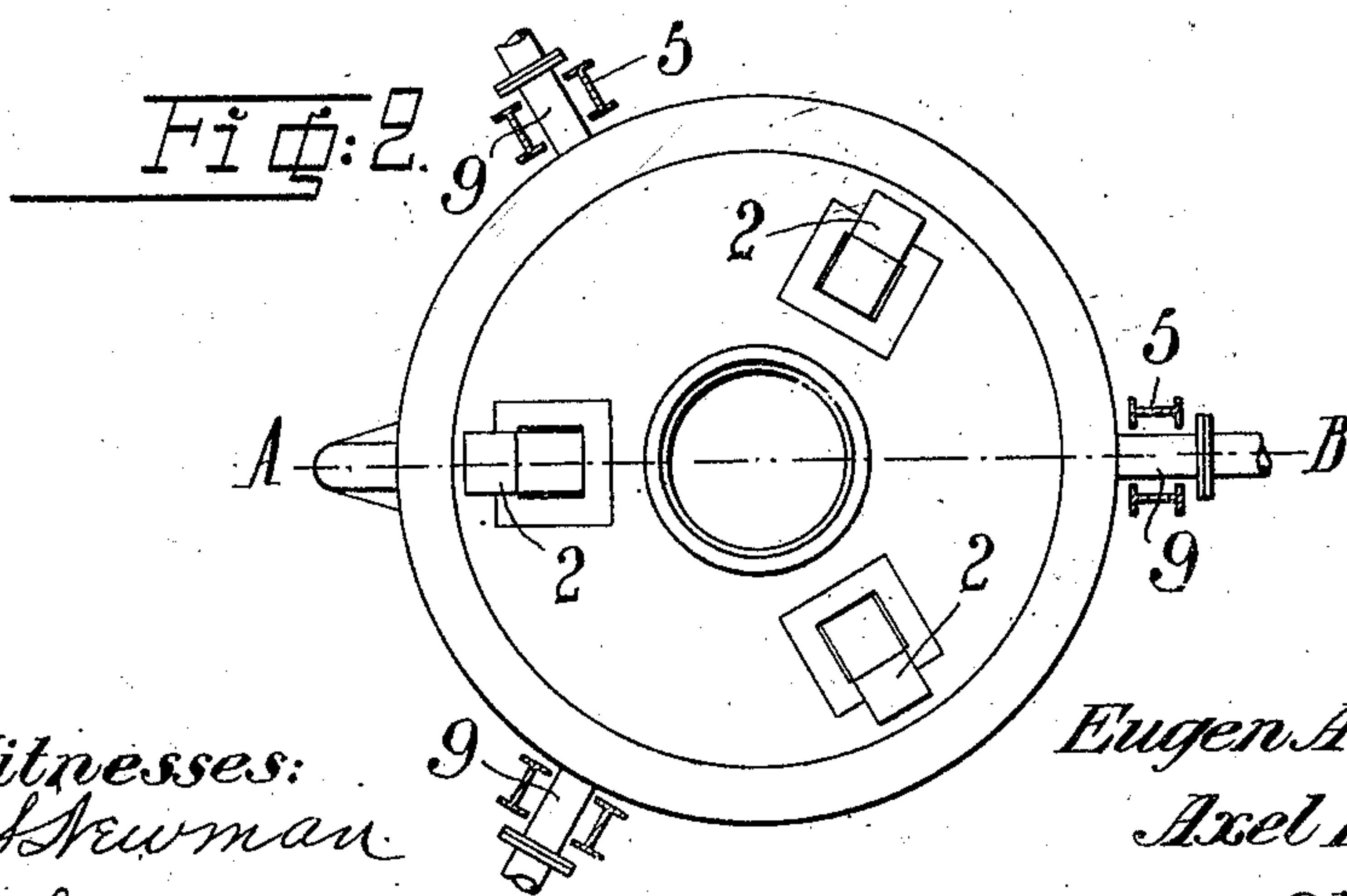
