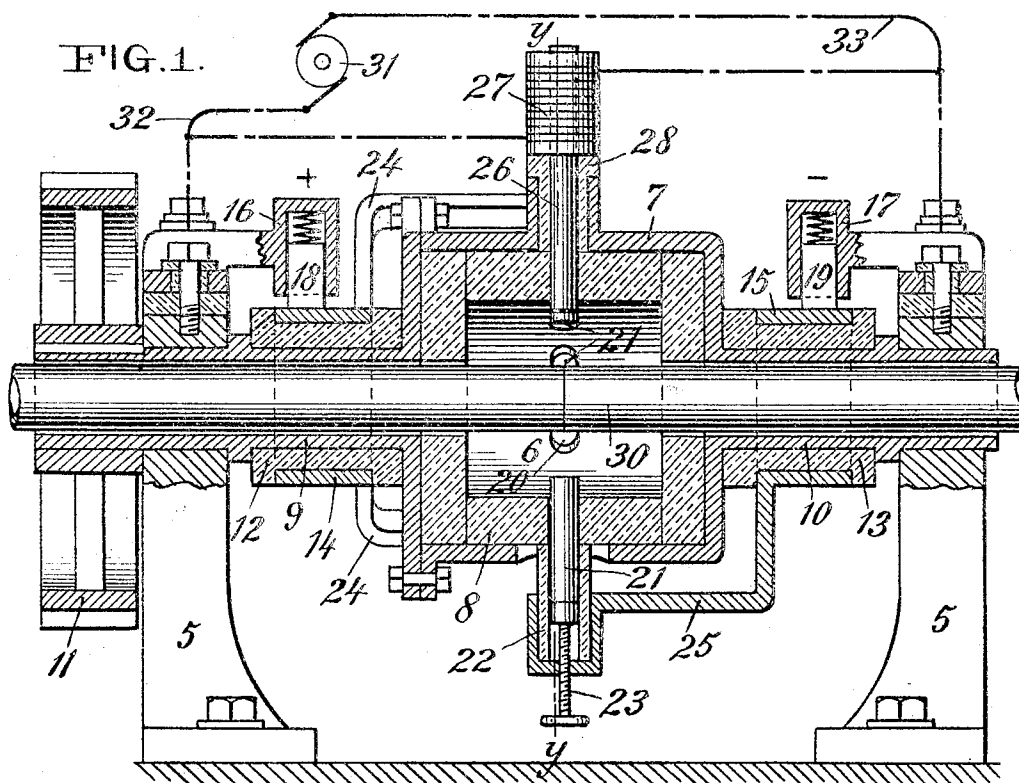
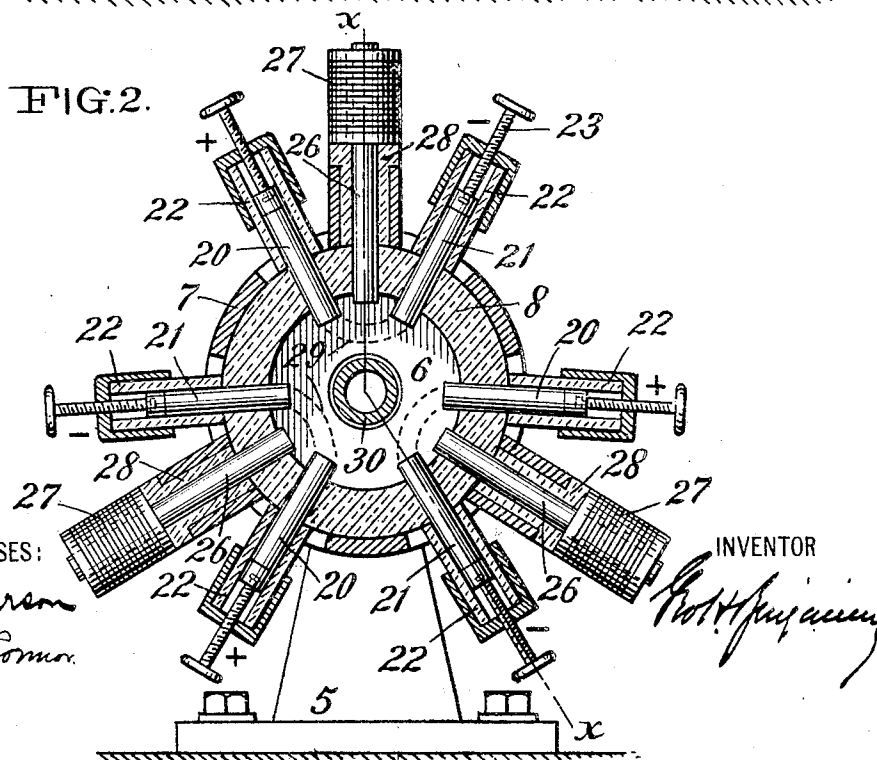


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ART OF HEATING PIPES, RODS, OR SIMILAR BODIES.

