

(No Model.)

J. E. BOTT & H. CRAMP.

T. B. PHILLIPS, Executor of H. CRAMP, Deceased.

PROCESS OF TREATING STEEL OR OTHER METALS.

No. 534,253.

Patented Feb. 19, 1895.

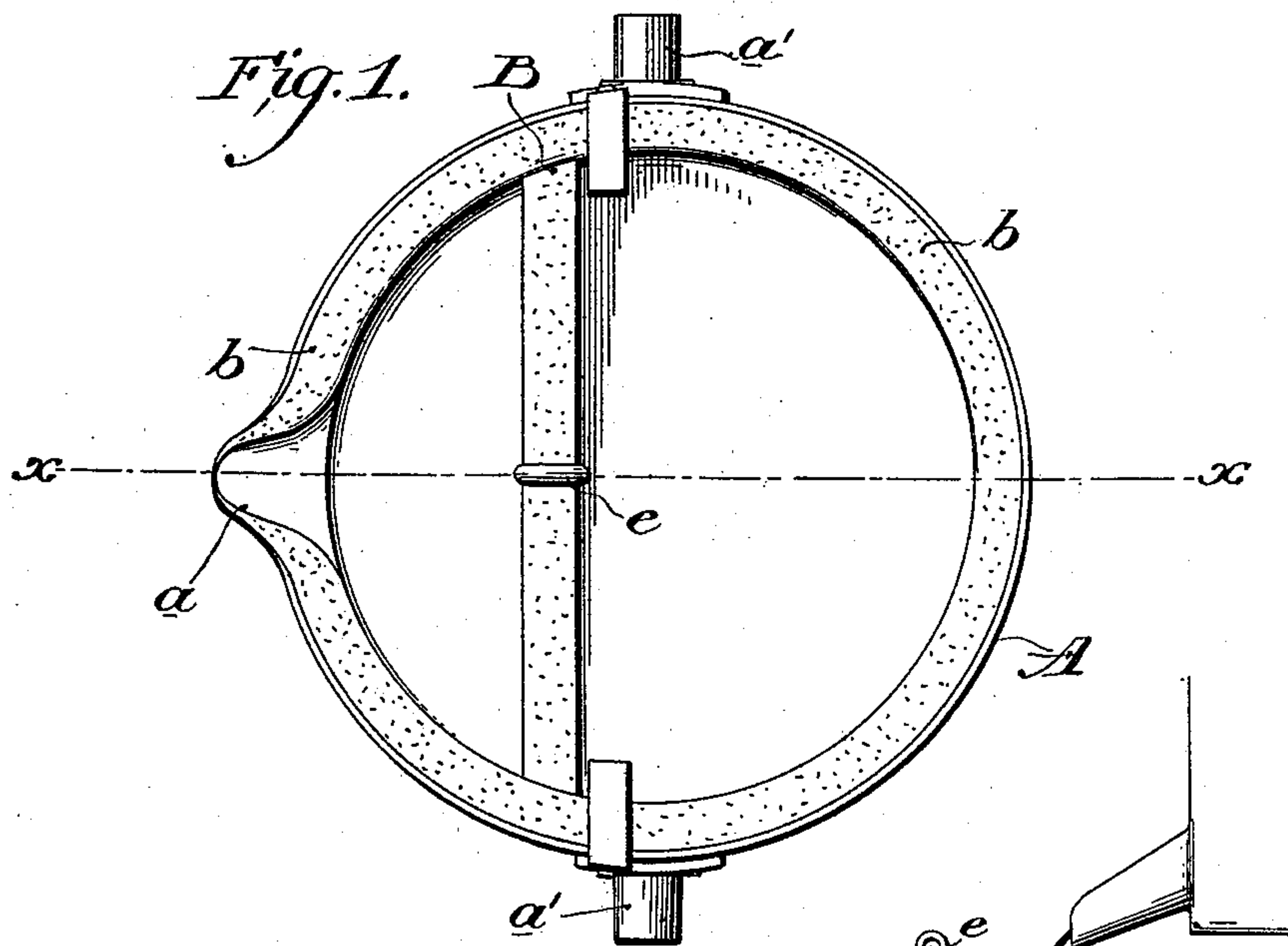


Fig. 2.

