Jan. 26, 1926. 1,570,815

H. N. WYLIE

PROCESS AND APPARATUS FOR INSURING THE STRAIGHTNESS OF METAL TUBES, AND STRIPS OF ANGLE OR OTHER FORM, DURING HEAT TREATMENT

Filed June 1, 1925 2 Sheets-Sheet 1

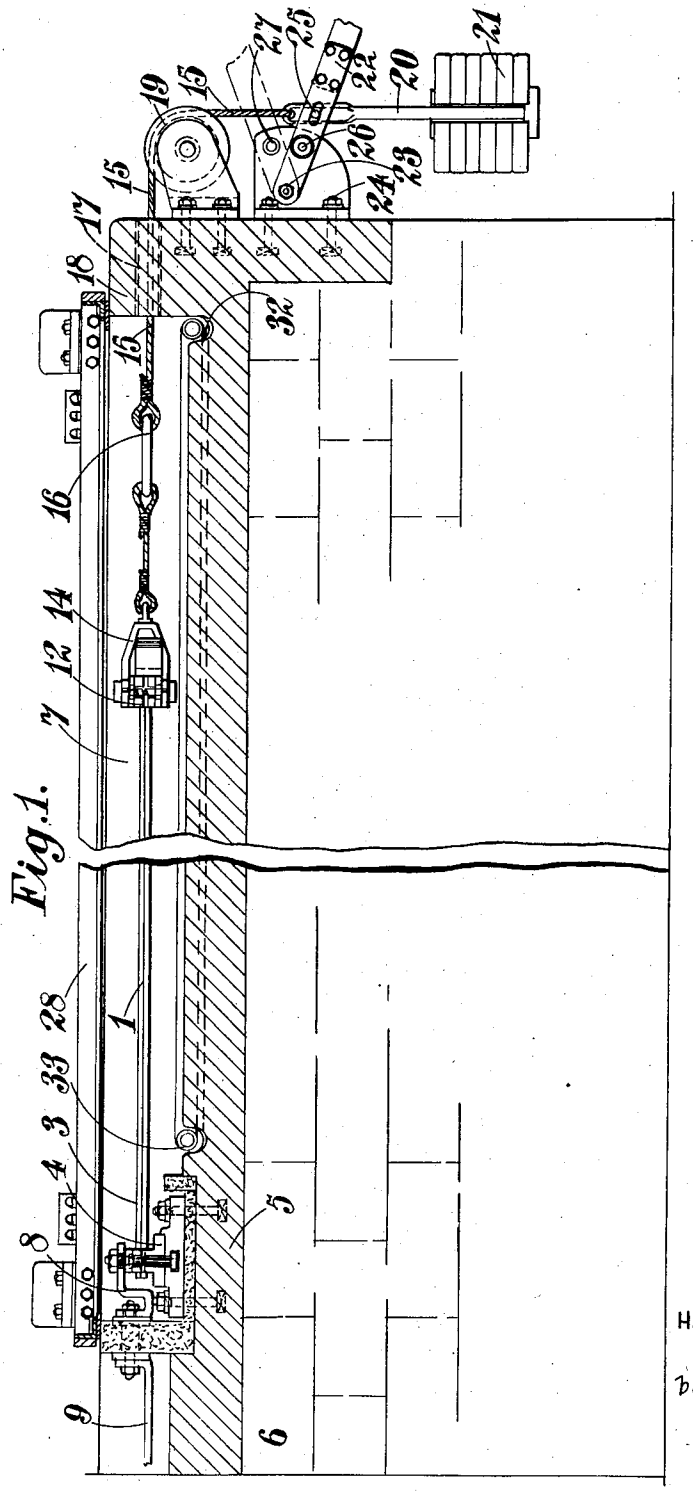


Fig. 1.

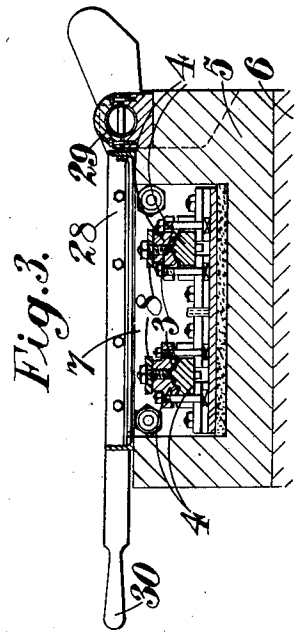


Fig. 3.