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UNITED STATES PATENT OFFICE.

GEORGE H. BENJAMIN, OF NEW YORK, N. Y.

ART OF HEATING PIPES, RODS, OR SIMILAR BODIES.

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To all whom it may concern:

Be it known that I, GEORGE HILLARD BENJAMIN, a citizen of the United States, residing at New York city, county and State of New York, have invented a certain new and useful Improvement in the Art of Heating Pipes, Rods, or Similar Bodies, of which the following is a specification.

My invention, stated broadly, consists in an improvement in the art of heating pipes, rods, or similar bodies by the heat derived from a series of confined rotating electric arcs.

It is now well known that the heating value of an electric arc will be in proportion to the amount of current transmitted through the arc. My invention therefore depends upon the fact that if a series of electric arcs are created in the vicinity of a body to be heated and the heat confined within a limited space such body may be raised to any desired temperature.

I will show my invention as applied to apparatus for butt-welding pipes. I wish it understood, however, that my invention may be embodied in a large variety of apparatus which may be employed for heating pipes, rods, sheets, or other forms of metal.

The butt-welding apparatus shown and described consists of a heating-chamber in which are arranged a number of pairs of electric arcs. This chamber, which is of small size, and the arcs are arranged to rotate relative to the pipe to be heated. The object of using a small chamber and in rotating the chamber and the arcs is to confine the heat and to distribute the heat uniformly around the pipe.

The object of my invention is to provide means for readily and quickly heating pipes and to reduce the cost of such heating.

The accompanying drawings will serve to illustrate one embodiment of my invention.

Figure 1 is a section on the line X X of Fig. 2.

Fig. 2 is a section on the line Y Y of Fig. 1.

Referring to the drawings, 5 indicates a pair of vertical standards which serve as supporting-bearings for the rotatable heating-chamber 6. This chamber, which may be of any suitable shape, but preferably small, so as to confine the heat from the arcs developed within it, consists of an inclosing casing 7 and a lining of brick or other refractory material 8. The lining should preferably be such as to prevent so far as possible any heat radiation from the surface of the chamber. The inclosing casing 7 is shown as having the lateral tubular extensions 9 10, which exten-

sions are located in bearings carried by the standards 5. Secured to the left-hand end of the tubular extension 9 is a pulley 11, having a tubular hub. Rotary motion may be communicated to the chamber 6 through this pulley. Mounted on the tubular extensions 9 10 at each side of the heating-chamber are tubular bodies of refractory material 12 13. The best material for the purpose I find to be consolidated asbestos fiber. Arranged around these tubular bodies are flat rings 14 15 of any good conducting material.

Projecting from the top of the standards 5 are brush-holders 16 17, carrying spring-pressed carbon blocks 18 19, which rest, respectively, upon the conducting-rings 14 15.

Arranged around the circumference of the heating-chamber 6, projecting within the chamber and inclined relative to each other, are the pairs of electrodes 20 21. These pairs of such electrodes are shown. I wish it understood that I do not limit myself to the number of pairs of electrodes which may be used. These electrodes, which may be formed of carbon or any other suitable material, are shown as located in tubes of refractory material 22 and provided with means 23 whereby they may be adjusted relative to each other. I do not limit myself in any wise to the means shown for the mounting of such electrodes or for effecting the adjusting of such electrodes. I may, if desired, provide means such as is now commonly used in electric-arc lamps for automatically effecting and maintaining the adjustment of the electrodes, and their mounting may be such as is found convenient and suitable. The electrodes 20, which carry the plus (+) sign, are shown as connected through the bars 24 to the conducting-ring 14, and the electrodes 21, which carry the minus (-) sign, through the bars 25 (but one bar shown) to the conducting-ring 15. Situated between each pair of electrodes and projecting within the heating-chamber is shown an iron core 26 and on the end of such core a spool carrying a magnet-coil 27. The core 26 is shown as located within a tube of refractory material 28, which serves also as a support for the magnet 27. The object of using the core 26 and magnet 27 is to blow the arcs (indicated in dotted lines at 29) created between the electrodes 20 21 forward toward the object to be heated—i. e., in the present case the pipe 30.

To supply current to the machine, I use

the dynamo 31 or other source of electric energy, connected through the conductors 32 33, respectively, with the carbon blocks 18 19. The magnet-coil 27 is connected across the conductors 32 33.