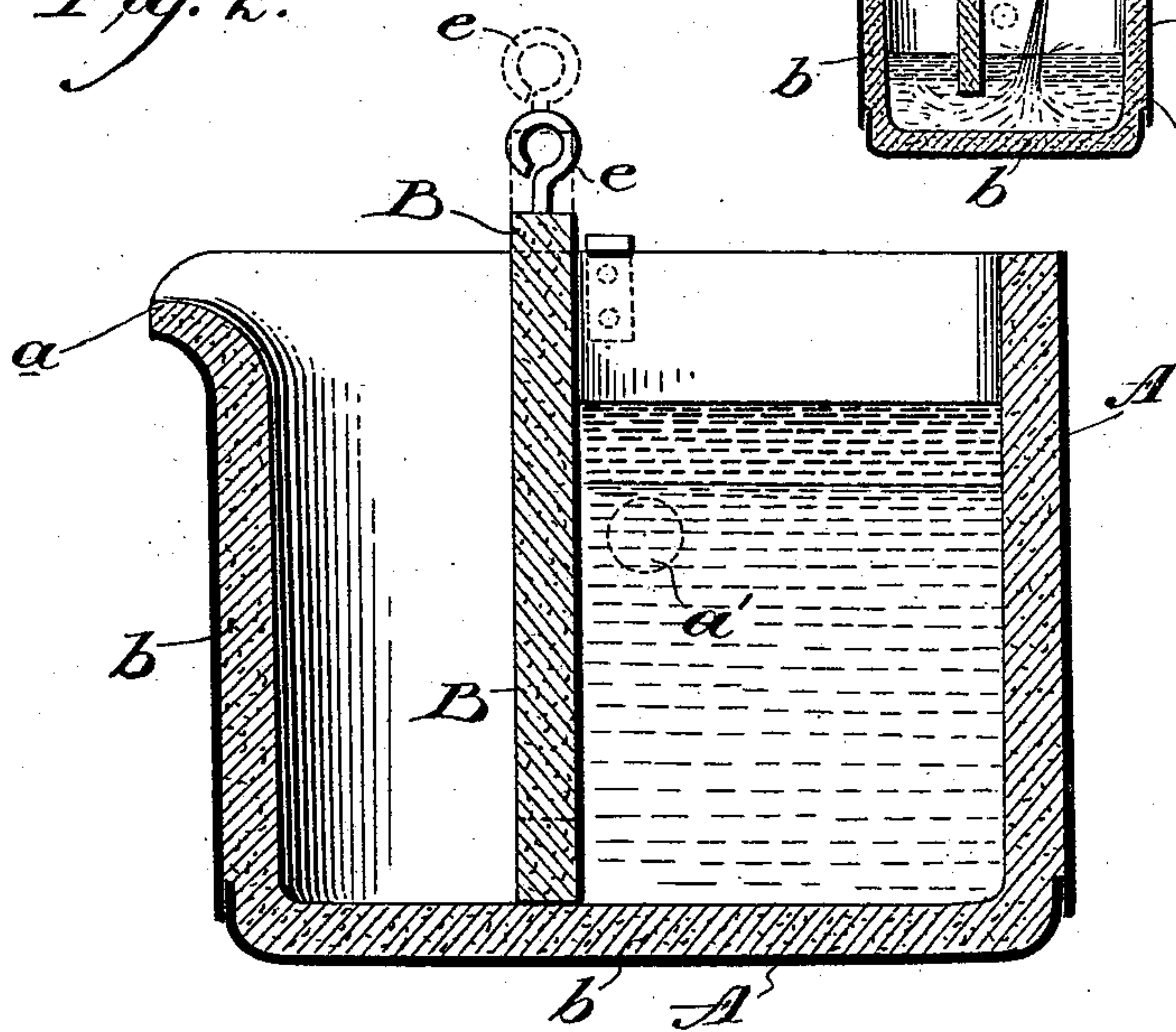