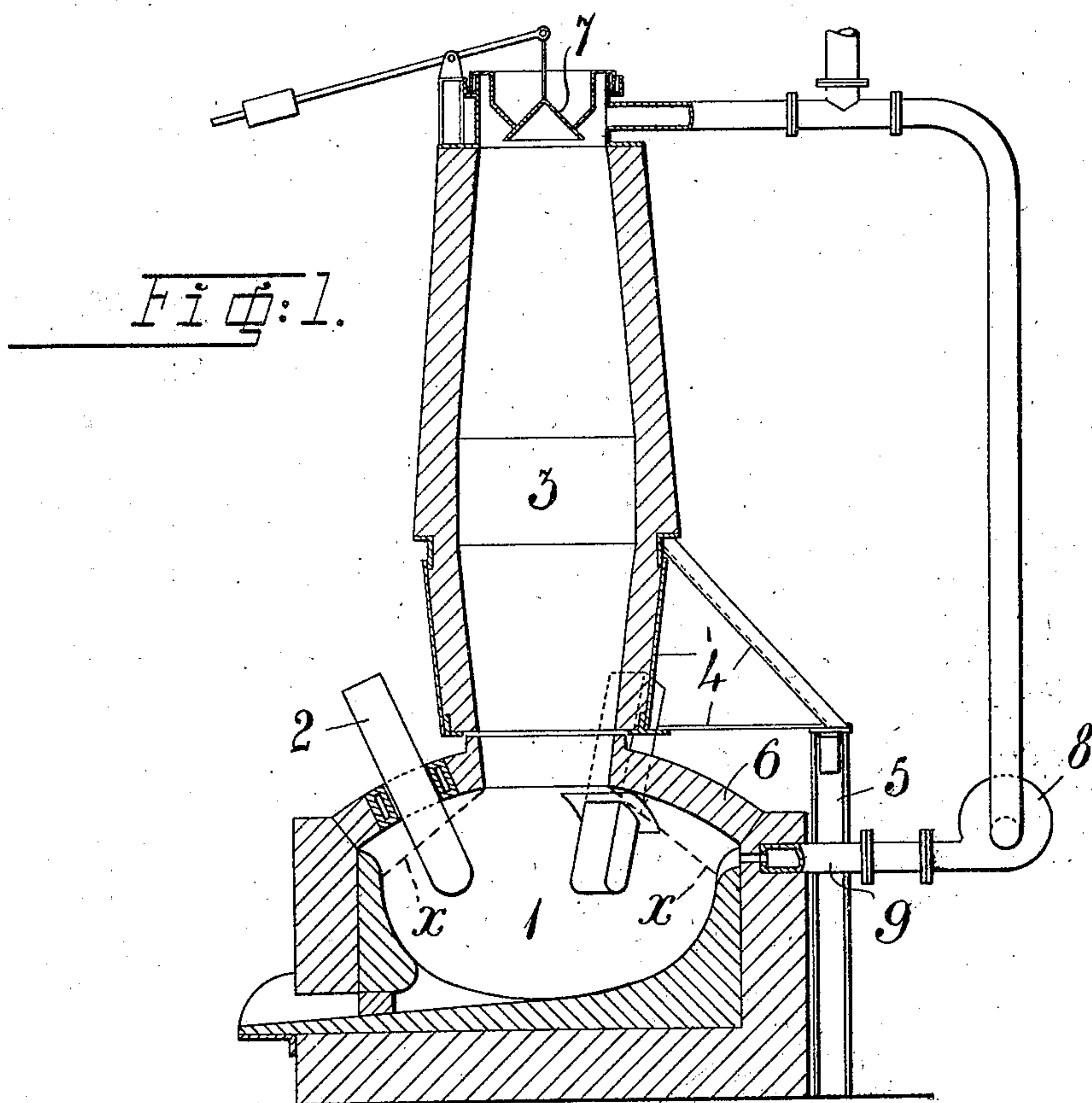


