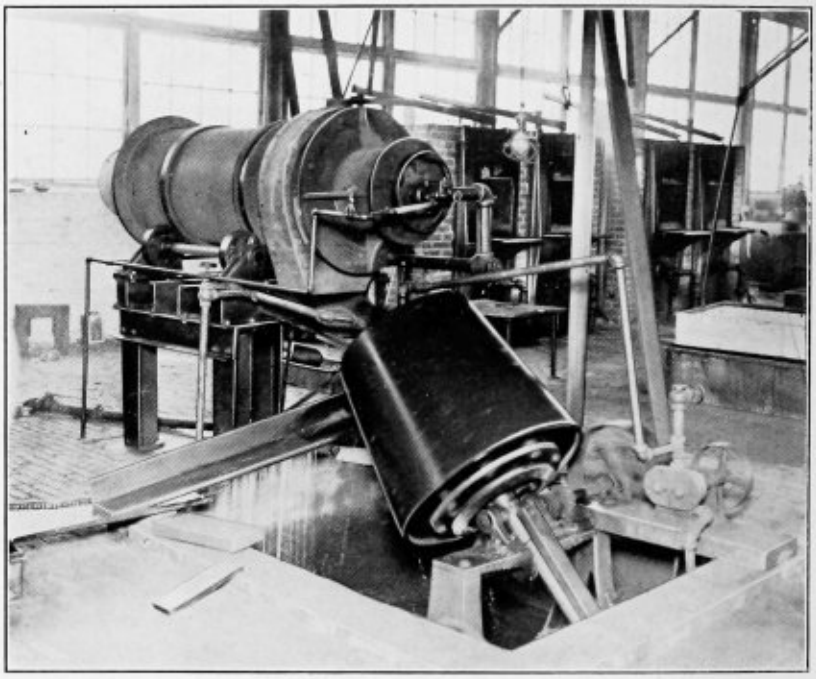


Fig. 9.—Rotary Hardening Furnace—Oil Fuel. Showing Rotary Quenching Tank.

FUEL: Either oil or gas may be used as fuel. Coal or coke cannot be used. If oil is used it may be atomized with air at 2 lbs. pressure per square inch or over; or with dry steam at boiler pressure.

REPAIRS: As a whole the furnace requires little repair—practically none on the outside. The wear inside is on the thread and fire tile lining. The life of these depends in some degree on the temperature carried and some on the abrasive nature of the material being heated. The thread is gradually destroyed by the heat—at the discharge end; very little in the charging half of the furnace. The thread in this half has practically no wear. The wear on the tile lining is from abrasion by the material traveling over it rather than from action of the heat, and of course is about uniform thruout the furnace. As only tiles of a hard as well as refractory nature are used and as the movement of the material thru the furnace is very slow and of a rolling or tumbling rather than sliding nature, the wear on the tiles is very slow. As the lining is formed of sectional pieces of the same shape, thread and body, the matter of the user carrying a stock of these two parts is simple. No expensive retorts, cylinders, conveyors or other complicated or expensive parts are required. All parts of the furnace are easily accessible for repairs when necessary.

PRICE: Where distance will permit we will contract to furnish, erect and put the furnace in operation and guarantee satisfactory results. Where the distance is so great that this cannot be done profitably we will sell all iron work, lining tiles, oil or gas burner and complete drawings showing purchaser how to erect. Our drawings show full details and any first class bricklayer or mechanic can erect, put in the lining and operate the furnace.

We solicit your inquiries and will give price and full information on receipt of particulars.

