July 27, 1943. R. W. PURSEL 2,325,342

WIRE DRAWING APPARATUS

Filed Aug. 27, 1941 3 Sheets-Sheet 1

FIG. 1.

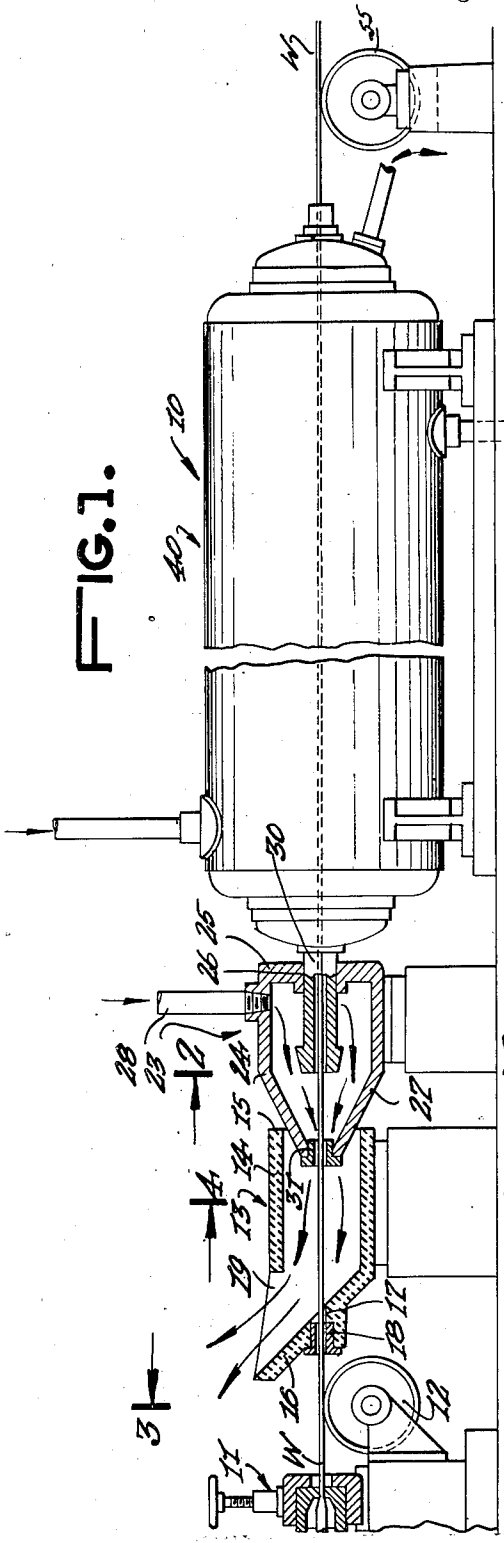


FIG. 4.

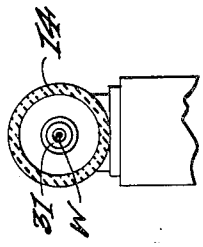


FIG. 3.

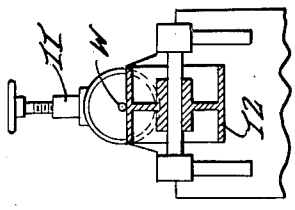
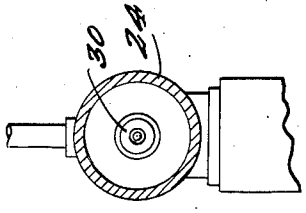


FIG. 2.



INVENTOR.
RUSSELL W. PURSEL
BY Carl Miller
ATTORNEY.

