Nov. 30, 1926. 1,609,132

J. E. SEDERHOLM

ELECTRIC HEATER

Filed August 4, 1924 3 Sheets-Sheet 1

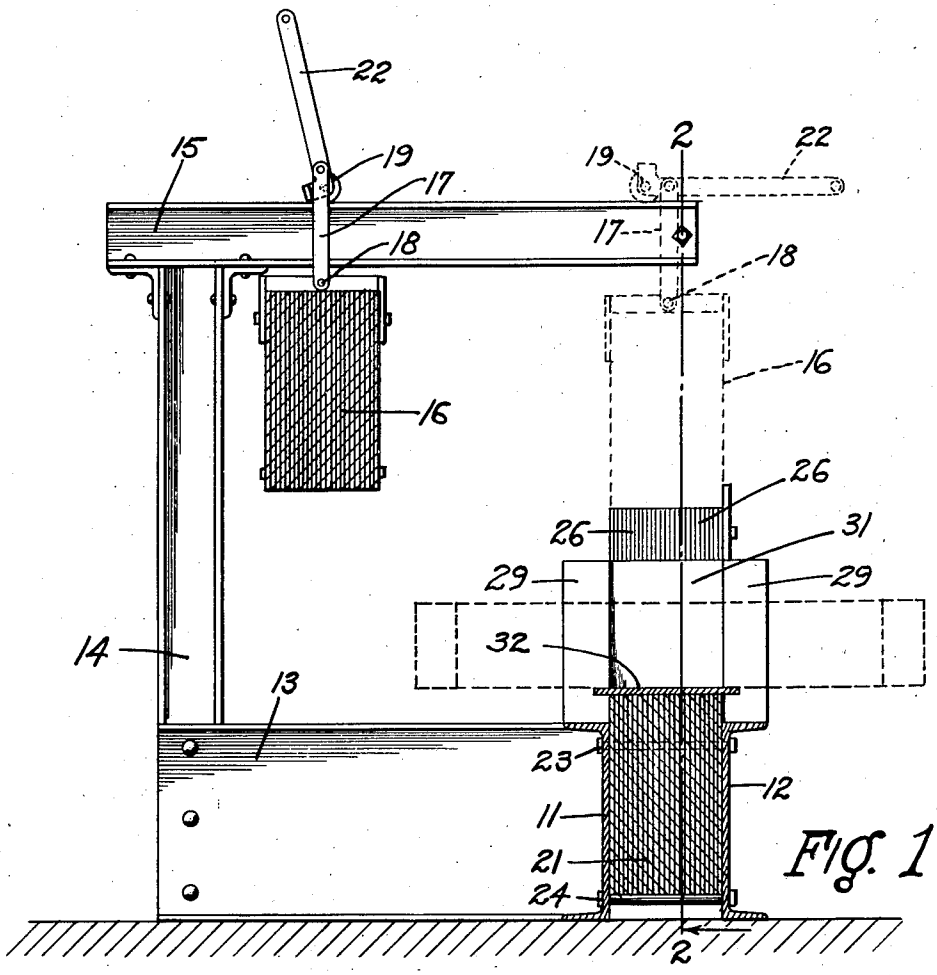


FIG. 1

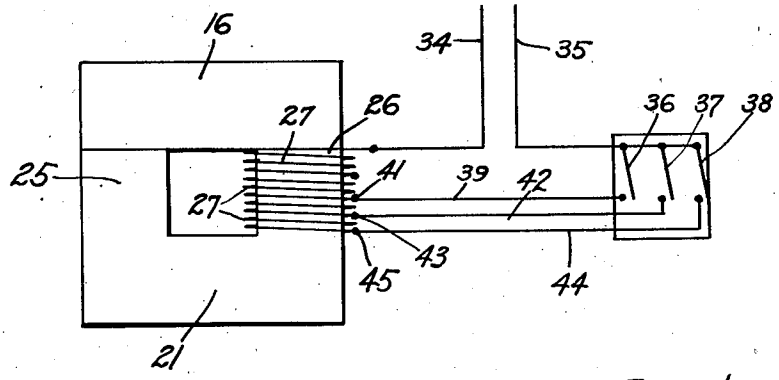


FIG. 4

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ELECTRIC HEATER

Filed August 4, 1924 3 Sheets-Sheet 2

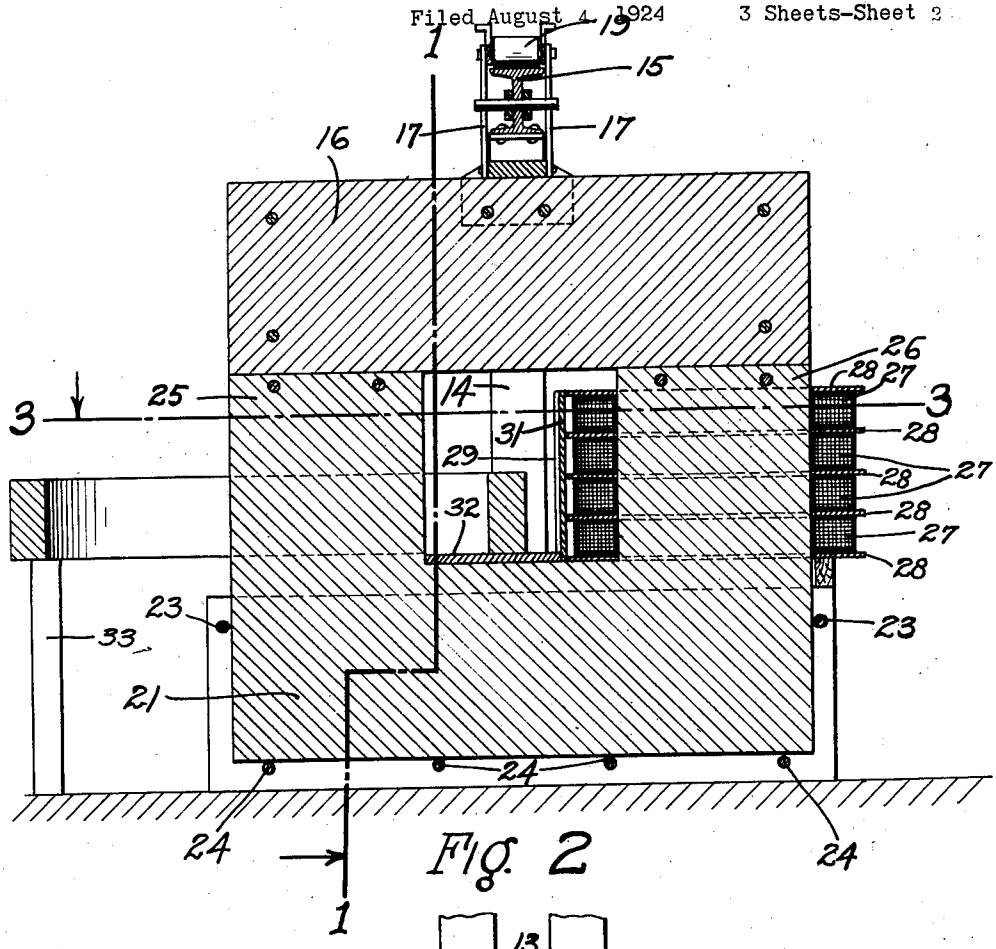


Fig. 2

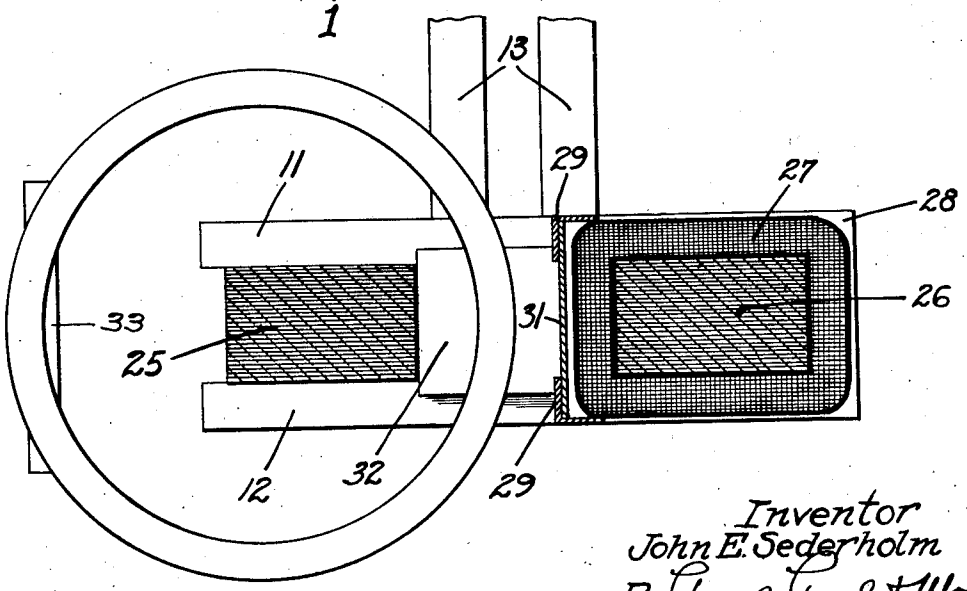


Fig. 3

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ELECTRIC HEATER

Filed August 4, 1924 3 Sheets-Sheet 3

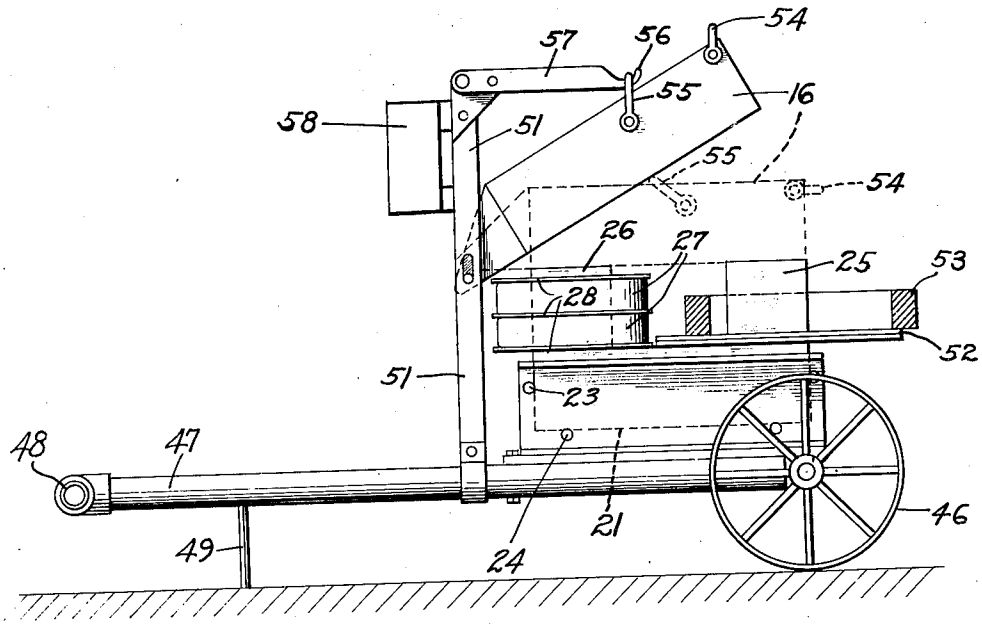


Fig. 5

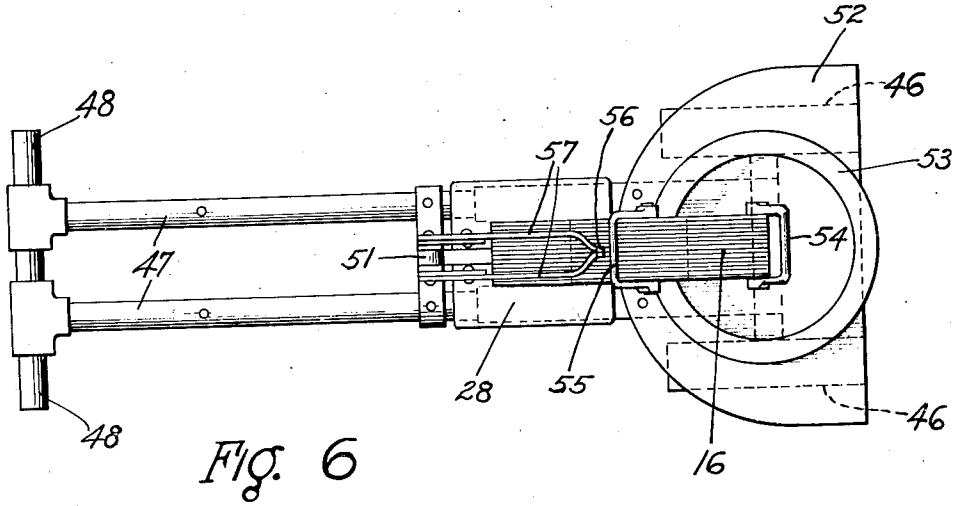


Fig. 6

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UNITED STATES PATENT OFFICE.

JOHN E. SEDERHOLM, OF ST. PAUL, MINNESOTA, ASSIGNOR TO AMERICAN HOIST & DERRICK COMPANY, A PARTNERSHIP COMPOSED OF F. J. JOHNSON AND W. O. WASHBURN, OF RAMSEY COUNTY, MINNESOTA.

ELECTRIC HEATER.

Application filed August 4, 1924. Serial No. 730,091.