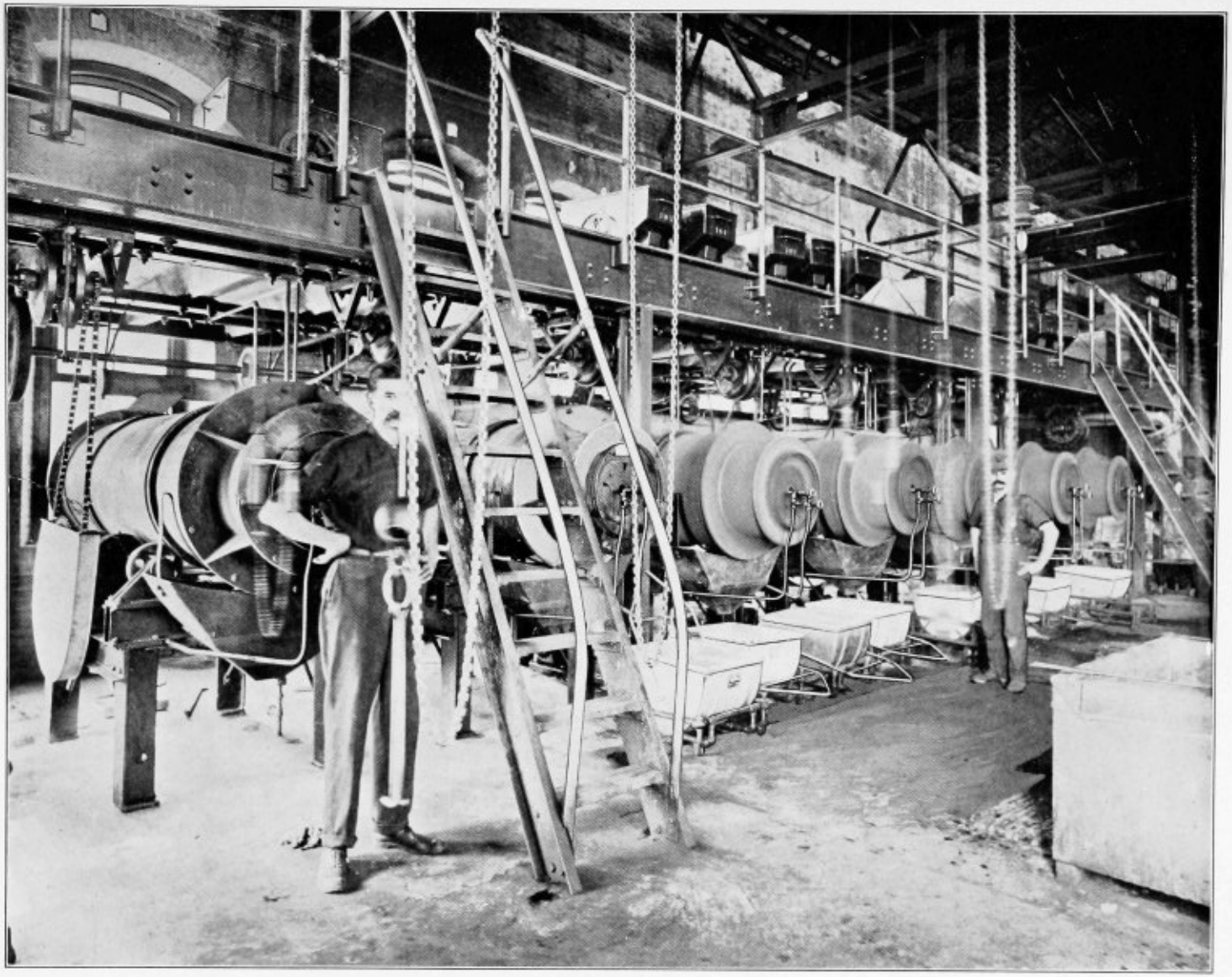


FIG. 10. — BATTERY OF 7 ROCKWELL ROTARY ANNEALING FURNACES — OIL FUEL.

Showing method of charging from overhead platform. Material is conveyed to platform by overhead hoist and is not handled again until discharged from the furnace.

Progress In Annealing Furnace Construction, Illustrated.

Three Different Types of Rotary Annealing Furnaces Doing The Same Work.

