No. 682,009. Patented Sept. 3, 1901.

J. L. WELLS.

BLAST FURNACE.

(Application filed Feb. 16, 1901.)

(No Model.)

Fig. 2.

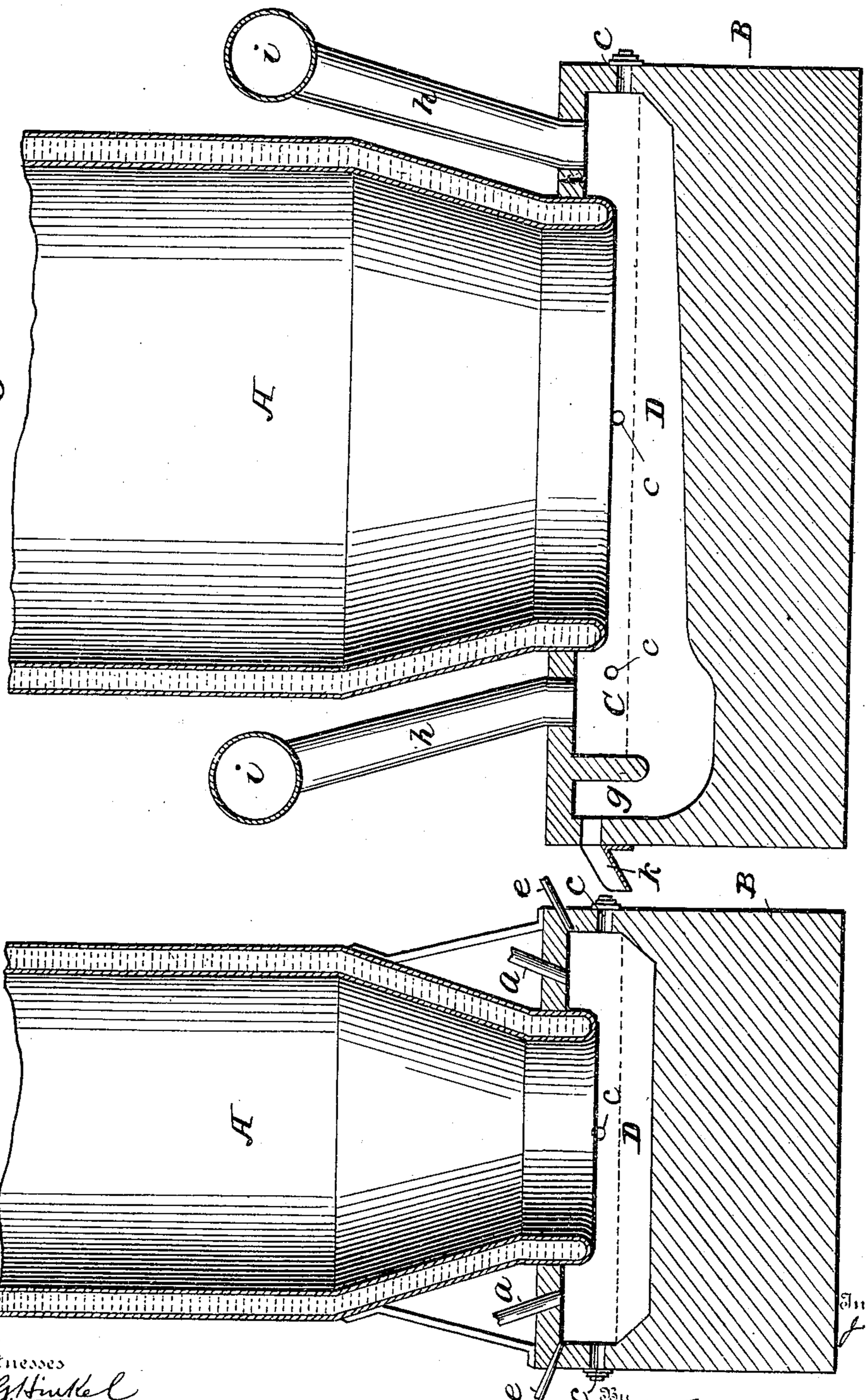

Fig. 1.

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UNITED STATES PATENT OFFICE.

JAMES L. WELLS, OF CERRILLOS, TERRITORY OF NEW MEXICO.

BLAST-FURNACE.

SPECIFICATION forming part of Letters Patent No. 682,009, dated September 3, 1901.

Application filed February 16, 1901. Serial No. 47,589. (No model.)

To all whom it may concern:

Be it known that I, JAMES L. WELLS, a citizen of the United States, residing at Cerrillos, in the county of Santa Fe, Territory of New Mexico, have invented certain new and useful Improvements in Blast-Furnaces, of which the following is a specification.

This invention relates to furnaces for reducing and smelting ores, the object being to improve the means for applying heat to ore contained in a blast-furnace and also to provide means for the introduction of fine ore into the combustion-chamber for reduction at the same time as the ore in the blast-furnace.

This invention will be fully described hereinafter, reference being had to the accompanying drawings, in which—

Figure 1 is a vertical transverse section of a furnace embodying my improvement, and Fig. 2 is a similar view taken at a right angle to Fig. 1.

