P. SCHMIDT & A. DESGRAZ.

INGOT HEATING FURNACE.

APPLICATION FILED JULY 16, 1907.

903.511. Patented Nov. 10, 1908.

Fig.1

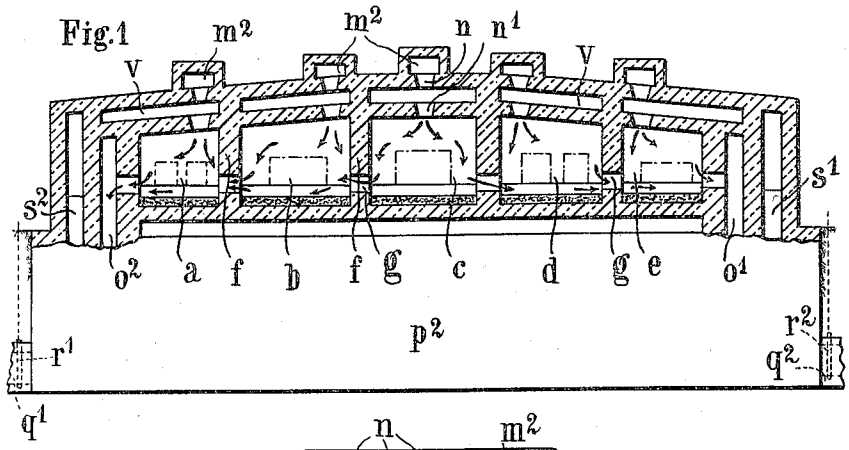


Fig.2

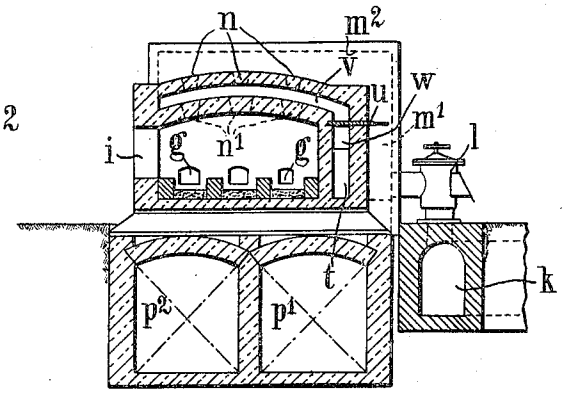
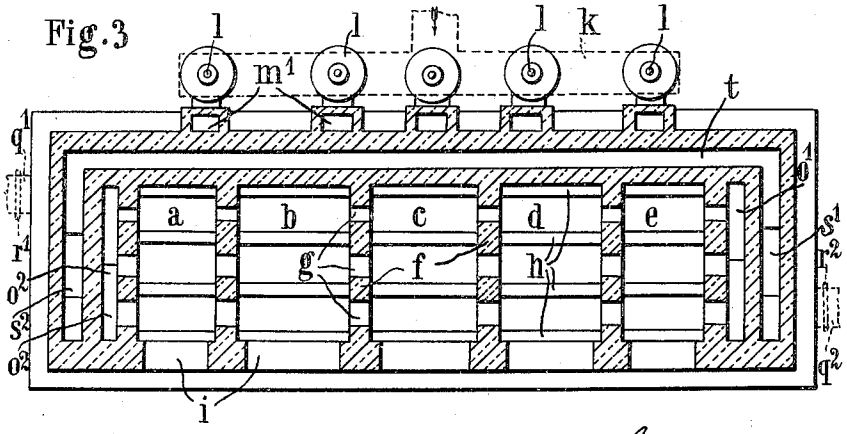


Fig.3



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UNITED STATES PATENT OFFICE.

PAUL SCHMIDT AND ADOLPHE DESGRAZ, OF HANOVER, GERMANY.

INGOT-HEATING FURNACE.

No. 903,511. Specification of Letters Patent. Patented Nov. 10, 1908.

Application filed July 16, 1907. Serial No. 384,127.

To all whom it may concern:

Be it known that we, PAUL SCHMIDT, a subject of the Emperor of Germany, and ADOLPHE DESGRAZ, a citizen of Switzerland, residing at Hanover, Germany, have invented certain new and useful Improvements in Ingot-Heating Furnaces, of which the following is a specification.

This invention relates to furnaces for heating large ingots or blocks of metal and its object is to produce a furnace in which a number of large ingots may be heated thoroughly and without injury in sufficient quantities to supply the demands of the rolling mill or other plant and in which cooling of the furnace and excessive consumption of fuel will be avoided.

The invention consists in certain novel features of the furnace illustrated in the accompanying drawings as will be hereinafter first fully described and then particularly pointed out in the claim.

In the drawings, Figure 1 is a longitudinal section, Fig. 2 a transverse section, and Fig. 3 a horizontal section of a furnace embodying our invention.

