

(No Model.)

2 Sheets—Sheet 1.

A. SCHMITZ & E. EHRENSBERGER.
PROCESS OF MANUFACTURING ARMOR PLATES.

No. 534,178.

Patented Feb. 12, 1895.

Fig. 1.

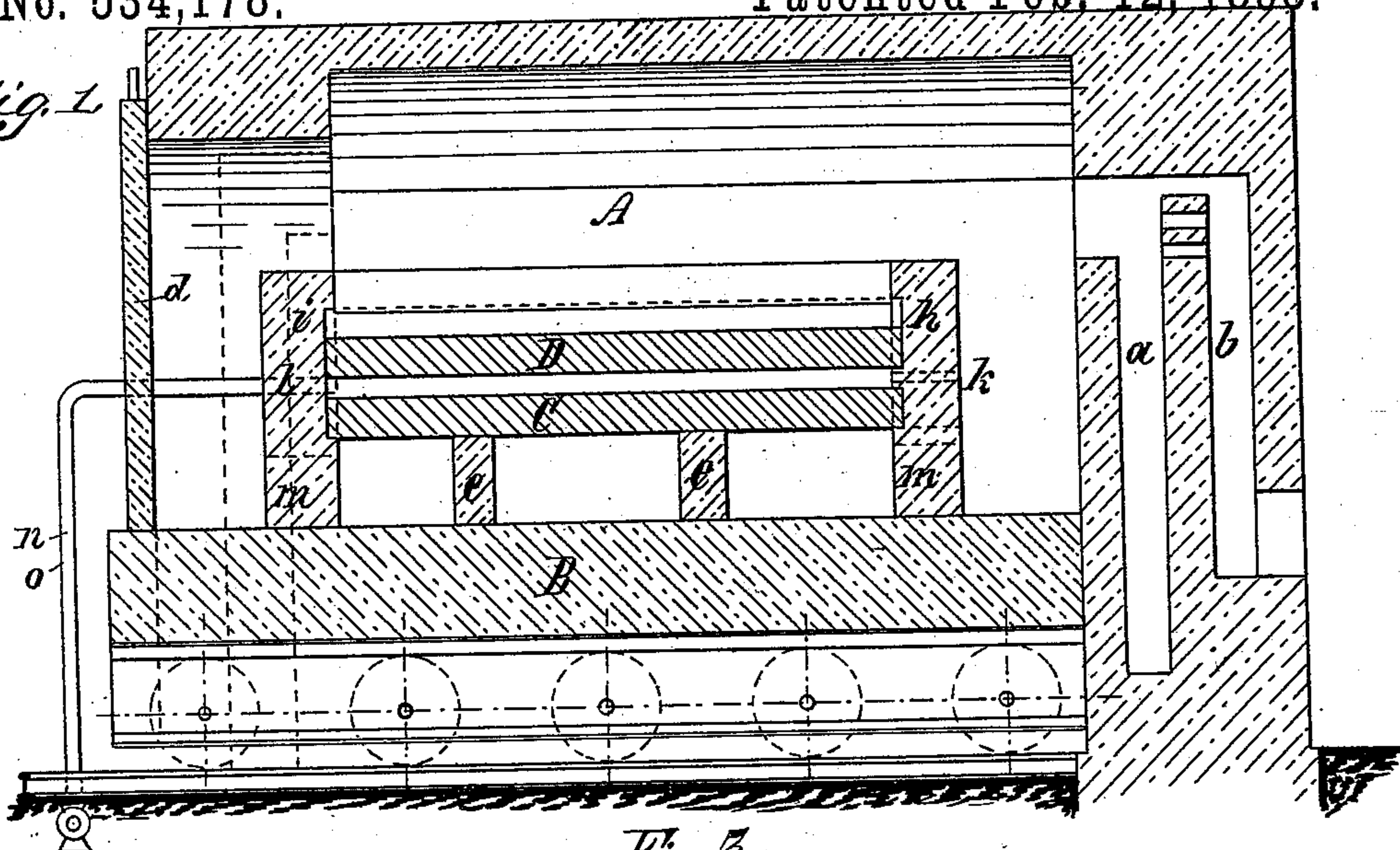
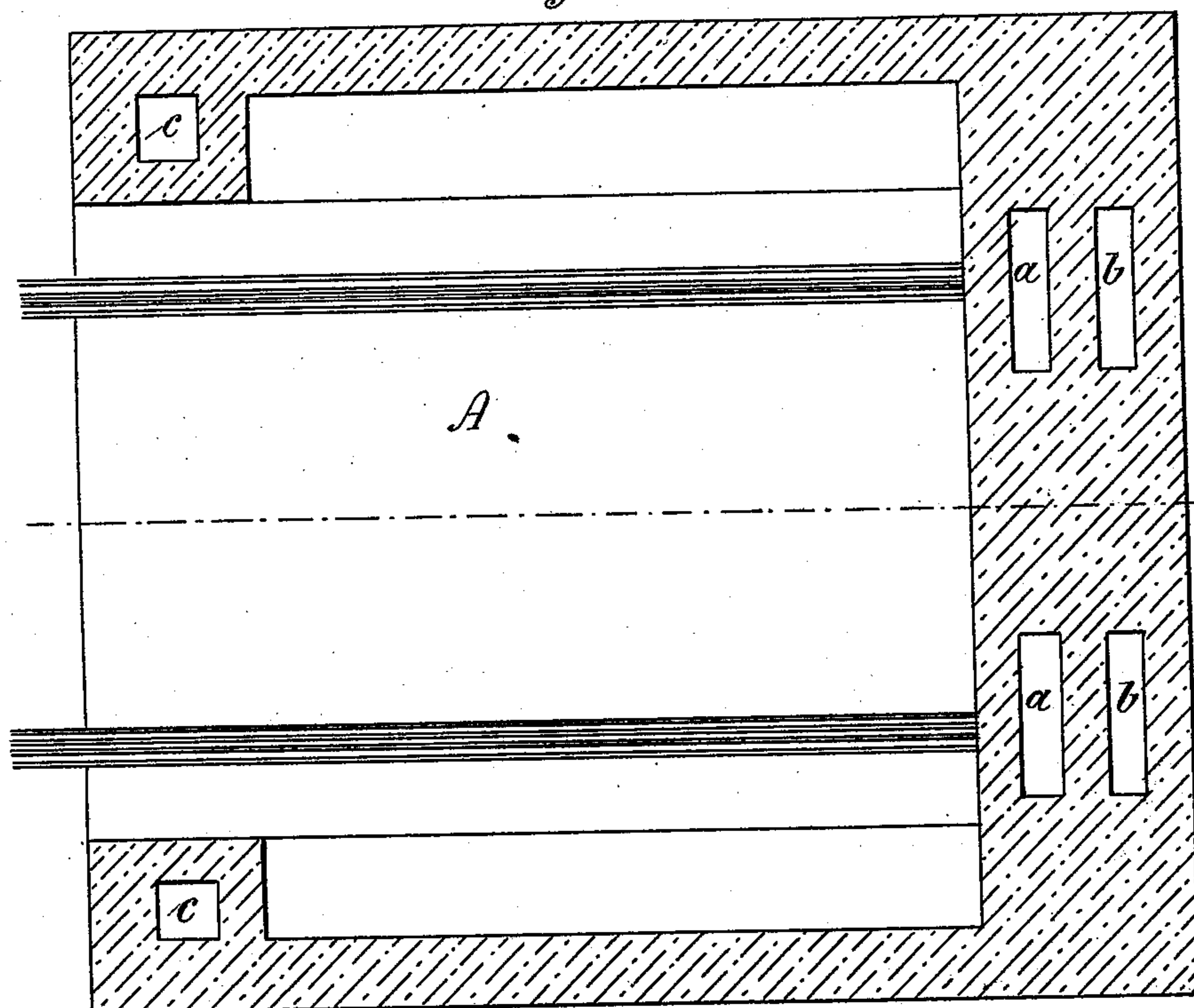