July 27, 1943. R. W. PURSEL 2,325,342

WIRE DRAWING APPARATUS

Filed Aug. 27, 1941 3 Sheets-Sheet 2

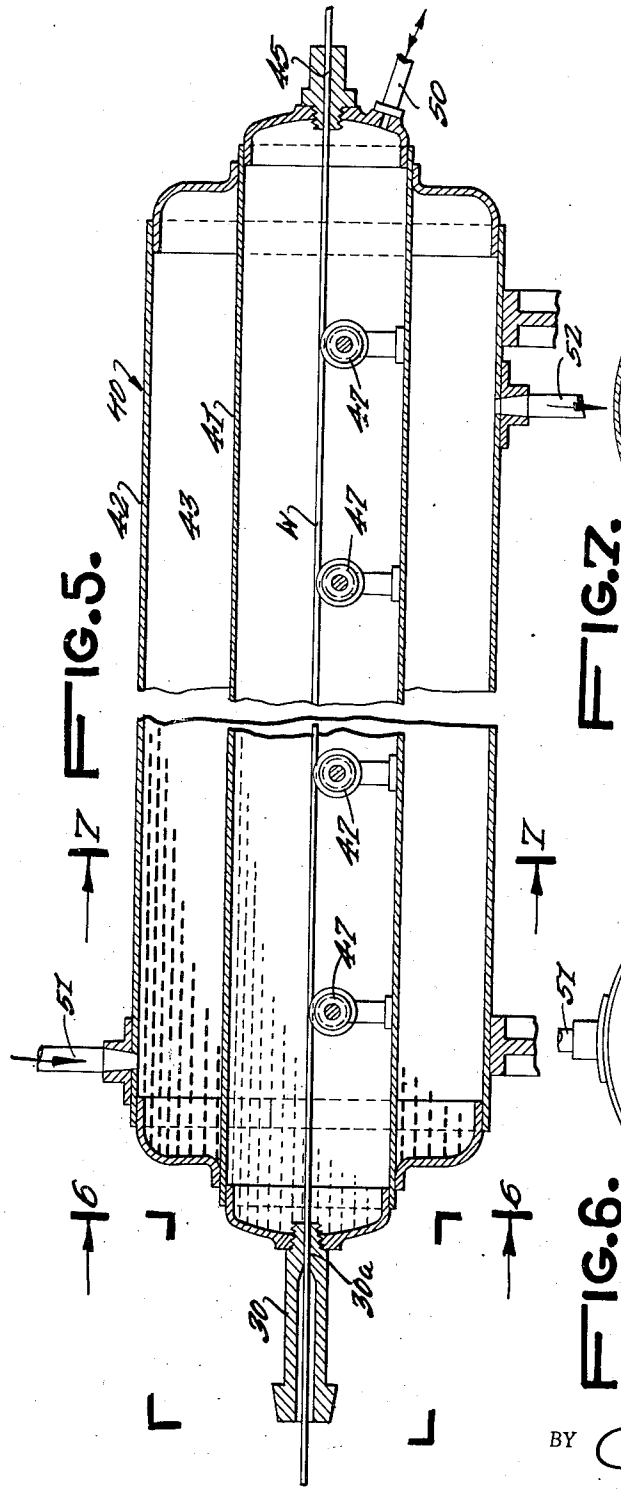


FIG. 5.

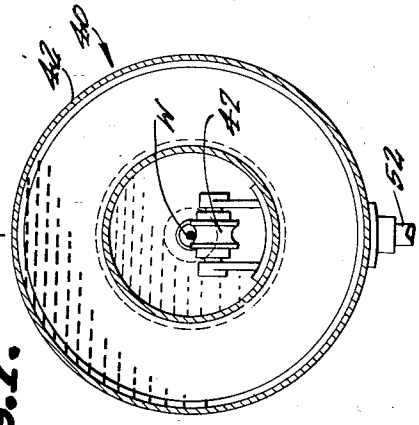


FIG. 7.

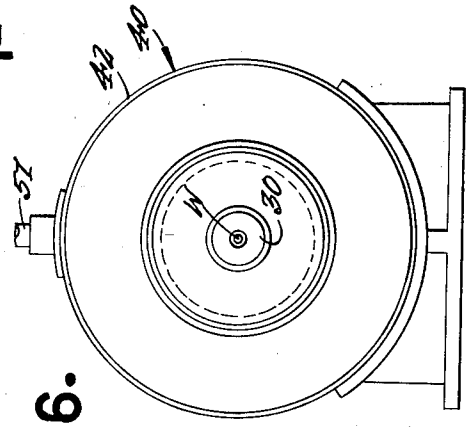


FIG. 6.

INVENTOR.
RUSSELL W. PURSEL
BY Carl Miller
ATTORNEY.

July 27, 1943. R. W. PURSEL 2,325,342

WIRE DRAWING APPARATUS

Filed Aug. 27, 1941 3 Sheets-Sheet 3

FIG. 9.