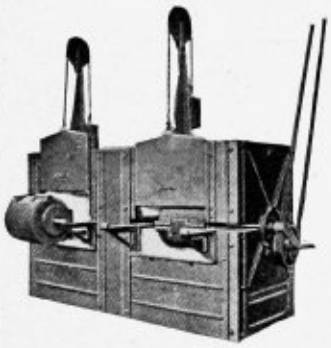


Fig. 11.

1898

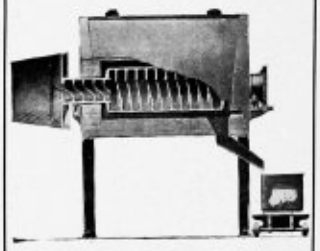


Fig. 12.

1906

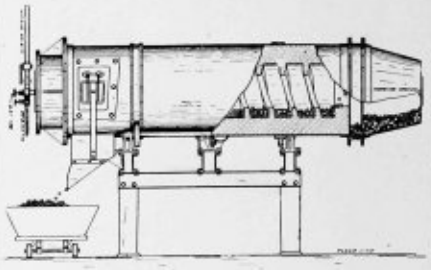


Fig. 13.

1909

	1898	1906	1909
Design of Furnace	Externally Fired Cast Iron Tumbling-Barrel Furnace.	Externally Fired Cast Iron Helical Cylinder Furnace.	Internally Fired Tile Lined Helical Cylinder Furnace
Metal Annealed per Hour	287 Pounds	576 Pounds	1,450 Pounds
Increase of Metal Annealed per Hour		100 Per Cent.	405 Per Cent
Fuel Oil Burned per Hour	6.41 U. S. Gallons	3.64 U. S. Gallons	3.48 U. S. Gallons
Decrease of Fuel Oil Burned per Hr.		43.3 Per Cent	45.7 Per Cent
Metal Annealed per Gallon of Fuel Oil	45 Pounds	158 Pounds	416 Pounds

NO FURNACE IS GOOD ENOUGH IF THERE IS A BETTER ONE. The above illustrations and figures clearly show the comparative output and fuel consumption of three different, but similar, designs of annealing and hardening furnaces and show the progress that has been made in furnace design of this character in the past ten or twelve years.

The figures are taken from actual operation and weight of material and fuel. In each case the pieces annealed were of the same size and material and the lightest in individual weight of their kind. The advantage in favor of the internally fired helical furnace—Fig 13—was still more marked when annealing pieces of greater individual weight. The material was also of better quality, being freer from oxidation. The cost of repairs is also very much less for the internally fired helical furnace than either of the others.

These three furnaces were operated with the same burner, the same fuel oil, the same steam pressure for atomizing, the same air for combustion, the same material, the same temperature, at the same time and by the same men; which proves conclusively that it is the furnace and not the burner alone which produces the desired result.

The furnace and fuel, then, more than the burner, are the important factors in the question of economy. Equally, a good furnace deserves a good fuel and a good fuel a good furnace. An intelligent and progressive manufacturer will not waste his time and material with a slow, old-fashioned furnace and an inferior fuel. He wants a dividend earner; one that turns out work rapidly and never spoils any; one that his workmen like; possibly automatic; certainly the most modern; prolific of output; abstemious of fuel and strong of endurance.—**THE ROCKWELL INTERNALLY FIRED ROTARY FURNACE IS IT.**