This invention relates to improvements in electric heaters particularly adapted for heating, for expansion purposes, metallic rings or bands, and the like, and more particularly relates to such an apparatus adapted to heat and expand steel tires to be shrunk onto wheels, such for instance as the drive wheels of a locomotive, or for heating steel rings to be shrunk onto a cast-iron wheel or disk to be used as a gear wheel, in which case the teeth are cut in the steel ring thus shrunk on, to obtain maximum strength with a minimum of weight.

Devices of this type employed at present for heating rings and bands to a predetermined degree so that they may be shrunk onto a complementary member, usually employ a tank which is filled with a suitable heating medium, such as oil. This oil is heated to a predetermined degree, usually by means of an oil or gas furnace, after which the articles to be heated and expanded are submerged therein. As soon as the ring or other article has been heated to the desired degree it is removed from the tank by such means as a tackle-block or small hoist. This type of furnace requires considerable space when properly installed, as it is usually necessary that it be built in a separate well-ventilated room, to prevent the dangerous fumes emanating therefrom from being discharged into the building and thereby impairing the health of attendants or workmen laboring thereabout. The above type of furnace is also objectionable in that it has been the source of serious damage to property as a result of explosions and fires caused by the accidental igniting of the combustible material, such as oil and gas, used in its operation.

As hereinbefore stated, the novel heater feature in this invention is of the electric type. Generally, it consists of a U-shaped stationary iron core having a complementary movable core arranged thereover adapted to engage the upper faces of the vertical legs thereof. One or more coils or windings are mounted to encircle one of the upright legs of the stationary core, and when this winding is energized by the flow of electric current therethrough, an electromagnetic circuit will be built up in the closed iron core, which in turn will induce in the ring or other device, having a portion thereof positioned between the upright legs of the stationary core, a current of very low potential but of very high amperage, thereby causing such device to rapidly heat, caused by the high resistance offered to the flow of current therethrough.

The object of this invention therefore is to provide an improved electric heater of simple and inexpensive construction, which will be safe and efficient in operation and performance.

Other objects of the invention will more fully appear from the following description and the accompanying drawings and will be pointed out in the annexed claims.

In the drawings there has been disclosed a structure designed to carry out the various objects of the invention but it is to be understood that the invention is not confined to the exact features shown as various changes may be made within the scope of the claims which follow.