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ELECTRIC FURNACE.

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UNITED STATES PATENT OFFICE.

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ELECTRIC FURNACE.

943,224.

Specification of Letters Patent.

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To all whom it may concern:

Be it known that we, EUGEN ASSAR ALEXIS GRÖNWALL, AXEL RUDOLF LINDBLAD, and OTTO STÅLHANE, engineers, subjects of the King of Sweden, residing at Ludvika, in the Kingdom of Sweden, have invented certain new and useful Improvements in Electric Furnaces, of which the following is a specification.

The present invention relates to an electric furnace for the reduction of metals, especially iron, from their ores, and it chiefly consists in giving the furnace a form which is especially suitable for the purpose whereby considerable advantages are gained over hitherto known constructions.

In order to illustrate the invention there is shown in the accompanying drawing as an example a furnace intended for the reduction of iron ore and constructed in accordance with this invention.

Figure 1 shows the furnace in vertical section along the line A—B in Fig. 2 which is a horizontal projection of the smelting chamber.

1 is the smelting chamber, corresponding to the so called hearth in an ordinary blast furnace where the electrodes 2 are put in contact with the charge.

3 is the shaft which, by means of an iron-structure 4 rests on pillars 5 in order that it may not press on the cupola 6 covering the smelting chamber. The lowest part of the shaft has, as can be seen from the drawing, a smaller interior diameter than either the smelting chamber or the higher part of the pipe or shaft. The fact that the furnace, above the smelting chamber, has a contracted part from which the smelting chamber expands downward and the shaft expands upward, and that the electrodes are arranged in such a way that they come into contact with the charge below this contracted part, constitutes just the characteristic feature of the present invention. The cupola 6 should be formed or curved in such a way that between the walls of said cupola and the charge which is sinking down through the shaft, there shall always be one or several free spaces. The electrodes 2 should be so placed that they enter into the charge at places where such free spaces exist. By this arrangement is attained that no considerable degree of heat will be developed in the immediate neighborhood of

the brickwork, whereby the latter will be afforded the greatest protection possible from the heat. The difficulty which always exists in the use of electric furnaces, viz. that of being able to place the smelting zone proper at a sufficient distance from the brickwork is thus solved in a simple way by this construction of the furnace.

If the furnace shaft were not constructed with the above mentioned contracted part the material contained in the shaft would press so heavy on the material contained in the smelting chamber that a part of this latter material would be pressed up into the free spaces above referred to. By giving the lower part of the shaft the above stated contracted form, however, the material contained in the shaft will be in some degree supported by the walls of said part of the shaft so that it does not press so heavily on the material contained in the smelting chamber that this latter material will be pressed up into the said free spaces and thus the existence of said free spaces is secured even when the shaft is of a considerable height.

In the reduction of ore, especially iron ore, it is of importance that the reducing power of the gases produced in the furnace is used to as great a degree as possible. In order to obtain this result, the ore must be exposed to the action of the gas for a sufficiently long time and this is attained by giving the shaft or pipe sufficiently great volume. This condition too is fulfilled by the present form of construction of the furnace as according to this construction the pipe can be given sufficiently great volume without there being any necessity for giving the smelting chamber so great dimensions that the loss of heat caused by radiation will be too great.

In case it is considered necessary the cupola 6 can easily be cooled by the gas which is taken out from the throat 7 being pressed in by means of a fan 8 or some other suitable device through twyers 9 into the free space or spaces between the cupola and the charge. This cooling is gained without any corresponding loss of heat, for the heat which the gases take up from the cupola and the charge is given back again to the charge higher up in the pipe.

Having thus described our invention, we declare that what we claim is:—

1. The combination in an electric furnace with the heating chamber and the stack communicating therewith, the chamber being organized to provide a free space between the charge and the top of the heating chamber when the charge is introduced into the chamber and into the lower portion of the stack, of electrodes entering through the wall of the chamber and extended to pass through the said free space with their end portions immersed in the charge, and means for drawing gas from the upper part of the furnace and passing such gas into said free space portion of the furnace.

2. The combination in an electric furnace with the heating chamber and the stack communicating therewith, the chamber being organized to provide a free space between the charge and the top of the heating chamber when the charge is introduced into the chamber and into the lower portion of the stack, the electrodes arranged to enter through the top wall of the heating chamber and extended down into the heating chamber to pass through the said free space with their lower ends immersed in the charge, and means for introducing gas into said free space portion of the furnace.

3. Electric blast furnace consisting of an electric smelting chamber provided with electrodes and a shaft arranged on the said chamber and communicating with the same, the shaft being formed to expand upward and the smelting chamber to expand downward from the part through which said chamber and the shaft communicate with each other, the interior of the smelting chamber being so formed, that one or several free spaces always exist between the walls of

said chamber and the charge and the electrodes being arranged in such a way that they enter into the charge at said free spaces, the furnace being also provided with means for introducing suitable gases into the said free spaces.

4. Electric blast furnace consisting of an electric smelting chamber, provided with electrodes and a shaft arranged on the said chamber and communicating with the same, the shaft being formed to expand upward and the smelting chamber to expand downward from the part through which said chamber and the shaft communicate with each other, the interior of the smelting chamber being so formed, that one or several free spaces always exist between the walls of said chamber and the charge and the electrodes being arranged in such a way that they enter into the charge at said free spaces, the furnace being also provided with means for introducing suitable gases into the said free spaces, the shaft being provided with means for leading off the gases and for reintroducing them into said free spaces.

In witness whereof we have hereunto set our hands in presence of witnesses.

EUGEN ASSAR ALEXIS GRÖNWALL.
AXEL RUDOLF LINDBLAD.
OTTO STÅLHANE.

Witnesses to the signatures of E. A. A. Grönwall and A. R. Lindblad:

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Witnesses to the signature of Otto Stål-
hane:

WILLIAM HANSSON,
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