(No Model.)

G. D. BURTON & E. E. ANGELL.

ELECTRIC METAL HEATING APPARATUS.

No. 488,467. Patented Dec. 20, 1892.

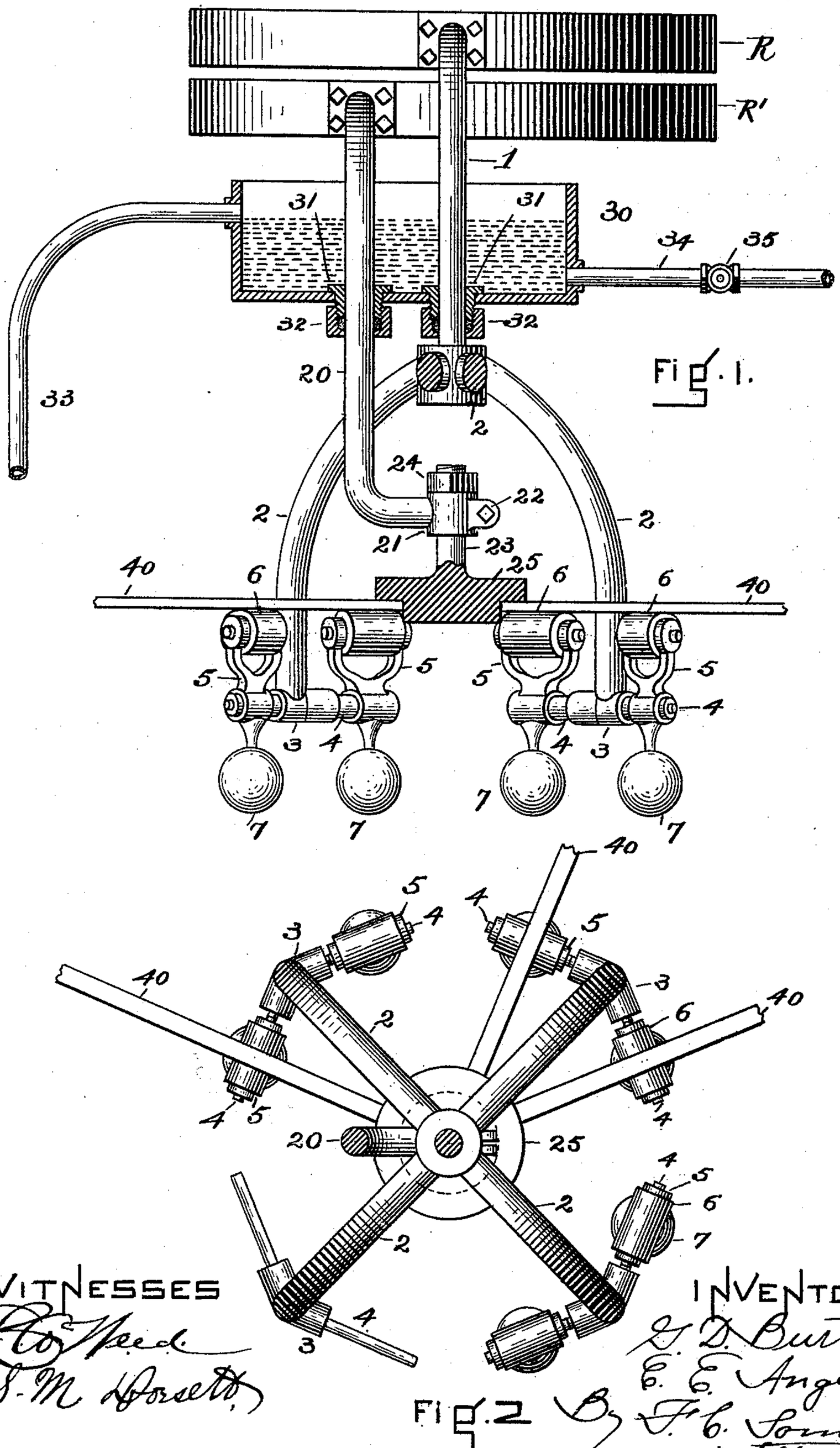

Fig. 1.

Fig. 2

WITNESSES

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ELECTRIC METAL-HEATING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 488,467, dated December 20, 1892.

Application filed August 8, 1892. Serial No. 442,479. (No model.)

To all whom it may concern:

Be it known that we, GEORGE D. BURTON, of Boston, in the county of Suffolk, and EDWIN E. ANGELL, of Somerville, in the county of Middlesex, State of Massachusetts, have invented a certain new and useful Improvement in Electric Metal-Heating Apparatus, of which the following is a specification.