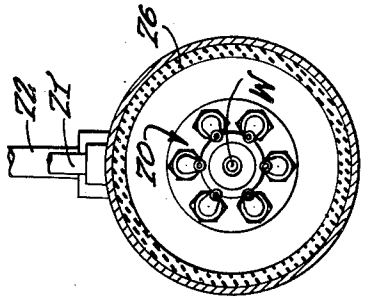


FIG. 11.

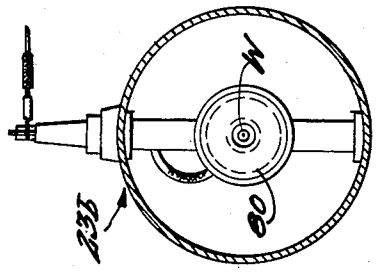


FIG. 8.

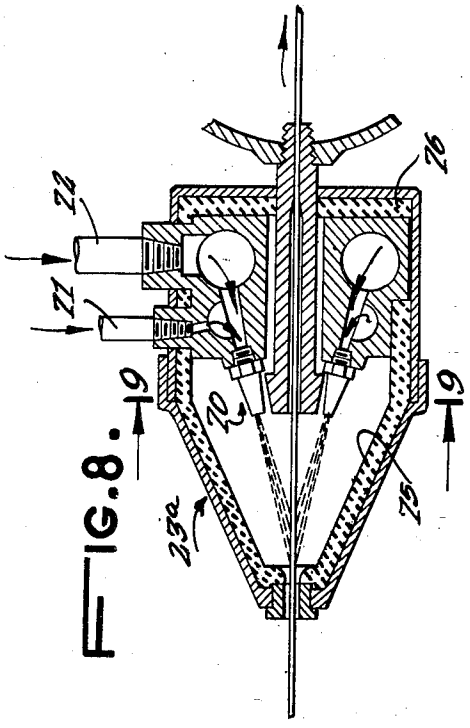
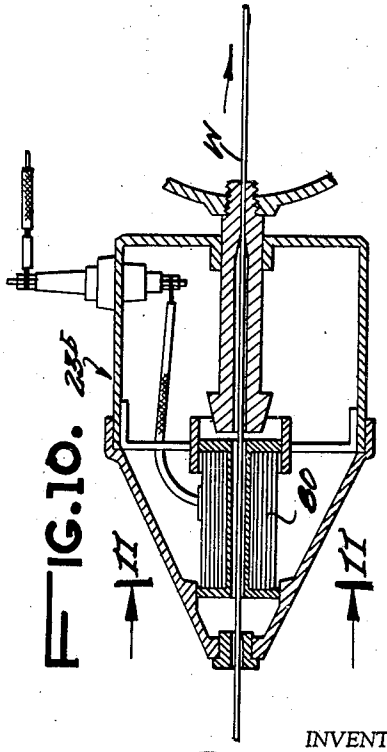


FIG. 10.



INVENTOR.
RUSSELL W. PURSEL

BY Carl Miller
ATTORNEY.

Patented July 27, 1943 2,325,342

UNITED STATES PATENT OFFICE

2,325,342

WIRE DRAWING APPARATUS

Russell W. Pursel, Indianapolis, Ind.

Application August 27, 1941, Serial No. 408,532

2 Claims. (Cl. 205—16)

This invention relates to apparatus and methods of heat treatment of wire. It is particularly directed to an apparatus for treatment of wire during hot or cold drawing or at the end of the drawing process.

An object of this invention is to provide apparatus for heat treatment of wire, said apparatus being adapted for carrying out a patenting process, for annealing, bright annealing, blue or color annealing, for hardening or tempering and for relieving the stress in the metal sometimes called "Spheroidizing."

With my improved process grain structures in the metal of austenite, martensite, troostite, either primary or secondary sorbite and pearlite may be obtained or any combination of these grain structures may be obtained.

A further object of this invention is to provide a process of heat treatment of wire which will reduce production costs, increase production, give better metallurgical control, produce a better product and eliminate hazards.

Yet another object of this invention is to provide a compact and durable apparatus of the character described, which shall be relatively inexpensive to use, and which shall yet be practical and efficient to a high degree in use.

Other objects of this invention will in part be obvious and in part hereinafter pointed out.