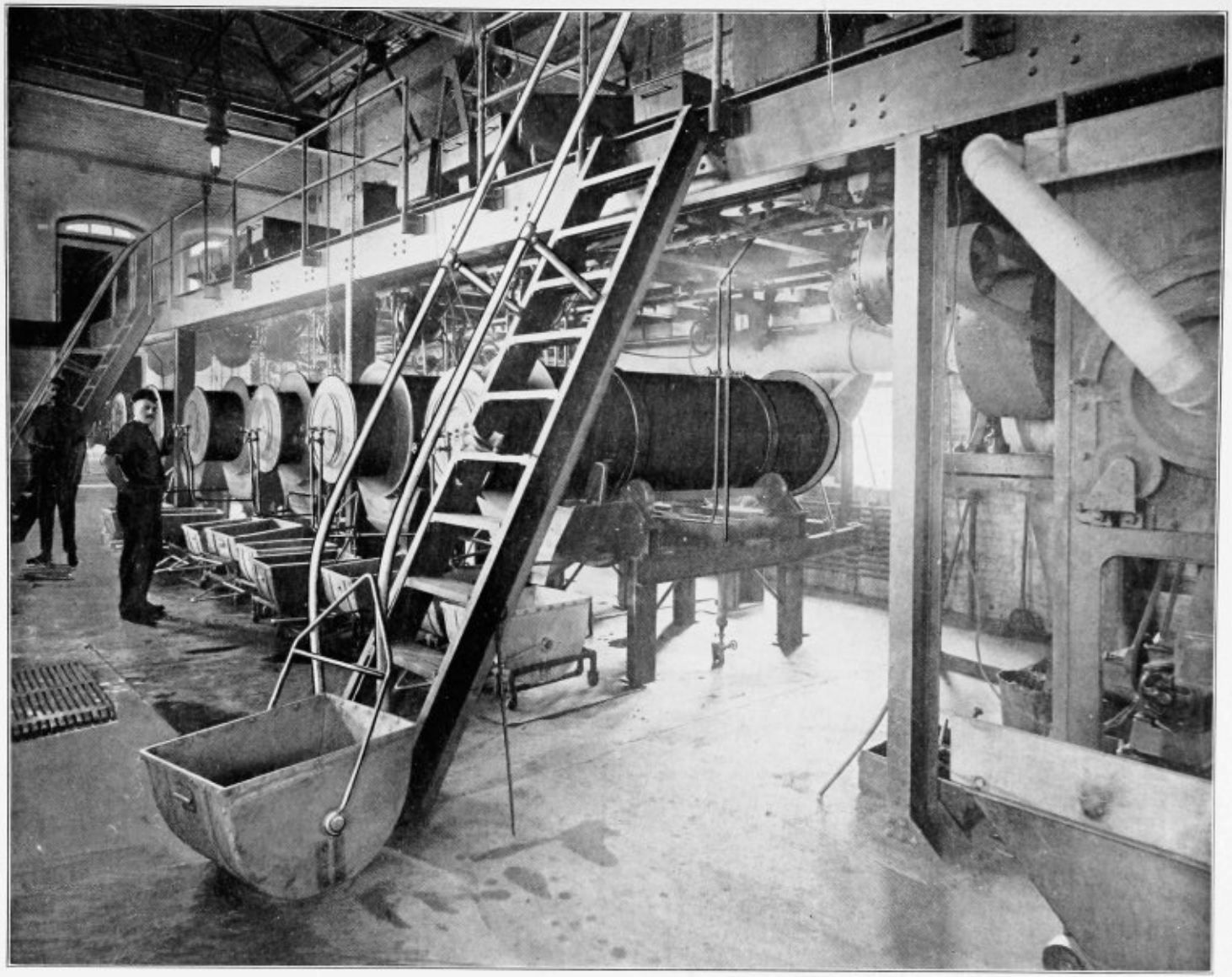


FIG. 14 — BATTERY OF 7 ROCKWELL ROTARY ANNEALING FURNACES — OIL FUEL.

Showing method of charging from overhead platform. Material is conveyed to platform by overhead hoist and is not handled again until discharged from the furnace.

OTHER ANNEALING FURNACES.

For stationary, semi-automatic and other styles of annealing furnaces for ROLLING MILLS, AUTOMOBILE WORKS, WIRE MILLS, ELECTRICAL WORK, FILE WORKS, SILVERWARE FACTORIES, TUBE MILLS, Etc., Etc. Write for Special Catalogs.