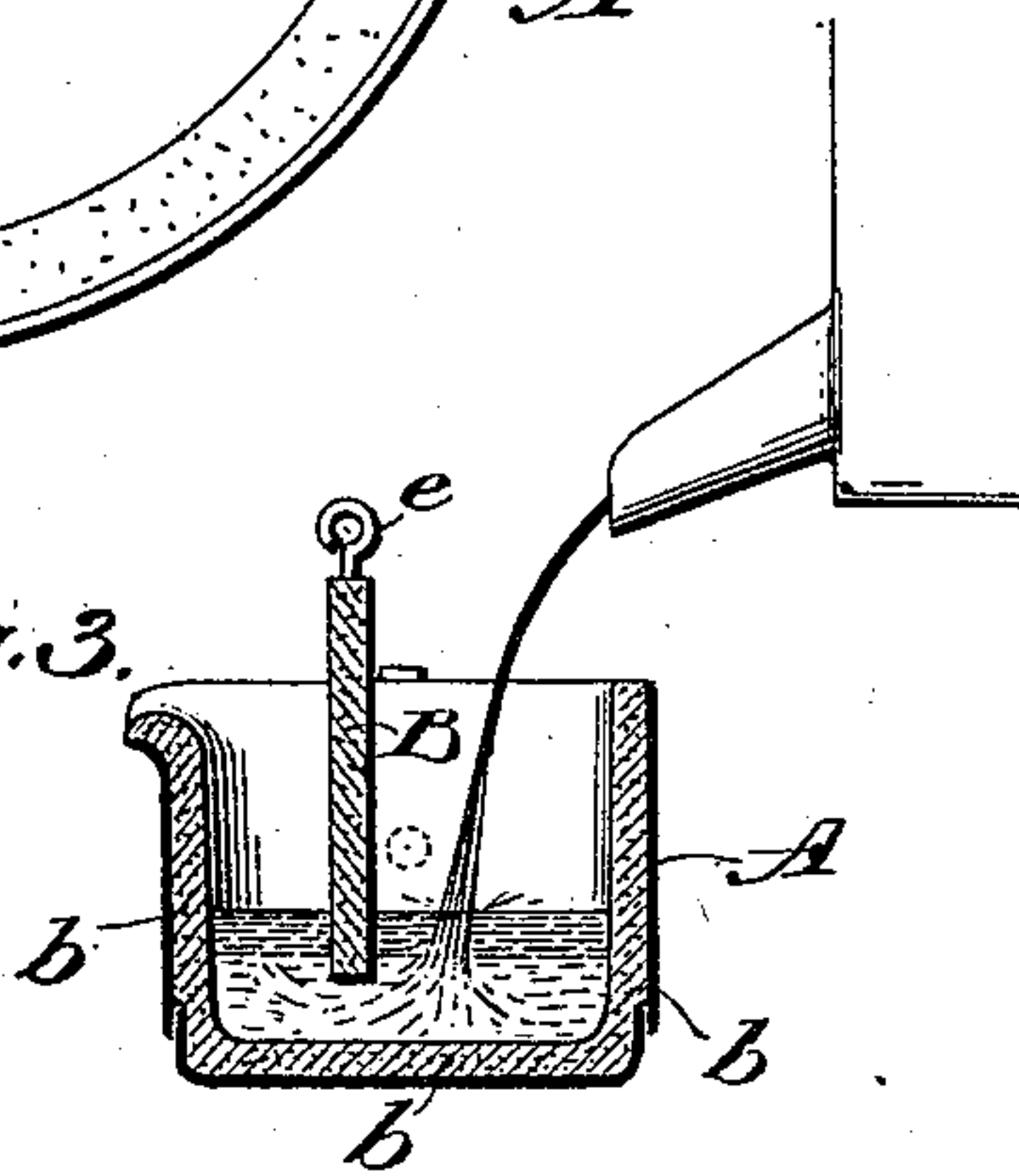