The invention accordingly consists in the combination of steps, features of construction, combinations of elements, and arrangement of parts which will be exemplified in the method and construction hereinafter described, and of which the scope of application will be indicated in the following claims.

In the accompanying drawings in which is shown one of the various possible illustrative embodiments of this invention,

Fig. 1 is a side elevational view of apparatus embodying the invention, with parts in cross-section;

Fig. 2 is a cross-sectional view taken on line 2—2 of Fig. 1;

Fig. 3 is a cross-sectional view taken on line 3—3 of Fig. 1;

Fig. 4 is a cross-sectional view taken on line 4—4 of Fig. 1;

Fig. 5 is an enlarged, longitudinal, cross-sectional view of the quenching chamber;

Fig. 6 is a front end view taken on line 6—6 of Fig. 5;

Fig. 7 is a cross-sectional view taken on line 7—7 of Fig. 5;

Fig. 8 is an elevational, cross-sectional view of the wire heating chamber, illustrating a modified construction;

Fig. 9 is a cross-sectional view taken on line 9—9 of Fig. 8;

Fig. 10 is a cross-sectional view similar to Fig. 8, and illustrating still another modified construction; and

Fig. 11 is a cross-sectional view taken on line 11—11 of Fig. 10.

It is well known that in a drawing of wire, it is sometimes necessary to stop drawing or reducing the wire due to the fact that the wire becomes hardened caused by the diameter reduction as the wire is pulled through the die, at which time the wire often becomes hard and brittle and must be annealed and the stresses therein relieved so that the grains are recrystallized. Such an operation is sometimes very costly as the wire has to be bound in bundles, taken to the annealing furnace, annealed, descaled and returned to the drawing mill. Such operation often causes delay of from 24 to 48 hours, or even longer. As will appear hereinafter, wire processed under my improved apparatus, eliminates such expensive delay in the manufacture of wire.

In accordance with the present invention, the wire passes from the drawing die directly through my improved annealing furnace, thus making for a line production process.

Referring now in detail to the drawings, 10 designates apparatus embodying the invention. The same comprises a wire drawing die 11 of usual construction, through which the wire W passes. As the wire comes through the die, it passes around a cylinder or wheel 12 several times. The wheel may be rotated, thus furnishing motive power for the wire. The wire then passes through a heat shield 13 made from refractory material. Said heat shield 13 comprises a horizontal, cylindrical portion 14, open at its rear end 15. At the forward end of cylindrical portion 14 is an upwardly inclined wall 16 formed with a through opening 17, through which the wire W passes into the shield. A sleeve 18 may be inserted in inclined wall 16, at the through opening 17, to receive the wire. It will be noted that the shield 13 is open at the top forward part thereof, as indicated at 19, for the purpose hereinafter appearing.

The wire passes through member 13 into a heat chamber 23. Said heat chamber 23 comprises a cylindrical wall 24 formed with a rear wall 25, having a central opening 26. At the front end of member 23 is a conical wall 27 projecting into the cylindrical portion 14 of member 13. Attached to the top of member 23 is a pipe 28.

Passing through the opening 26 is a horizontal pipe 30 receiving the wire W. Any suitable heating medium may be used in the furnace or heating chamber 23. Hot gases may be supplied to said chamber through pipe 28. Hot gas may pass through the opening 31 at the apex of the conical

wall 27, thus passing into member 23 and escaping through the opening 19.

The furnace 23 may be heated by solid fuels and air, oxygen, or gas, or a mixture of the same may be fed to the furnace through the pipe 28.

The pipe 30 which serves as a guide for the wire is fixed to one end of a tank 40. Tank 40 comprises a horizontal axial inner chamber 41 to which the pipe 30 is fixed. Surrounding the inner chamber 40 is an outer jacket 42 forming a chamber 43 surrounding the inner chamber 41. The pipe 30 is constricted at one end, as at 30*a* and the constricted opening 30*a* commmunicates with the interior of the inner chamber 41. At the opposite end of chamber 41 is an axial through opening 45. The wire W passes into chamber 41 through pipe 30 and opening 30*a* and out of said chamber through the opening 45.

Within the bottom of chamber 41 are a plurality of aligned rollers 47 serving as guides for the wires W. The chamber 41 has a common inlet and outlet pipe 50. The outer jacket 42 has an inlet pipe 51 at the top thereof, and adjacent one end thereof, and an outlet pipe 52 at the bottom thereof and adjacent the opposite end thereof. The inner chamber 41 is a quenching chamber, and chamber 43 is for the purpose of cooling the quenching chamber and maintaining the same at a substantially constant temperature.