The method of operation of my device is as follows: The objects to be heated—*i. e.*, the pipes 30 in the present case—are introduced through the hollow extensions 9 10 and brought in contact within the chamber 6. The current is then turned on to the electrodes 20 21 and an arc is formed between each electrode. Motion is then imparted to the pulley 11, which causes the chamber 6 and the electrodes 20 21 to be rotated relatively to the pipes 30. As a result the arcs traverse around the junction of the pipes. When the pipes are sufficiently heated, they are pressed into intimate contact by pressure exerted at their opposite ends, as is usual. The current is then turned off and the pipes withdrawn from the machine. I find the best results can be obtained by rotating the heating-chamber 6 and electrodes 20 21. I, however, do not limit myself to the employment of apparatus for carrying my improved method into effect which shall be rotated, as the device will accomplish the same result, though not with such perfection, when the arcs formed between the electrodes occupy fixed positions in the heating-chamber. In practice I find that the desired heating of the pipes can be accomplished in a very few moments, the time of course depending upon the heating value of the arcs. In the drawings the arcs are shown as not in contact with the body to be heated, and I prefer to so arrange them, as the best effects may be obtained by utilizing the radiated heat from the arcs. I may, however, so locate the arcs that the body to be heated will be within the arcs and the arcs thus heat directly by conduction.

The apparatus shown and described, while especially applicable for butt-welding, may also be used for heating rods, tubes, or wire preparatory to drawing and in connection with a draw-bench, and the same apparatus modified in shape may be employed for heating metal in the form of sheets.

In the drawings I have shown the pipe to be heated of such size as to substantially fill the cavities of the tubular extensions 9 10. Where bodies are to be heated of less diameter than the openings formed by such extensions into the heating-chamber, it is preferable to close through suitable means the outer ends of such extensions to prevent so far as possible the ingress of air into the chamber or the egress of heat from the chamber. This I find to be of advantage, as by so doing the generated heat may be preserved within the chamber and oxidation of the metal treated in a large measure prevented. This latter condition is due to the fact that the arcs by the decomposition of the electrodes produce

a reducing atmosphere, which, so far as I can discover, consists of carbonic dioxid and nitrogen in the form of gas.

Having thus described my invention, I claim—

1. The improvement in the art described, which consists in introducing the body to be heated into a substantially closed chamber, and then subjecting said body to the radiated heat of a series of electric arcs rotated around said body.

2. The improvement in the art described, which consists in introducing the body to be heated into a substantially closed chamber, and then subjecting said body to the physical effects of a series of electric arcs rotated rapidly around said body.

3. The improvement in the art described, which consists in introducing the body to be heated into a chamber which is substantially closed by the introduction of said body, and then subjecting said body to the radiated heat of a series of electric arcs rotated rapidly around said body.

4. The improvement in the art described, which consists in introducing the body to be heated into a substantially closed chamber, then subjecting said body to the uniformly-applied radiated heat of a series of electric arcs rotated around said body.

5. The improvement in the art described, which consists in introducing the body to be heated into a substantially closed chamber, then subjecting said body to the radiated heat derived from a series of electric arcs, and from the lining of said chamber, as such sources of heat are rotated around said body.

6. The improvement in the art described, which consists in introducing the body to be heated into a substantially closed chamber, then subjecting said body to the radiated heat of a series of electric arcs rotated around said body and magnetically blown toward said body.

7. The improvement in the art described, which consists in introducing the body to be heated into a chamber substantially closed to the external atmosphere, then subjecting said body to the radiated heat of a series of electric arcs rotated around the periphery of said body.

8. The improvement in the art described, which consists in introducing the bodies to be welded into a chamber substantially closed to the atmosphere, then rotating a series of electric arcs around the meeting-point of said bodies.

9. The improvement in the art described, which consists in introducing a body to be heated into a chamber substantially closed to the atmosphere, then subjecting said body to the high-temperature effects due to a series of electric arcs rapidly rotated around said body.

10. The improvement in the art described,

which consists in introducing the body to be heated into a chamber closed to the atmosphere, then subjecting said body while maintained in a fixed position to the radiated heat
5 of a series of electric arcs rotated rapidly around said body.

11. The improvement in the art described, which consists in introducing the body to be heated into a chamber closed to the atmosphere, then subjecting said body to the high-
10 temperature effects of an annular heated zone of uniform intensity surrounding said body and having the temperature of an electric arc.

12. The improvement in the art described, 15 which consists in introducing the body to be heated into a chamber closed to the atmosphere, then subjecting said body to the effects of a uniformly-heated zone surrounding said body but not in contact with said body and 20 having the temperature of an electric arc.

In testimony whereof I affix my signature in the presence of two witnesses.

GEORGE H. BENJAMIN.

Witnesses:

J. E. PEARSON,
FRANK O'CONNOR