Fig. 3.



WITNESSES:
David Williams,
J. Henderson.

INVENTORS:
Joseph Elton Bott,
Howard Cramp,
By their Attorney,
Harvey Pettit.

UNITED STATES PATENT OFFICE.

JOSEPH ELTON BOTT, OF STOCKPORT, ENGLAND, AND HOWARD CRAMP,
OF PHILADELPHIA, PENNSYLVANIA; T. BENNETT PHILLIPS EXECUTOR
OF SAID CRAMP, DECEASED.

PROCESS OF TREATING STEEL OR OTHER METALS.

SPECIFICATION forming part of Letters Patent No. 534,253, dated February 19, 1895.

Application filed July 15, 1892. Renewed July 21, 1894. Serial No. 618,282. (No specimens.)

To all whom it may concern:

Be it known that we, JOSEPH ELTON BOTT, of Stockport, England, and HOWARD CRAMP, of the city of Philadelphia and State of Pennsylvania, have invented a certain new and useful Improvement in Processes of Treating Steel, Iron, or other Metals; and we do hereby declare the following to be a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming part of the specification.

Our invention has relation to the treatment of steel, iron and other metals, and consists in the process of passing the metal to be treated while in the molten state through a purifying, deoxidizing, carburizing or augmenting alloy as hereinafter particularly described.

The object of our invention is to provide a process whereby the molten metal to be treated will become thoroughly subjected to the action of the purifying, deoxidizing, carburizing or augmenting agent employed. In the processes heretofore invented and employed the material for purifying, &c., used in the manufacture of steel and other metals does not become thoroughly diffused either chemically or mechanically with the metal to be treated, and consequently all the particles are not acted upon alike. Therefore the quality of the product is not strictly speaking homogeneous. This defect is a serious one, especially where the metal produced is employed for fine work such as tools, fine castings, &c. In order to produce the desired result as nearly as possible, the whole of the molten metal to be treated must come into contact with the purifying, &c., agent so as to insure even and thorough distribution or diffusion through the entire mass of molten metal undergoing treatment. We are aware that many methods have heretofore been invented and employed to accomplish this end, but without the desired results.

By the term "augmenting," herein employed, is meant an increasing or added agent or metal to the metals previously introduced. For instance as a matter of illustration, if to a given quality of molten steel having a given content of carbon and manganese, we add say

five hundred pounds of ferro-manganese having a carbon content of 0.5 per cent. and manganese content of eighty per cent. the total weight of the treated metal becomes increased or "augmented" by nearly five hundred pounds and at the same time the carbon and manganese content of the original given quantity of molten steel is "augmented."

We will now describe our invention so that others skilled in the art to which it appertains may make and use the same, reference being had, as a matter of illustration, to the accompanying drawings, forming part of this specification.

Figure 1 is a plan view of the preferable form of ladle or vessel employed in our improved process, though other constructions may be employed. Fig. 2 is a sectional view through the line $x-x$ of Fig. 1, of the ladle or vessel. Fig. 3 is a sectional view as in Fig. 2 representing a permanent adjustment of the dividing partition as when tungsten and other heavy alloys are employed.

In carrying out our process we preferably employ the construction of ladle or vessel, A, such as illustrated in the drawings, though as before stated numerous other partitioned constructions may be used. The ladle, A, has provided within it a vertically adjustable partition, B, preferably placed to one side of the center of the ladle. The partition, B, is provided with any suitable means for elevating the said partition as for instance with the eye, e , as shown in the drawings. The ladle, A, is provided with spout, a , and lined with any desired noncombustible lining, b . Where corrosive oxides are contained in any of the metals to be treated the ladle, A, is preferably provided with a carbon lining.

At the bottom of the ladle, A, a quantity of the purifying, deoxidizing, carburizing or augmenting metal or alloy is introduced such as is desired to be used in the treatment of steel, iron or other metal, for instance spiegel, ferro-manganese, &c., in either the molten or cold state. The molten steel, iron or other metal is then poured from the furnace on to the purifying, &c., agent causing a thorough admixture to take place with the purifying, &c., agent, the agitation being continued owing to the ve-

locity and weight of the molten metal flowing from the furnace whereby every particle of the iron, steel or other metal under treatment is thoroughly subjected to and brought into intimate contact with the purifying, &c., agent.