Fig. 3.



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Inventors:

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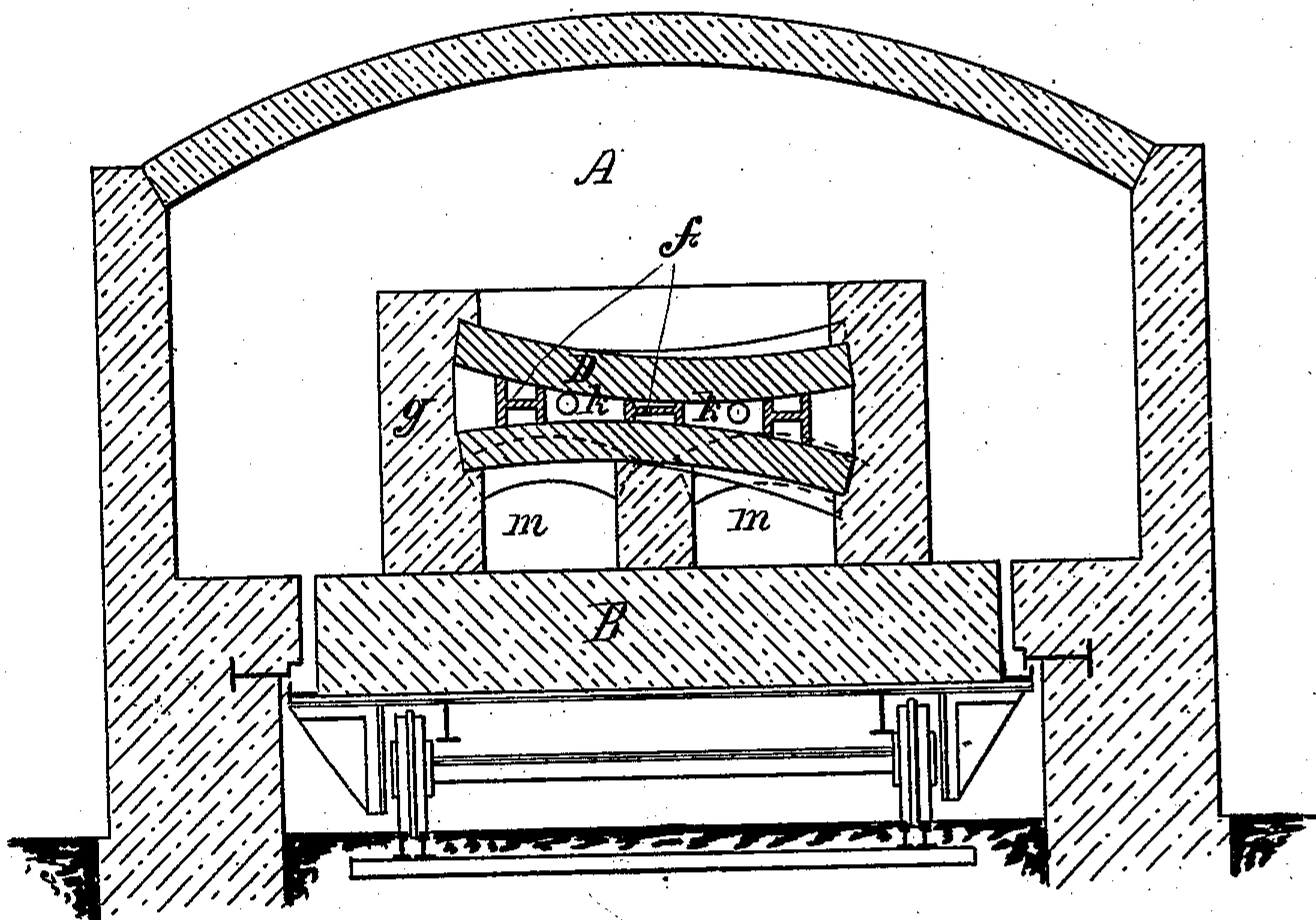
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Fig. 2.



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UNITED STATES PATENT OFFICE.

ALBERT SCHMITZ AND EMIL EHRENSBERGER, OF ESSEN, GERMANY, AS-
SIGNORS TO THE FIRM OF FRIED. KRUPP, OF SAME PLACE.

PROCESS OF MANUFACTURING ARMOR-PLATES.

SPECIFICATION forming part of Letters Patent No. 534,178, dated February 12, 1895.

Application filed January 24, 1893. Serial No. 459,563. (No specimens.) Patented in Germany November 16, 1892, Nos. 72,547 and 74,242; in France December 9, 1892, No. 226,286; in Belgium December 10, 1892, No. 102,523; in England December 16, 1892, No. 23,228; in Italy December 31, 1892, XXVII, 33,126, LXV,104, and in Spain February 9, 1893, No. 14,054.

To all whom it may concern:

Be it known that we, ALBERT SCHMITZ and EMIL EHRENSBERGER, subjects of the King of Prussia, residing at Essen, in the Kingdom of Prussia, German Empire, have invented new and useful Improvements in Processes of and Apparatus for or Relating to the Manufacture of Armor-Plates, (for which we have obtained Letters Patent in Germany, Nos. 72,547 and 74,242, dated November 16, 1892; in France, No. 226,286, dated December 9, 1892; in Belgium, No. 102,523, dated December 10, 1892; in Great Britain, No. 23,228, dated December 16, 1892; in Spain, No. 14,054, dated February 9, 1893, and in Italy, Reg. Gen., Vol. XXVII, No. 33,126, Reg. Att., Vol. LXV, No. 104, dated December 31, 1892,) of which the following is a specification.