STANDARD SIZES OF
ROCKWELL
Rotary Annealing and Hardening Furnaces.

(Larger Sizes Built to Order)

Style of Furnace	Annealing Without Quenching Tank.			Annealing or Hardening With Quenching Tank.		
Furnace Number	75	76	77	78	79	80
Floor space, feet	4½ x 10	5 x 12	5½ x 14	4½ x 11½	5 x 13½	5½ x 15½
Height over all, feet	6	6¼	6½	6	6¼	6½
Shipping weight, all iron work, special tiles and burner, pounds	8,000	10,000	13,000	8,500	11,500	15,000
Shipping measure, cubic feet	250	280	325	250	280	325
Maximum dimensions of intake, inches	4 x 5	5 x 6	6 x 8	4 x 5	5 x 6	6 x 8
* Oil consumption per hour, U. S. gallons	3	4	6	3	4	6
* Gas consumption per hour, cubic feet	420	560	840	420	560	840
† Capacity per hour, pounds	500	1,000	1,500	500	1,000	1,500
Horse power required	½	1	1½	½	1	1½
Code word	Almox	Alnew	Alond	Habid	Hajom	Hakel

†In making inquiry the purchaser should state the purpose for which the furnace is to be used, with full information as to size and weight of the individual pieces of material to be heated, the temperature required and the fuel to be used.

If fuel oil is to be used the pressure **must** be uniform—5 pounds per square inch or over will do.

If gas is to be used state kind and pressure.

*The fuel consumption will vary according to kind of material. The above figures are for average consumption.

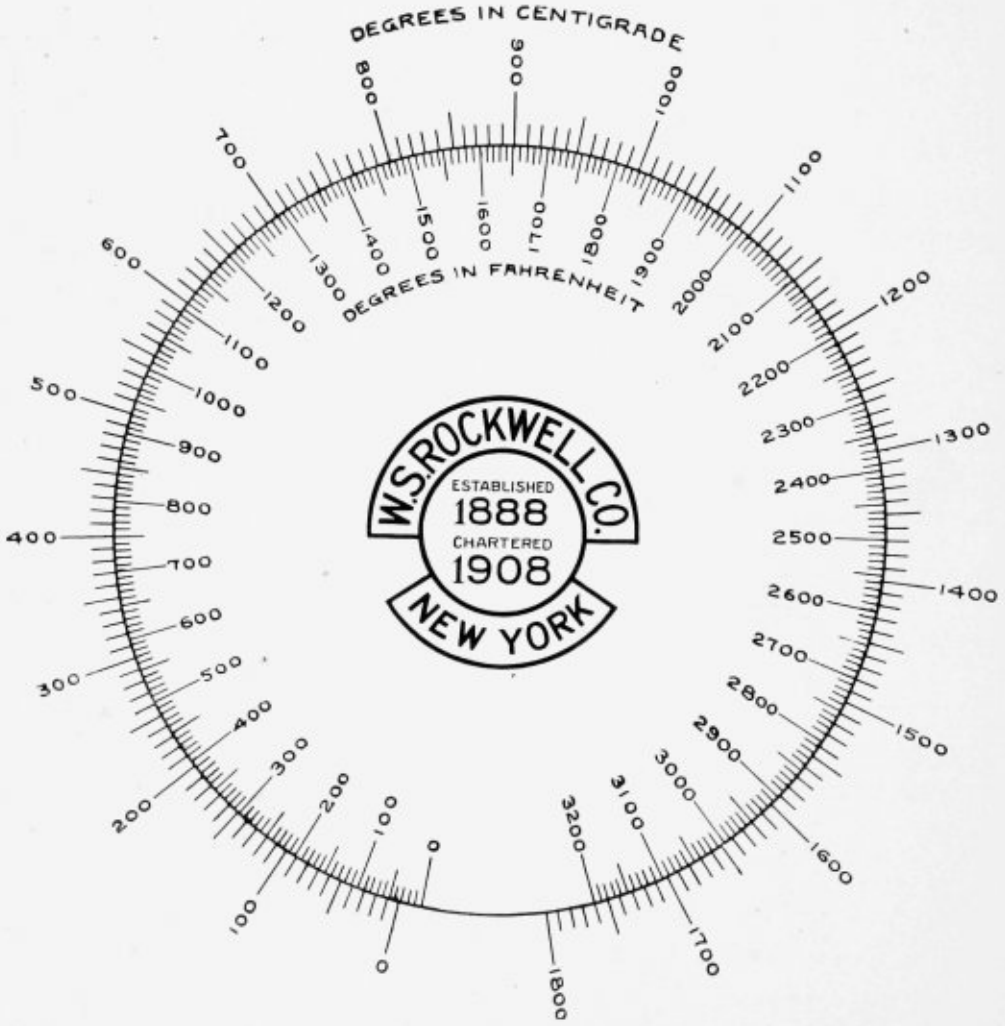
If air is used to inject the oil or gas 2 pounds pressure will best serve the purpose. If steam is to be used the higher the pressure and dryer it is the better the operation. It should be taken direct from boiler or steam main and all condensation should be trapped out.