In the accompanying drawings forming a part of this specification,

Figure 1 is a vertical sectional view on the line 1—1 of Figure 2 of my improved heater, showing in dotted lines a ring positioned thereon;

Figure 2 is a sectional view on the line 2—2 of Figure 1 showing the winding encircling one of the upright legs of the stationary core;

Figure 3 is a sectional plan on the line 3—3 of Figure 2;

Figure 4 is a wiring diagram of the device showing three different heats;

Figure 5 is a modified construction showing a side elevation of a portable type of heater, the movable core being shown in raised inoperative position; and

Figure 6 is a plan view of Figure 5.

In the selected embodiment of the invention here shown there is illustrated an electric heater having a frame comprising opposed channel bars 11 and 12 and a beam 13 having an upright supporting member 14 secured to the rear end thereof adapted to support a horizontal beam 15 adapted to provide a track and to support a movable core 16 as shown in Figure 1. This core is preferably supported by means of a pair of links 17 having one end pivotally secured to the core by means of a pin 18 and the

other end thereof secured to a carriage 19 adapted to travel back and forth upon the horizontal beam 15 when the core is moved to and from a complementary core 21, which will subsequently be described. The carriage 19 is preferably provided with a lever handle 22, and is so constructed that when positioned as shown in full lines in Figure 1, the core 16 will be elevated from the position shown in dotted lines in the same figure wherein the core 16 is shown lowered to contact with the upper portion of the stationary core 21.

The stationary core 21 is arranged between the frame members 11 and 12 and is preferably secured thereto by means of tie-bolts 23 and 24 which are suitably insulated from the laminated core 21. The stationary core 21 is substantially U-shaped in form, comprising a main body 21 and the upright legs 25 and 26 so that when the movable core 16 is moved into contact with the upper faces of the upright legs 25 and 26 it will present an angular frame or structure as particularly shown in Figure 2. The iron cores 16 and 21 are of usual construction, being built up of a plurality of sheet-iron laminations suitably secured together, as is common practice and well-known in the art.

The means provided for inducing an electro-magnetic circuit in the iron core when positioned as shown in Figure 2, preferably consists in the provision of a plurality of suitable coils or windings 27 arranged to encircle one of the upright legs of the stationary core 21. In the drawings I have shown the coils 27 mounted upon the upright leg 26, but it is to be understood, of course, that they may be mounted upon the opposed leg 25 with equal results. The coils 27 are suitably insulated and are preferably separated from one another by means of plates 28 of a suitable insulating material. These insulated plates 28 are preferably fitted to the walls of the upright leg 26 and are adapted to outwardly project beyond the outer surfaces of the coils 27, thereby to offer a protection of the coils against injury. These insulated plates 28 also prevent the windings of the coils 27 from contacting with one another which might cause short-circuiting and burning out of the coils. A pair of upright angle bars 29 are mounted at one end of the coils adjacent the upright leg 25. These angle bars 29 are preferably secured to the opposed channel-bars 11 and 12 of the main frame of the heater by such means as welding. A plate 31 of suitable insulating material is arranged between the upright angle bars 29 in such a manner as to abut against the edges of the horizontal spacing plates 28 as particularly shown in Figure 2, thereby protecting the coils from injury which might be caused by the ring or other device to be heated coming in contact therewith. An insulating plate 32 is positioned between the upright leg 25 and the coil-protecting plate 31 to prevent the article to be heated from coming in actual contact with the lower horizontal portion of the core 21 when positioned thereon as shown in Figures 2 and 3.