It is known that iron deficient in carbon can be very quickly carburated by passing hydrocarbon gases over the same, and according to our invention we utilize this knowledge as hereinafter described for the purpose of giving a hard surface to one face of otherwise soft armor plates of all kinds.

Our invention will be readily understood from the following description having reference to the accompanying drawings, in which--

Figure 1 is a vertical, longitudinal section of a furnace adapted for carrying out our process. Fig. 2 is a transverse section and Fig. 3 is a horizontal section of the same furnace.

Similar letters of reference designate corresponding parts.

The furnace A is heated by gas which enters through the passage *a*, while the air is supplied through the passage *b*. The products of combustion escape through two passages *c* that are situated on either side of the door *d*. The hearth B of the furnace is capable of being drawn out from the latter, say on rails as shown. The first plate C to be carburated is laid with the face to be carburated uppermost, upon supports or pillars *e* on the hearth of the furnace, the said hearth having been drawn out of the said furnace, while a second plate D is laid with the face to be car-

bonized, toward the first plate and is held at a small distance from the latter by means of intermediate pieces of iron *f*, stone or other suitable material. When so placed both plates have walls *g g h i* built round them, so that the space between the two armor plates is completely closed with the exception of two holes *k* in the wall *h* and two larger holes *l* in the wall *i*, while the furnace gases can pass freely above and below the exterior surfaces of the respective plates, the gases passing under the plate C through openings *m* formed in the walls *h* and *i*. After the two plates have been built up in this manner on the hearth, the latter is pushed into the furnace and the latter is heated, until the plates are at about the melting temperature of copper. whereupon pipes *n* and *o*, the positions of which are indicated at Fig. 1, are passed through two openings in the furnace door into the holes *l* in the wall *i*, and hydrocarbons, illuminating gas, paraffine-vapor, petroleum-gases, or the like, are passed through said pipes in between the plates. The surfaces of the plates become carburated by the action of these gases in a comparatively short time, while the used gases deprived of a large proportion of their carbon, pass through the openings *k* into the wall *h* in the furnace and burn there. As soon as the carburization of the plates has reached the desired degree, the hearth is run out and the plates are hardened by dipping into or by spraying the parts to be hardened, with water or oil.

The same arrangement as employed, according to our invention, for carburating with hydrocarbon, may be also employed for carburating with solid carbon or the like, by merely fitting with the same the space between the two armor plates into which the gas would otherwise enter. The holes *k* and *l*, and the supports between the plates, are dispensed with in this case. This method of hardening two plates together with solid carbon is an important improvement on the heretofore usual method of carburating one plate only at a time.

The faces of the plates, exposed to the frame are in both methods preferably pro-

tected by a light suitable covering of fire clay or the like.

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—

1. The described process of cementation of plates or articles to be carbonized on one side only, said process consisting in forming in a furnace a gas-tight chamber or inclosure having the surface of the plate to be cemented for a portion of the wall thereof, heating the plate and admitting to said chamber gaseous cementing agents, substantially as set forth.

2. The herein described process for the manufacture of armor plates, &c., hardened on one side only, consisting in building the same into a furnace with the faces to be hardened opposite to each other and with an intermediate space, heating said plates, then admitting a gaseous hydro-carbon into the inclosed space and discharging the used gases deprived of a large proportion of their carbon.

3. The herein described process for the manufacture of armor plates, &c. hardened on one side only, consisting in building the same into a furnace with the faces to be hardened opposite to each other and with an intermediate space, heating said plates, then passing a gaseous hydrocarbon into the in-

closed space, and finally hardening, substantially as described.

4. The herein described process for the manufacture of armor plates, &c. hardened on one side only, consisting in building the same into a furnace with the faces to be hardened opposite to each other and with an inclosed intermediate space; heating said plates, then introducing a gaseous hydrocarbon at one side of the intermediate space and discharging it at the other, and finally hardening the carbureted side, substantially as described.

5. The herein described process for the manufacture of armor plates hardened on one side only, consisting in building said plates into a furnace with the faces to be hardened opposite to each other and an intermediate space; heating said plates while in contact with carbonaceous matter filling said intermediate space and then removing the plates from the furnace and hardening.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

ALBERT SCHMITZ.

EMIL EHRENSBERGER.

Witnesses:

ALBERT KLINGHAMMER,

CHRISTIAN SORMENREHEIN.