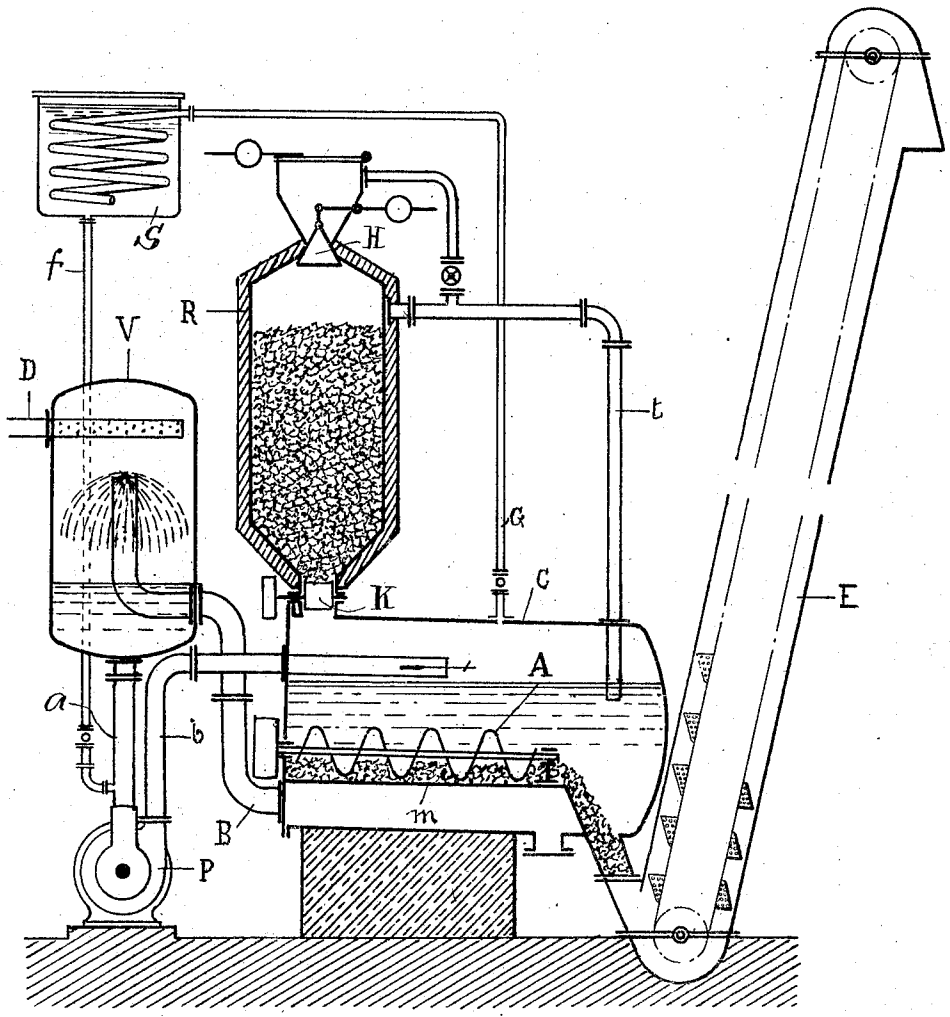
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P. BRINGHENTI

APPARATUS FOR RECOVERING HEAT FROM COKE, SLAGS, ASHES, AND OTHER SOLID SUBSTANCES

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Inventor:
P. Bringhenti
By Marks & Clerk
Attys.

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PLINIO BRINGHENTI, OF MILAN, ITALY.

APPARATUS FOR RECOVERING HEAT FROM COKE, SLAGS, ASHES, AND OTHER SOLID SUBSTANCES.

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The problem of the rational and, as much as possible complete utilization of fuels, has given rise to a fairly considerable number of patents relating to the recovery of heat, in all branches of the industry. Thus for example, heat is recovered by heating the combustion air of coal used for the heating of ordinary boilers, for the production of steam.