The quenching medium within the chamber 41 may be gas, liquid or solid. Once the quenching material is put into chamber 41, pipe 50 may be closed. The cooling medium in chamber 43, however, is continuously circulated therethrough, thus keeping the quenching medium in chamber 41 at a desired temperature. The wire W may pass from the quenching chamber through the drawing dies, if desired.

If the quenching apparatus is set at the end of the drawing operation, the wire can be annealed or tempered or heat treated, as necessary, and the wire will then be ready for shipment or made into products.

The wire is bright annealed at the end of the drawing operation and also would be in condition for galvanizing.

It will now be understod that the process described above eliminates batch heat treating of wire in the furnace. The desired treatment of the wire may be accomplished by regulating the temperature of the furnace 23, the speed of passage of the wire therethrough, and through the quenching apparatus and by also controlling the temperature in the quenching chamber.

After the wire W passes out of the quenching chamber, it may pass over a wheel 55 and then to additional drawing dies if desired.

In Figs. 8 and 9 there is shown a furnace 23*a* which may be substituted for the furnace 23. In the furnace 23*a*, heating is accomplished by the use of a number of jets 70 conically arranged within the chamber around the horizontal axis of the chamber, so that the flame from the jets impinges upon the wire. Gaseous fuel may be fed to the furnace by means of a pipe 71, and air may be fed to said furnace by pipe 72. The interior of the furnace is preferably lined with refractory material, as indicated at 75 and 76.

The furnace 23*a* may also be heated by burning hydrogen, hydrocarbon or petroleum.

In Figs. 10 and 11, there is shown a furnace 23*b* which may be substituted for the furnace 23. The furnace 23*b* is electrically heated by a heating coil 80, so that the wire is heated as it passes through the coil. Any suitable well known control may be employed for controlling the temperature within the furnace 23*b*.

It will thus be seen that there is provided a device and method in which the several objects of this invention are achieved, and which is well adapted to meet the conditions of practical use.

As various possible embodiments might be made of the above invention, and as various changes might be made in the embodiments above set forth, it is to be understood that all matter herein set forth or shown in the accompanying drawings is to be interpreted as illustrative and not in a limiting sense.

Having thus described my invention, I claim as new and desire to secure by Letters Patent:

1. Apparatus of the character described comprising a wire drawing die, a rotary wheel about which wire passing through the die may be wound, a shield through which the wire which passes around the wheel may pass, said shield being tubular and open at one end, and having an inclined wall at the other end, said inclined wall having an opening through which said wire passes, the top of said shield having an opening adjacent said inclined wall, a furnace provided with means to permit the wire to pass therethrough, and having a conical portion at one end projecting into the first mentioned end of said shield without closing said end of said shield, said furnace having an end wall at its opposite end formed with an opening, a pipe projecting into said opening in said end wall of said furnace and closing said opening, and said pipe having a through opening through which the wire passes, a quenching chamber at one end of the pipe, said wire being adapted to pass through the pipe and through the quenching chamber, said quenching chamber having means to permit the wire to pass out of the quenching chamber, and a jacket surrounding said quenching chamber.

2. Apparatus of the character described comprising a wire drawing die, a rotary wheel about which wire passing through the die may be wound, a shield through which the wire which passes around the wheel may pass, said shield being tubular and open at one end, and having an inclined wall at the other end, said inclined wall having an opening through which said wire passes, the top of said shield having an opening adjacent said inclined wall, a furnace provided with means to permit the wire to pass therethrough, and having a conical portion at one end projecting into the first mentioned end of said shield without closing said end of said shield, said furnace having an end wall at its opposite end formed with an opening, a pipe projecting into said opening in said end wall of said furnace and closing said opening, and said pipe having a through opening through which the wire passes, a quenching chamber at one end of the pipe, said wire being adapted to pass through the pipe and through the quenching chamber, said quenching chamber having means to permit the wire to pass out of the quenching chamber, a jacket surrounding said quenching chamber, and rollers in said quenching chamber supporting the wire passing through said chamber.

RUSSELL W. PURSEL.