In the operation of this novel ring heater, the movable core 16 is first removed from the upright legs 25 and 26 of the stationary core 21 as shown in Figure 1. Such removal of the core 16 from the stationary core 21 is effected by raising the handlever 22 from the position shown in dotted lines in Figure 1 to substantially a vertical position which will cause the core 16 to be elevated to the position shown in full lines in Figure 1. The carriage 19 may then be backwardly moved upon the horizontal beam 15, as shown in this figure, until the core 16 has been moved out of contact and away from the stationary core so as to permit a ring or other device to be placed between or over the upright legs 25 and 26 of the stationary core, as shown. When the ring to be heated has been positioned upon the stationary core as shown in Figure 2, the movable core 16 will be returned to its operative position in contact with the upper faces of the upright legs 25 and 26 of the core 21 as shown in Figure 2. Electric current is then introduced in the coils 28 by the manipulation of a suitable switch, not shown. As soon as current starts to flow in the coils 27, an electro-magnetic circuit will be induced in the iron cores which form a complete circuit around one side of the coils 27 and around a portion of the ring to be heated, the electro-magnetic flux thus induced in the iron cores 16 and 21 in turn inducing an electric current in the ring of a very low potential but a very high amperage. As a result of the inability of the ring to carry this high amperage, caused by the high resistance it offers to the passage of the current, the friction caused by the current flowing through the ring becomes so great that the ring immediately begins to heat. As soon as the heat has reached a predetermined degree, the flow of current through the coils 27 will be interrupted by means of a suitable switch, and the movable core removed from the stationary core to the position shown in full lines, Figure 1, after which the ring may be removed from the heater for subsequent shrinking onto a complementary device such as a locomotive driving wheel. The overhanging portion of the ring may be supported by means of a supporting member 33 as shown in Figures 2 and 3.

The temperature to which the ring is to be heated to obtain the proper degree of expansion for shrinking onto a complementary member may be controlled by the period of

time in which the current is allowed to flow through the coils 27. The means provided for controlling the flow of current through the coils 27 may therefore be manually operated, or if desired, it may be controlled by means of a timed switch mechanism which may be so adjusted as to automatically interrupt the flow of current through the coils 27 when a predetermined temperature has been reached in the heating of the ring.

In the actual operation of this novel ring heater, it has been found that the size or diameter of the ring or device to be heated has little to do with the time required to obtain a predetermined ring temperature. This heater, therefore, has proven of considerable advantage over present forms of heaters or furnaces used for this purpose. Its operation and construction is very simple, thereby providing such a device which may be efficiently employed to heat, for expansion purposes, metallic rings to be shrunk onto such devices as locomotive drive wheels or large gear wheels.

If desired, the coils 27 may be connected up in such a manner that a number of different heats may be obtained in order that the ring or other device may be heated to different temperatures which is necessary, depending upon the material and diameter of the ring in order to obtain the proper expansion of the ring to provide a good shrink fit.

In Figure 4, there is shown a conventional wiring diagram showing how the coils may be connected in order to obtain such different heats. As here shown all of the coils 27 are connected in series but are so arranged and tapped that the number of effective ampere turns thereof may be varied to obtain the desired flow of current through the coils 27. A conductor 34 leads from one side of the main line, (not shown,) to the upper coil 27 and a conductor 35 from the other side of the main line to a multiple switch mechanism comprising switches 36, 37 and 38. A wire 39 leads from the switch 36 to a tap 41 taken off the bottom of the second coil from the top, and a wire 42 from the switch 37 to a tap 43 on the third coil, and similarly a wire 44 leads from the switch 38 to a tap 45 provided on the lower coil 27. By this arrangement it will be seen that when the switch 36 is closed, the current will flow through the conductor 34 through the two upper coils 27, through the conductor 39, switch 36, conductor 35 and back to the main line, thus eliminating from the circuit the two lower coils. When this circuit is employed a higher temperature will be obtained in the ring. When the switch 37 is closed, the current will flow through three of the coils 27 thus increasing the number of ampere turns in the circuit with the result that less heat will be obtained, and when the switch 38 is closed the four coils 27 will be connected in the circuit with an additional increase in the number of ampere turns, with the result that a lower heat or temperature will be obtained. The form of multiple switch to be used is preferably of such construction that only one switch can be closed at one time in order to prevent short-circuiting and therefore burning out of the coils, which would result if two or more switches were closed at one time. Such a switch forms the subject matter of a pending application of the inventor hereof filed August 2, 1924, Serial #729,807.