INVENTOR:
HAMILTON N. WYLIE

By Spear, Middleton, Donaldson & Hall.
Attys.

Jan. 26, 1926. 1,570,815

H. N. WYLIE

PROCESS AND APPARATUS FOR INSURING THE STRAIGHTNESS OF METAL TUBES, AND STRIPS OF ANGLE OR OTHER FORM, DURING HEAT TREATMENT

Filed June 1, 1925 2 Sheets-Sheet 2

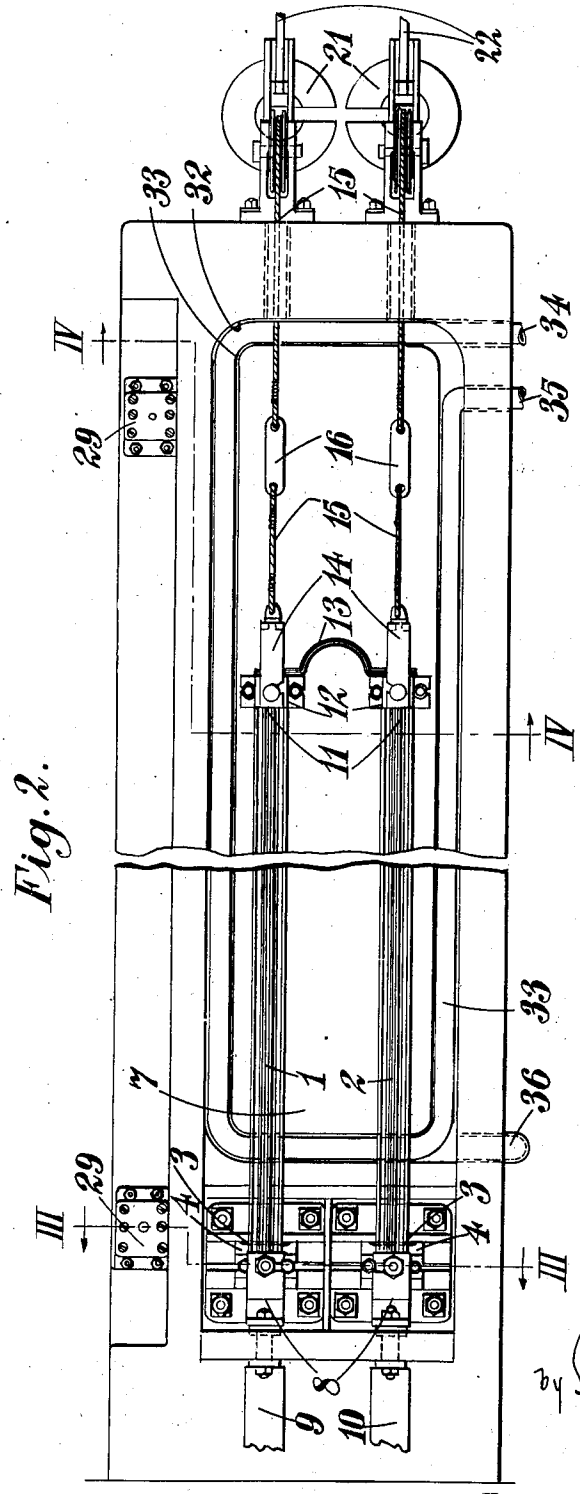


Fig. 2.

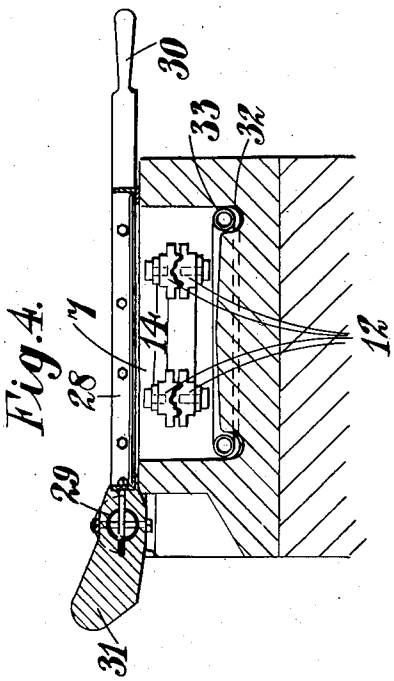


Fig. 4.