A represents the shaft or stack of an ordinary blast-furnace, and B represents a forehearth-furnace, the top of which is cut away to admit the lower end of the stack A to project through it down into the forehearth-furnace in such manner that a combustion-chamber C is formed, which, as shown, surrounds the lower end of the shaft A. It is not essential that the combustion-chamber C entirely surround the lower end of the stack A, for the latter might be inserted through the top of the furnace B close to one side of the latter, in which case the combustion-chamber C would only partially surround the lower end of the stack A. The hearth of both furnaces is indicated by D.

It is designed to use gaseous, liquid, or some suitable finely-divided solid fuel in the combustion-chamber C, and any suitable means may be provided for the introduction of such fuel to the furnace. Thus a series of pipes *a a* may lead into the top of the combustion-chamber for the admission of gaseous or liquid fuel, and a series of nozzles *e e* or charging-orifices *c c* also be provided, through which finely-divided solid fuel may be injected in any suitable manner. It is also necessary to provide means for the admission of air under pressure to the combustion-chamber, and any suitable devices may be employed for this purpose—as, for instance, a series of twyers *h h*, which are connected to a supply-pipe *i*, which latter may extend partially or entirely around the furnace and will be connected to any suitable air-forcing device. (Not shown.)

As shown, the hearth inclines downwardly to one side of the furnace, and near this side a bridge *f* depends downwardly, and a chamber *g* is provided between this bridge and the side wall of the forehearth-furnace. A discharge-spout *k* leads from the upper end of the chamber *g*.

The furnace will operate as follows: Sufficient fuel is first placed upon the hearth to heat the hearth and combustion-chamber, after which the ore and coke or other solid fuel are charged into the stack A through the top in the usual manner until the stack is sufficiently filled. Air is then forced through the twyers *h h* into the combustion-chamber C, and preferably a heated blast will be employed. As the fuel which was first placed upon the hearth becomes consumed either liquid, gaseous, or solid fuel may be introduced into the combustion-chamber C, and the heat within the furnace may thus be increased to any desired degree. As the process proceeds the molten material descends onto the hearth D and gradually fills the same until it reaches the bridge *f*, which traps the blast from the chamber *g*, and the pressure of the blast upon the molten material will force the slag up into the chamber *g*, from whence it may be permitted to escape to the spout *k*. The matte and the bullion may be drawn off either continuously or intermittently in the usual manner.

By admitting fuel and a heated blast into the combustion-chamber C its action on the surface of the molten mass on the hearth of the furnace will be like that of the heated gases in a reverberatory furnace, except that the gases in the combustion-chamber C will be under the pressure of the blast, while the gases in a reverberatory furnace are under atmospheric pressure only. It is obvious the gases from the combustion-chamber will be forced with the blast into the lower end of the shaft A and up through the charge, thereby utilizing to the fullest extent the products of combustion from the chamber C. Fine ores—such as flue-dust, fine concentrates, &c.—may be introduced into the combustion-chamber

C through the nozzles *e* or orifices *c*, where they will mix with the molten mass from the blast-furnace and be reduced under the action of the products of combustion in the chamber C. The fuel, fine ore, &c., may be introduced at the side or top of the combustion-chamber.

Without limiting myself to the precise details of construction illustrated and described, I claim—

1. The combination with a forehearth-furnace having an opening in its top and a hearth inclining downwardly to one side thereof, a depending bridge adjacent to said side and forming with said side a chamber having communication with the hearth, and said chamber having a discharge-orifice at its upper end, a blast-furnace stack supported with its lower end projecting through the top opening down into the forehearth-furnace whereby a chamber is formed between the sides of the forehearth-furnace and the inwardly-projecting end of the stack to receive the molten material, and means for introducing air under pressure into said chamber, substantially as set forth.

2. The combination of a forehearth-furnace having an opening in its top and a hearth inclining downwardly to one side thereof, a depending bridge adjacent to said side and forming with said side a chamber having communication with the hearth, and said chamber having a discharge-orifice at its upper end, a blast-furnace stack supported with its lower end projecting through the top opening down into the forehearth-furnace whereby a combustion-chamber is formed between the sides of the forehearth-furnace and the inwardly-projecting end of the stack, means for introducing fuel into said combustion-chamber, and means for introducing air under pressure into said combustion-chamber, substantially as set forth.

3. The combination of a forehearth-furnace having an opening in its top and a hearth inclining downwardly to one side thereof, a depending bridge adjacent to said side and forming with said side a chamber having communication with the hearth, and said chamber having a discharge-orifice at its upper end, a blast-furnace stack supported with its lower end projecting through the top opening down into the forehearth-furnace whereby a combustion-chamber is formed between the sides of the forehearth-furnace and the inwardly-projecting end of the stack, means for introducing fuel into said combustion-chamber, means for introducing air under pressure into said combustion-chamber, and means for introducing fine ores into said combustion-chamber, substantially as set forth.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

JAMES L. WELLS.

Witnesses:
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A. C. CAMPBELL.