The hearth proper of the furnace is divided into any suitable number of chambers, *a*, *b*, *c*, *d*, *e*, the walls between which are provided close to the bottom and just above the hearth with apertures *g* through which the waste gases can pass from one chamber to another. In the bottom of the hearth there are arranged a number of stone ridges *h* which support the ingots and thus enable the waste gases to circulate beneath them. Instead of these ridges, several loose stones may be placed upon the hearth. The front of each chamber is provided with a door *i*, and each chamber is provided with a separate adjustable gas supply. The gas passes from the gas supply pipe *k* by any of the separate regulating valves *l*, the ascending passages m^1, the distributing channels m^2 which are arranged upon the furnace crown, and finally through the various inlet nozzles *n* in the arched crown of the furnace into the separate chambers. The waste gases escape at both sides of the furnace and pass through the flues o^1 and o^2 into the regenerators p^1 and p^2. The gases escaping on each side of the furnace are consequently provided with a separate regenerator having a separate outlet passage q^1 or q^2 furnished with a regulating valve r^1 or r^2. Each regenerator is also separately supplied with air which enters the passages s^1 and s^2 arranged at the two front ends of the furnace in a highly heated condition and passes thence into the collecting chamber *t* arranged on the rear wall, where it is still further heated. From this chamber the air is supplied separately and in adjustable quantities to the different chambers passing by means of the apertures *w*, which are provided for each chamber and which can be regulated by means of the slides *u*, into the intermediate spaces *v* between the double arches and from thence through larger mixing nozzles *n'*, which are arranged beneath the nozzles *n*, into the furnace, being meanwhile intimately mixed with the gas.

The method of operating the furnace is as follows: In the case in which the furnace has been just constructed or has been entirely out of work, some of the chambers, for instance, *a*, *b* and *c* are filled with ingots some hours before the beginning of the shift, the heaviest ingot being preferably put into the central chamber *c* and the lightest ingots into the outer chamber *a*. The slide r^2 is then opened to permit of the escape of the waste gases through the flue o^2, the slide r^1 meanwhile remaining closed. By means of the regulating device the supply of gas is so regulated that the maximum amount of gas and a corresponding amount of air passes into the central chamber *c*, while the chamber *b* is supplied with a correspondingly smaller amount of gas and the chamber *a* with no gas at all, provided the ingots placed therein are but small. As the waste gases of all the three chambers pass away in the first instance through o^2 they will be forced to pass through the apertures arranged in the partition walls *f* from chamber to chamber, passing thereby to a large extent beneath the ingots and giving up to them a large portion of their heat which hitherto has been lost. The supply of gas to the side chambers from above is consequently mainly intended to supply the heat still required for heating the blocks thoroughly. The heating process is so arranged that when the shift begins the chamber *a* has been fully heated and that when the chamber *a* has been emptied the chamber *b* will be fully heated. Before, however, the chamber *a* is completely emptied, the chambers *d* and *e* which have hitherto been empty, are charged with ingots and supplied with a suitable quantity of gas and air mixture, whereupon the slide r^1 is opened and r^2 almost entirely closed, with the result that the waste gases will now

pass almost entirely through o^1 a fact of very great importance, as the waste gases escaping from the chambers *b* and *c* are no longer able to give up much of their heat to the already hot blocks. When the ingots in chamber *a* have been all worked up, this chamber is at once again filled and more waste gas is caused to pass through o^2. The same process is repeated when all the blocks in chamber *b* have been used up and the chamber has again been filled with new ingots, the only difference being that now again there is supplied a suitable amount of air and gas mixture. By this time the ingot in chamber *c* will likewise be ready to be withdrawn. After this chamber has also again been charged, the waste gases thereof are first caused to escape through o^2, while the ingots in the chambers *d* and *e*, which in the meantime have become hot, are withdrawn. The furnace will now be in regular working order and is alternately emptied chamber by chamber from one side or the other and again charged. The newly inserted cold ingots cannot possibly affect the already heated ingots as the hot partition walls *f* act as insulators or buffers and at the same time, by means of the heat stored in them, assist in the heating of the ingots. By heating each chamber separately to a greater or less extent and by varying the direction of flow of the waste gases from chamber to chamber, the furnace may be operated in various different ways, for instance, only one, or two, or three chambers may be used, without consuming a relatively larger amount of coal. The furnace is moreover suitable for ingots of all sizes, from the largest down to the smallest.

The furnace satisfies therefore all the above-mentioned conditions in the most satisfactory manner. It permits of the gradual heating of the heavy ingots, it insures an absolutely uniform heating of the ingots throughout as the ingots are surrounded on all sides, above as well as beneath, by the heating gases, and finally it makes continuous working possible. The manner in which the furnace is operated, moreover, reduces the waste of iron to the smallest possible amount as the ingots are subjected to the greatest heat in the order in which they are withdrawn and are consequently not exposed to this heat longer than is absolutely necessary, a fact which explains without further remark the small coal consumption of the furnace.

Having now particularly described and ascertained the nature of our said invention and in what manner the same is to be performed, we declare that what we claim, is:

An ingot-heating furnace having a plurality of heating-chambers, means for supplying gas to the chambers, means for causing the gas to travel successively through the chambers, a regenerator, a passage leading from the end chamber to the regenerator, and an outlet from the regenerator common to all the chambers.

In testimony whereof we have hereunto set our hands in presence of two subscribing witnesses.

PAUL SCHMIDT.
ADOLPHE DESGRAZ.

Witnesses:
PAUL R. THOMPSON,
ROBERT V. BULON.