The construction of ladle, A, illustrated in the drawings is preferably employed so that the vertical partition may be raised after a sufficient quantity of the molten metal has been combined with the purifying, &c., agent. As the metal is introduced the partition, B, is gradually elevated so as to allow the molten metal which has been treated by passing through the purifying, &c., agent, to enter the portion of the ladle previously cut off by said partition, B, the lower end of the said partition, however, preferably being retained at or below the line of the lower level of the purifying agent. It will thus be seen that as the ladle, A, is filled and turned on its pivotal bearings, *a'*, the metal treated will be allowed to flow out of the spout, *a*, while the purifying, &c., agent will be retained and prevented from flowing out by the proper adjustment of the partition, B. It is also clear from the description of our invention that other forms of ladles or receiving vessels having the adjustable vertical partition can be employed in the operation of our process.

As is well known the specific gravity of some purifying, &c., agents which may be employed in the manufacture of steel, iron and other metal, such as tungsten and other heavy metals, is greater than the specific gravity of the molten metal to be treated. In such cases the adjustment of the partition, B, of the ladle, A, is as shown in Fig. 3, in which it will be seen that the partition is permanently partially raised, so the tungsten or other kindred metal occupies the whole of the bottom of the ladle with the partition, B, partially protruding into the same. As the molten metal is poured into the first chamber upon the tungsten, &c., notwithstanding the tungsten is heavier the metal to be treated will pass into and through the tungsten underneath the partition, B, into the second chamber taking up as it passes its combining proportions of tungsten or kindred metal. The static weight of molten metal as it flows from the furnace causes it to pass into and through the tungsten under the partition, B, and into the second chamber by the common laws of gravity.

The treated metal may be run from the ladle into ingots, bars, castings, &c., or manipulated in any desired manner.

We do not limit ourselves to the use of any specific purifying, deoxidizing, carburizing or augmenting metal or alloy as various well known agents such as ferro-silicon, manganese, tungsten, &c., may be employed in carrying out our process.

Having thus described our invention, what we claim, and desire to secure by Letters Patent, is—

1. The hereinbefore described process of treating molten metal consisting in providing purifying, deoxidizing, carburizing or augmenting metal or alloy in the bottom of a ladle, of pouring the molten metal to be treated upon said purifying, deoxidizing, carburizing or augmenting metal or alloy and causing said molten metal being treated to pass into and through said purifying, deoxidizing, carburizing or augmenting metal or alloy and thoroughly subjecting the said metal being treated to said purifying, &c., metal or alloy, of flowing the treated metal into a separate chamber of the ladle under or through an upright partition and discharging the treated metal from the ladle, substantially as described.

2. The process hereinbefore described of providing purifying, deoxydizing, carburizing or augmenting metal or alloy in the bottom of a partitioned ladle, of pouring the molten metal to be treated upon said purifying, deoxidizing, carburizing or augmenting metal or alloy so that the molten metal to be treated in passing through said metal or alloy is thoroughly subjected to the action of said metal or alloy, of flowing the treated metal into a separate chamber of the ladle by an adjustment of the partition and discharging the treated metal from the ladle while retaining the said purifying, deoxidizing, carburizing or augmenting metal or alloy within the ladle, substantially as described.

3. The process hereinbefore described of treating molten metal in a vertically partitioned ladle or vessel with an opening between the bottom of the ladle and the lower end of the partition, of pouring from a height the metal to be treated into one of the chambers upon a purifying, deoxidizing, carburizing or augmenting metal or alloy of greater specific gravity than the metal to be treated occupying the entire bottom of the ladle or vessel and extending above the lower end of the vertical partition, of passing the molten metal to be treated into and through the purifying, deoxidizing, carburizing or augmenting metal or alloy under the vertical partition and into the adjoining chamber and from thence from the ladle or vessel, substantially as described.

In witness whereof we have hereunto set our hands this 14th day of July, A. D. 1892.

JOSEPH ELTON BOTT.
HOWARD CRAMP.

Witnesses:

H. GORDON MCCOUCH,
HORACE PETTIT.