In all these cases there is always a considerable loss of heat because of the difficulty which the heat has to overcome, first of all in passing gases which contain it, to the metallic surfaces of receptacles which, very often, are covered with soot and incrustations, and moreover in passing from these surfaces to the water. Moreover sometimes one has to deal with gaseous mixtures which corrode the metal, or with solid products which cannot be treated by ordinary apparatus.

The recovery of heat becomes particularly difficult when it is a question of molten products, such as slags; however, the heat which could be recovered from a blast furnace producing 200 tons of iron by the Martin process per day would practically correspond to that from ten tons of coal burnt in an ordinary boiler.

The present invention has for its object an apparatus directly producing steam at a pressure of several atmospheres and this, by means of a process which, at the same time does not require great maintaining costs or labour for its operation, gives fairly pure steam with a minimum loss of heat.

The accompanying drawing—a single figure—illustrates in vertical section a diagram of one form of construction.

The coke and the incandescent slags are charged by a charging hopper (T) through a valve H into a receptacle (R) covered with an insulating material. From this receptacle they are then mechanically distributed through a valve (K) into a boiler (C) situated under the said receptacle, where they give up their heat to the water contained therein and from where an Archimedean screw (A) transports them to a bucket elevator (E). The bucket elevator is provided with a water tight sheet-iron casing, which has to resist the pressure of the steam which has just been produced and the height of water in a column will correspond to this same pressure. The buckets of the bucket elevator are perforated; consequently the water which they raise remains in the casing. At the same time the water in the boiler is heated and the pressure of the gases and of the steam which has developed drives back the part of the water which is under the plate (*m*) by the tube (B) into the vaporization chamber (V) where it is partially vaporized. The vapour produced passes out above by the perforated tube (D) whilst the residual water is driven back into the boiler by the centrifugal pump (P) and by the tubes (*a*) and (*b*). By this means steam is obtained which is free from the incondensable gases given off by the slag. If, however, the steam to be utilized were drawn off direct from the pipe G, such steam would contain the above-mentioned incondensable gases.

The little steam which it is necessary to allow to escape through the tube (G) in order to expel the gas which little by little accumulates in the boiler, is made to condense in the feed water reservoir (*s*) of the boiler, the feed water being introduced into the boiler by means of a tube (*f*) coupled to the suction tube (*a*) of the pump.

The solid products, raised by the bucket elevator can be discharged at a desired place, by means of a continuous transporter.

The gases and vapours which subsequently develop in the reservoir (R) are introduced into the boiler by means of the tube (*t*).

By such a process the solid products give up their heat to the water in the most direct and simplest manner, at the same time giving a very high output.

One can also, at the same time recover the salts which may be present in the slag and in the ashes; they are recovered in the form of solution in the water of the boiler.

The vapour produced in (V) contains but a minimum quantity of gas: it can be used in the heating or for power purposes.

The apparatus employed are very simple and can be constructed of any kind of metallic material. The power necessary for the operation is only several hundredths of that produced.

What I claim is:—

1. An apparatus for the direct production of high pressure steam, free from gas, by means of the heat contained in hot products such as coke, slags and blast-furnace ashes,

comprising a receiver for said products, a boiler beneath said receiver, valves controlling the communication of the receiver to the outside atmosphere and to the boiler respectively in order to permit the introduction of said products into water and high pressure steam contained in the boiler, a gas vent to said boiler, means within said boiler for removing the solid products therefrom, a vaporization chamber, a water circulation system insulated from the atmosphere, whereby water is taken from the lower part of the boiler and delivered to the vaporization chamber, and whereby water from the vaporization chamber is delivered back into the boiler, and an outlet pipe from the vaporization chamber through which pure high pressure steam is removed for use.

2. An apparatus for the direct production of high pressure steam free from gas as claimed in claim 1, comprising a conduit between the upper part of said receiver and the boiler, whereby the hot gases evolved in the receiver are introduced below the level of the water contained in the boiler.

In testimony whereof I have signed my name to this specification.

PLINIO BRINGHENTI.