In Figures 5 and 6, there is shown a modified construction wherein the heater is portably mounted upon a small truck comprising the carrying wheels 46 and a frame 47 having handles 48 provided thereon whereby it may be conveniently transported from place to place. Standards 49 are preferably provided on the frame 47 to support the end thereof when in operative position as shown in Figure 5. As here shown the stationary core 21 is relatively smaller in dimension than the one shown in Figures 1, 2 and 3. The upper movable core 16 is pivotally mounted upon an upright supporting member 51 secured to the frame 47 in such a manner that it may be lowered to the position shown in dotted lines in Figure 1, wherein it is in contact with the upper surfaces of the upright legs 25 and 26 of the stationary core. In this construction, there is shown but two coils 27, it being understood of course that any number may be used to accomplish the desired results. An insulated plate 52, preferably semi-circular in form, is mounted upon the stationary core 21 as shown in the drawings, and this plate provides a support for the ring 53 when positioned on the heater as shown. The movable core 16 is preferably provided with a hand grip 54 whereby it may be raised from the dotted position shown in Figure 5, to the full line position shown in this same figure. A loop or clevis 55 is also pivotally mounted thereon adapted to engage a hook 56 provided on an overhanging arm 57 to retain the core 16 in raised inoperative position. A suitable switch box 58 is preferably mounted on the upright supporting member 51 which is in electrical connection with a suitable source of electric energy and whereby the flow of current through the coils 27 may be controlled. The portable heater shown in Figures 5 and 6 is particularly adaptable for use in heating small rings and the like and as a result of its portable mounting may be conveniently transported about from one place to another within the factory or shop where it is used.

I claim as my invention:

1. A device of the class described, com-

prising a pair of base-forming and clamping irons, holding therebetween the laminations of a U-shaped stationary core, said core providing upright arms, and a work-receiving space therebetween, a coil encircling one of the arms, a second pair of base-forming irons attached and extending laterally of one iron of the first pair, midway of the work space, a vertical iron secured between the second pair of irons, a track-iron connected at the top of the vertical iron, and extending forwardly and centrally over the work space, and a movable core adapted to bridge the work space and rest upon the arms, and connections between said movable core and track for pendently disposing the core and for holding and guiding the same for working cooperation with the stationary core, whereby said movable core can be positioned to permit the unobstructed removal of the work.

2. A device of the class described, comprising a pair of irons clampingly securing the laminations of a U-shaped core, said core providing vertical arms and a work-receiving space therebetween, coils encircling one of the arms, a second pair of irons attached to the first pair midway of the work space, a vertical iron attached to the second pair of irons, a horizontal iron as a track at the top of the vertical iron and extending forwardly and centrally over the work space, a movable core adapted to bridge the work space and rest upon the arms, and connections between the movable core and track for pendently disposing said movable core and guiding the same for placement upon the stationary core, and a stop on the track for engaging the connections to limit translative movement of the stationary core at a point vertically above said stationary core.

3. A device of the class described having a stationary core providing upright arms and a work-receiving space between the arms, a coil encircling one of the arms, a vertical frame disposed rearwardly of the stationary core and providing a track overhanging said stationary core centrally of the work space, a movable core, and connections between the same and the track disposing said core transversely of the track pendently therebeneath for movement in a direction at right angles to the faces of greatest area of the stationary core, said connections adapted to raise and obtain translation of the movable core to a point rearwardly of the stationary core, to permit unobstructed removal of the work.

4. An electric heater comprising a frame, a core supported thereon and having legs spaced apart and adapted to receive the work to be heated between them, a coil encircling one of said legs and having an electric circuit, an upright standard, a horizontal arm carried by said standard and overhanging said core, and a movable core slidably supported by said arm and adapted to be lowered to contact with said legs and form with said core a continuous metallic circuit and heating the work encircled by said core.

In witness whereof, I have hereunto set my hand this 30th day of July 1924.

JOHN E. SEDERHOLM.