INVENTOR:
HAMILTON N. WYLIE.

by Spear, Middleton, Donaldson & Hall
Attys.

Patented Jan. 26, 1926. 1,570,815

UNITED STATES PATENT OFFICE.

HAMILTON NEIL WYLIE, OF COVENTRY, ENGLAND.

PROCESS AND APPARATUS FOR INSURING THE STRAIGHTNESS OF METAL TUBES AND STRIPS OF ANGLE OR OTHER FORM DURING HEAT TREATMENT.

Application filed June 1, 1925. Serial No. 34,110.

To all whom it may concern:

Be it known that I, HAMILTON NEIL WYLIE, a subject of the King of England, residing at Coventry, in the county of Warwick, England, have invented certain new and useful Improved Process and Apparatus for Insuring the Straightness of Metal Tubes and Strips of Angle or Other Form During Heat Treatment, of which the following is a specification.

This invention relates to an improved process and apparatus for insuring the straightness of metal tubes, and strips of angle or other form, during heat treatment. It has for its principal object to provide a simple commercial process which will produce uniform heat treatment of the material, and at the same time will straighten it if initially crooked and insure such straightness being maintained during cooling.

The manner of carryig out the invention is illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal section of a preferred form of apparatus for carrying out the invention,

Figure 2 is a plan of Figure 1,

Figure 3 is a cross section of the apparatus on the line III. III. of Figure 2, and

Figure 4 is another cross section on the line IV. IV. of Figure 2.

The tubes, strips 1 and 2, or the like are arranged horizontally side by side and spaced apart. Each end 3 of the strips is clamped to a bracket 4, preferably of copper, which is rigidly bolted to a concrete bed 5 supported on masonry 6 and forming the lower surface of a muffle 7 or equivalent. The two brackets 4 are electrically distinct from one another and are each connected by metal strips 8 with electrical conductors 9 and 10 forming part of the supply system for the heating current applied to the strip.

The other ends 11 of the strips are gripped by clamps 12 which are electrically connected together by a conducting member 13. To each of these clamps is attached a yoke or shackle 14, and to the yoke is attached a cable 15 which is formed in two parts connected by an insulator 16. Thus it will be seen that the electrical current is confined to the path indicated by the various elements, comprising an anchored clamp 4 for one strip, the strip itself, through the conductor 13 at its end into the adjacent strip, and thence through the other anchored clamp 4 to the main lead.

The cables 15 extend horizontally from the insulators 16 through clearance passages 17 formed in the end walls 18 of the muffle, and from thence pass over guide pulleys 19 for attachment to rods 20 adapted to carry removable weights 21 so that any desired load may be put upon the strips 1 and 2. A manually operable lever 22 is pivoted at 23 to a bracket 24 attached to the end wall of the muffle or the masonary 6 below the guide pulley 19, and has a pin-and-slot engagement 25 with the rod 20 so that the loads on the strips may be withdrawn by raising the lever and securing it by means such as a spring detent or a pin 26 adapted to extend through the lever 22 and a hole 27 in the bracket 24.

The muffle 7 is closed by a lid 28 hinged at 29 along one side of the muffle and provided with an operating handle 30 at its free edge and a counterpoise 31 at its opposite edge.

The lower part of the muffle forms a trough into which cooling fluid may be quickly supplied from an adjacent service tank (not shown), a pump also being provided to return the fluid to the tank after the cooling. In the arrangement shown, a channel 32 is provided around the inner edge of the muffle, and the service pipes 33 for the cooling fluid are arranged around this channel with suitably located inlets and outlets at 34 and 35. A drain 36 may also be provided at one corner of the muffle.