The object of this invention is to provide a non-heating governor or regulator for controlling within certain limits the converted current.

The object of the invention is further to prevent the heating of the current converter by conduction of heat from the forge or other instrument where the heat is utilized.

The object of the invention is further to provide an electric forge in which the bars to be heated may be freely held with sufficient contact without the use of clamps whereby they may be readily inserted and removed and permitted to expand during the heating operation.

In the drawings:—Figure 1 is a side elevation, partly in section, of a portion of an electric converter and an electric forge connected therewith, and with our improvements applied thereto. Fig. 2 is a top plan view of the forge portion of the same.

R, R′, are the outer rings of an electric converter, such as is shown in the patent to Burton, Eddy & Briggs, No. 475,232, issued May 17, 1892. This converter is connected to the generating apparatus and constructed substantially as shown in that patent, and need not be further described. It delivers from the rings, R, R′, when they are connected in circuit, currents of great volume and low potential, requiring massive conductors of copper or similar metal to convey them to the work. From the positive converter ring, R, the current-conducting arm, 1, leads downward and is connected to branch arms, 2, 2, each of which has a sleeve, 3, at its lower end, which supports a cross bar, 4, on the outer ends of which are mounted the swinging arms, 5, 5. The upper end of each of these arms is bifurcated and carries the roller, 6, in its fork, while its lower end is provided with the weight 7. From the negative converter ring, R′, the current-conducting arm, 20, leads downward and has on its lower end the split sleeve, 21, the ears of which are drawn together by the screw bolt, 22. In this sleeve the upright shaft, 23, is held and it has on its upper end the nut, 24, by which it may be adjusted up or down to the height desired. Attached to the lower end of shaft, 23, is the circular heater plate, 25, under the edge of which the ends of the bars, 40, which are to be heated are thrust, each bar being passed over one of the rollers, 6, as shown. The electric current therefore passes through the portion of the bar between the roller and the heater plate and heats it to the degree desired.

In dealing with the heavy currents of low potential which we employ, it becomes necessary to employ conductors of great comparative size, made of copper or other similar metal of high conductivity. The great size of these conductors, while it enables them to convey the electric current readily, also causes them to transmit by conduction a large amount of heat from the bars being heated to the converter rings, and to gradually heat up the parts of the converter by such conduction through its metal contacts. This, in the course of a day's work, sensibly interferes with the conversion and delivery of the electric current, by reason of the converter consuming more energy in converting it. It has also been found to be desirable to employ a means of regulating the amount of current delivered through the bars being heated, so that any sudden increase of the speed of the dynamo connected to the converter may not burn or injure the metal in that process. To overcome these difficulties and accomplish these results we employ a reservoir of cooling fluid in a peculiar way, so that it also forms a liquid bridge between the positive and negative conductors, 1 and 20, of the converter. The reservoir, 30, is attached to the conductors, 1 and 20, fluid-tight by means of the sleeves, 31, and nuts, 32, 32, with packing between them as shown; the sleeves, 31, being soldered in the bottom of the reservoir. An inlet pipe, 33, admits fluid to the reservoir,

while an outlet pipe, 34, allows it to escape. This pipe is provided with a stop cock, 35, by which the height of the fluid in the reservoir can be regulated; it being only necessary to set it at a certain degree of opening to keep the liquid running through the reservoir at the desired height. The reservoir may also be filled to any desired height with the stop cock closed.