7 U. S. gallons of fuel oil equal 1,000 cubic feet of natural gas.

5 U. S. gallons of fuel oil equal 1,000 cubic feet of city gas.

COMPARATIVE SCALE

Fahrenheit and Centigrade Thermometers.



W. S. ROCKWELL COMPANY has a practical experience of 25 YEARS in general furnace construction. "ROCKWELL FURNACES" for oil or gas fuel are in use in thousands of the best factories in this and other countries, as also in the arsenals, mints, assay offices, navy yards and other governmental service.

Write for catalogs for details under the following headings :

Annealing Furnaces, Stationary and Rotary Types: For brass and copper rolling mills, wire mills, malleable iron works, aluminum works, cartridge factories, silverware, electrical works, and for material of every kind in many other lines of manufacture.

Brazing Furnaces: For brass, copper and steel tubing, trolley wire, smith work, etc.

Case Hardening Furnaces: For engine, automobile, gun, machine and other parts.

Core Ovens: For iron or brass foundries. Large or small types.

Cupel Furnaces: For assaying and mint work.

Enameling Furnaces: For granite or agate ware—no muffle required—50 to 80 per cent. saving.

Forge Furnaces: For all classes of railroad, ship and miscellaneous forging.

Galvanizing Furnaces: For all lines of work.

Hardening Furnaces, Stationary and Rotary Types: For cutlery, dies, needles, saws and saw teeth, springs, plow, automobile and engine parts, steel balls and rollers, carbon and high speed tools, etc.

Heating Furnaces: For copper and steel billets, ship plates and angles, bulldozer work, etc.

Japanning Furnaces: For all lines of work.

Melting Furnaces, Crucible Tilting and Stationary Types: For brass, copper, bronze, gold, silver, aluminum, steel, steel additions, monel metal, etc.

Muffle Furnaces: For all lines of work.

Reverberatory Furnaces: For all lines of heating, melting and refining.

Rivet Forges and Furnaces, Portable and Stationary Types: For railroad, bridge and ship work. Celebrated **"Rockwell"** portable forge.

Singeing Furnaces: For cotton goods. Single or multiple plates

Soft Metal Furnaces, Lead, Tin, Babbitt, etc.: For all lines of work.

Tempering Furnaces, Stationary and Rotary Types: For all lines of work.

Tinning Furnaces: For wire, tubing, sheets, etc,

Special Furnaces for practically every line of work. **WRITE FOR CATALOGS.**

W. S. ROCKWELL COMPANY

50 CHURCH STREET **NEW YORK**

(Hudson Terminal Building)