The electrical circuit may include a quick-break switch, and if preferred tripping means may be provided at a prearranged distance below the loading device for the strip. When the current is switched on, the temperature of the strip is quickly raised, and, under the load, it elongates, and at the same time the load straightens the strip. By this arrangement the extent of such elongation may be prearranged, and thus the load in descending, or the lever 22 or other moving part, can be adapted to make contact with the trip mechanism of the switch so that the electrical circuit is broken and cooling takes place under load.

Such cooling may, when required, be considerably accelerated by flooding the muffle with water or any other suitable quenching medium, particularly a non-oxidizing gas,

such as hydrogen, which may be blown or drawn through the muffle.

An important advantage of the foregoing arrangement is that the strips to be treated are contained in the muffle from start to finish of the operation, and furthermore the muffle may be provided with means whereby it may be filled with an inert gas or gases, such as hydrogen, steam, or other non-oxidizing gas. In this way the strip is protected from oxidation while at a high temperature.

It will be understood that the clamps employed for securing the ends of the strips will be suitably shaped to conform to the material and to distribute the stress due to the load uniformly over the cross section of the strip. If preferred, the strip, tube or the like may be flattened for a short distance at its ends and thereby the nature of the clamp is simplified. In this case, if preferred, a bolt may extend through the clamp and the strip and may serve also to secure the electrical conductor at the same time. It is of importance, however, that any holes pierced in the strip for the reception of these bolts should be on the axial line of the strip.

One of the strips may be replaced by a conductor of low resistance when it is desired to economise current or to apply a particularly heavy current to the other strip, or when only one strip is to be treated at a time.

In an alternative arrangement of apparatus, the tube or strip may be suspended at one end and loaded at the other to hang vertically. Preferably, however, a pair of tubes or strips are arranged side by side and spaced apart, as in the apparatus above described, the electrical supply connections then being made either at the upper or the lower ends of the strips as may be most convenient. A cable and winding drum with appropriate insulating means may be employed for hoisting the clamp or clamps used to suspend the strip.

In carrying out the process, it is to be understood that the extent of the heating, the intensity of the loading of the material, and the allowable stretch thereof during the straightening, as well as the nature and rapidity of the cooling means, are each determined in accordance with the requirements of the material undergoing treatment. In the same way, the current applied and the voltage of supply are determined by the quantity of material to be heated and also its specific heat and the time allowed for its attainment of the desired temperature.

It has been found practicable so to regulate the current that within five seconds of switching it on the material becomes just red hot, attains its full red heat in twenty seconds, and after being subjected to this condition for ten seconds the current is switched off and in three seconds the strip is cooled to blackness, the whole process lasting only thirty-three seconds and the heat treatment and straightening of the strip being effectively carried out.

From the foregoing, therefore, it will be seen that the process can be very simply carried out, and that the straightening of the material is effectively accomplished and its cooling under load prevents any risk of distortion.

What I claim as my invention and desire to secure by Letters Patent of the United States is:—

1. A process for heat treating and for insuring the straightness of metal tubes and strips of angle or other form during heat treatment, consisting in first subjecting the tube, strip or the like to a predetermined tensile load, and, while so loaded, heating it by the passage through it of an electric current which is cut off when the required temperature of the material is attained and the desired straightening has been effected, after which, when the strip has cooled sufficiently, the load is removed, substantially as and for the purpose described.

2. A process for heat treating and for insuring the straightness of metal tubes and strips of angle or other form during heat treatment, as claimed in claim 1, in which the tube or strip is enclosed in a muffle or equivalent adapted to contain an inert gas and provided with means for quenching the tube or strip by means of a cooling fluid, substantially as and for the purpose described.

3. A process for heat treating and for insuring the straightness of metal tubes and strips of angle or other form during heat treatment, as claimed in claim 1, in which the electrical circuit includes a quick-break switch with tripping means adapted to be actuated by a prearranged movement of the load-applying mechanism during the straightening of the strip, substantially as and for the purpose described.

4. A method of treating metal elements which includes the steps of subjecting said elements to heat while under tension, cutting off the application heat thereto while under tension, and retaining the element under tension until it has cooled to a predetermined degree.

5. A method of treating metal elements which includes the steps of subjecting said element to heat while under tension and surrounded by an inert medium, and then quenching said element while under tension in a cooling medium.

In testimony whereof I have signed my name to this specification.

HAMILTON NEIL WYLIE.