The operation of the mechanism is as follows:—Suppose the metal bars, 40, 40, to be inserted over the rollers, 6, and against the heater plate, 25, and the converter to be set in operation to convert the dynamo current into one of very low tension. The latter current will flow through the conductors, 1 and 20, and heat the metal bars, 40, because they afford a better conductor for the current than the fluid in the reservoir 30. This fluid employed by us is usually cold water, and we keep it flowing at a certain rate through the reservoir. The depth of water in the reservoir and the distance apart of the conductors passing through it will be, of course, regulated to prevent the current short circuiting through it. The reservoir itself may be made of iron and the sleeves, 31, of plumbago so as to increase their resistance, and we prefer to make it so in some cases. When so made it will be found that the metal of the reservoir will not heat very much, because of the presence and contact against it of the cooling liquid, and we thus provide a metal bridge that will not melt away in short circuiting the current, and will not itself be raised to so high a temperature in short circuiting the current as to vary it widely in heating the metal bars, 40, or any one of them. These conditions being understood we will proceed with the description of the operation of our device. When the resistance of the bars, 40, is increased by heating them up to a certain temperature, the liquid in the reservoir, or the combined metal of the reservoir and the liquid, begins to act as a bridge to short circuit a portion of the electric current, and thus prevents the heating of the metal beyond the desired degree. This liquid bridge, therefore, acts as a governor to the heating operation, which will not itself heat up and which remains constant within reasonable limits, and in this respect is different from resistance coils and rheostats made of metal and electrically connected in a similar manner, which heat up and vary in resistance as soon as they begin to short circuit the heavy heating current. But the liquid in the reservoir, 30, performs another function of importance, independently of that just described. That is to say, it arrests the heat conveyed upward along the copper conductors, 1 and 20, from the bars, 40, while being heated, and prevents this heat from reaching the converter. For this purpose two separate reservoirs might be made out of, 30, by putting a division board of wood between the conductors 1 and 20 and by constructing the reservoir of wood, and separate pipes might be run into said two reservoirs from different sources of water supply and separate outlet pipes be employed. The same cooling effect would then be had upon the conductors, while the liquid bridge between them would be eliminated. Hence it is evident that these two functions of the liquid in the reservoir, 30, are independent of each other. Since the cooling effect of the liquid upon the conductors, 1 and 20, prevents the heat from being conducted through them to the rings, R, R', of the converter, it is apparent that the latter and their connections in the converter will not have their electrical conditions affected, as would be the case if the reservoir, 30, were not used with its fluid contents. When a bar is inserted between the electrode 25 having its contact face on its under side and the opposite electrode having its contact face on the upper side, a leverage is exerted upon the bar, either by the weight thereof at its outer end or by pressure of the operator, which establishes sufficient contact of the bar against the electrodes without the use of clamps, to insure the passage of the current and the bar is free to expand under the effect of the heat developed between the electrodes. The weighted swinging arm having a contact face on its upper side which is preferably in the form of a roller, serves as a yielding electrode and adapts itself to operate in conjunction with the plate 25 upon bars of different sizes placed in position at different times.

What we claim as new and of our invention is:—

1. The combination of a converter for converting electrical currents of high potential into those of low potential, conductors leading from said converter and provided with metal heating appliances at a suitable distance therefrom, and a liquid bridge or short circuit placed between the converter and said metal heating appliances substantially as described.

2. The combination of a converter for converting electrical currents of high potential into those of low potential, conductors leading from said converter and provided with metal heating appliances at a suitable distance therefrom, and a liquid bridge or short circuit contained in a metal reservoir, between the converter and said metal heating appliances, substantially as described.

3. The combination of a converter for converting electrical currents of high potential into those of low potential, conductors leading from said converter and provided with metal heating appliances at a suitable distance therefrom, and a body of cooling liquid contained in a reservoir around each of said conductors, between the converter and said metal heating appliances, substantially as described.

4. The combination of two electrodes con-

nected with opposite electric poles, one of said electrodes comprising a pivoted freely swinging arm provided with a roller at its upper end and a counter balancing weight at its lower end, substantially as set forth.

5. The combination, in an electrical apparatus for heating metals, of the central heating plate, 25, attached to one electric terminal, and a series of pivoted swinging rollers, 6, arranged around said plate and attached to the opposite electric terminal, substantially as described.

6. In an electric heating apparatus, an arm, 2, constituting one electric terminal thereof, and having the cross bar, 4, and two rollers, 6, 6, mounted thereon, in combination with the heater plate, 25, arranged to receive the ends of the bar to be heated under it and connected to the other electric terminal, substantially as described.

7. In an electric heating apparatus, an adjustable central heating plate, 25, arranged to receive against it the ends of the bars to be heated and connected to one electric terminal, and a series of contact rollers, 6, 6, disposed radially around the said plate and connected to the other electric terminal, substantially as described.

8. The combination of two electrodes connected with opposite electric poles, one of said electrodes comprising a pivoted freely swinging arm, provided with a contact face at its upper end and a counter-balancing weight at its lower end, substantially as set forth.

9. The combination in an electric apparatus for heating metal of a central heating plate connected with one electric pole and provided with an overhanging flange, and electrodes connected with the opposite electric pole and having their contact faces on their upper sides, substantially as set forth.

10. The combination of two non-clamping electrodes connected with opposite electric poles, one of said electrodes having a yielding contact face on its upper side and the other electrode having a contact face on its under side, substantially as set forth.

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