(No Model.)

3 Sheets—Sheet 1.

J. E. CHASTER.

ORE AMALGAMATOR.

No. 492,711. Patented Feb. 28, 1893.

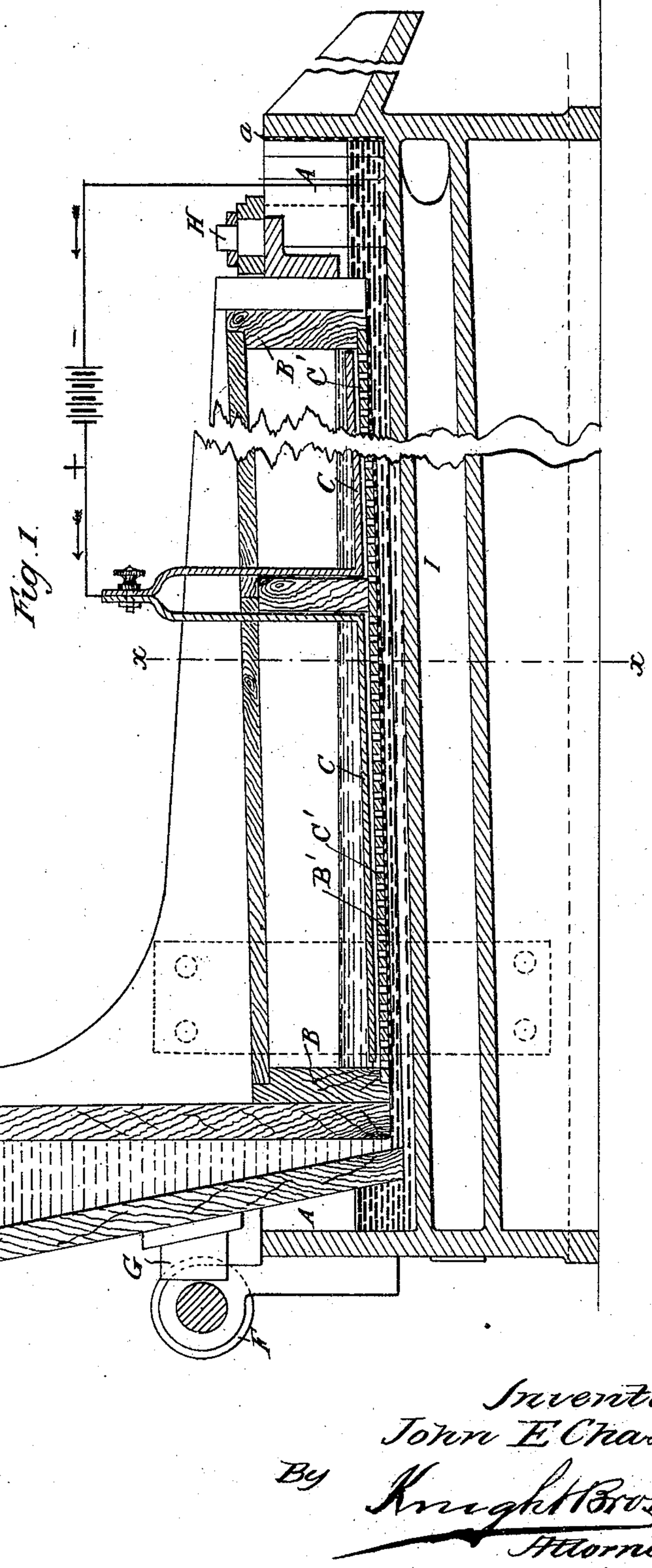

Fig. 1.

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(No Model.) 3 Sheets—Sheet 2.

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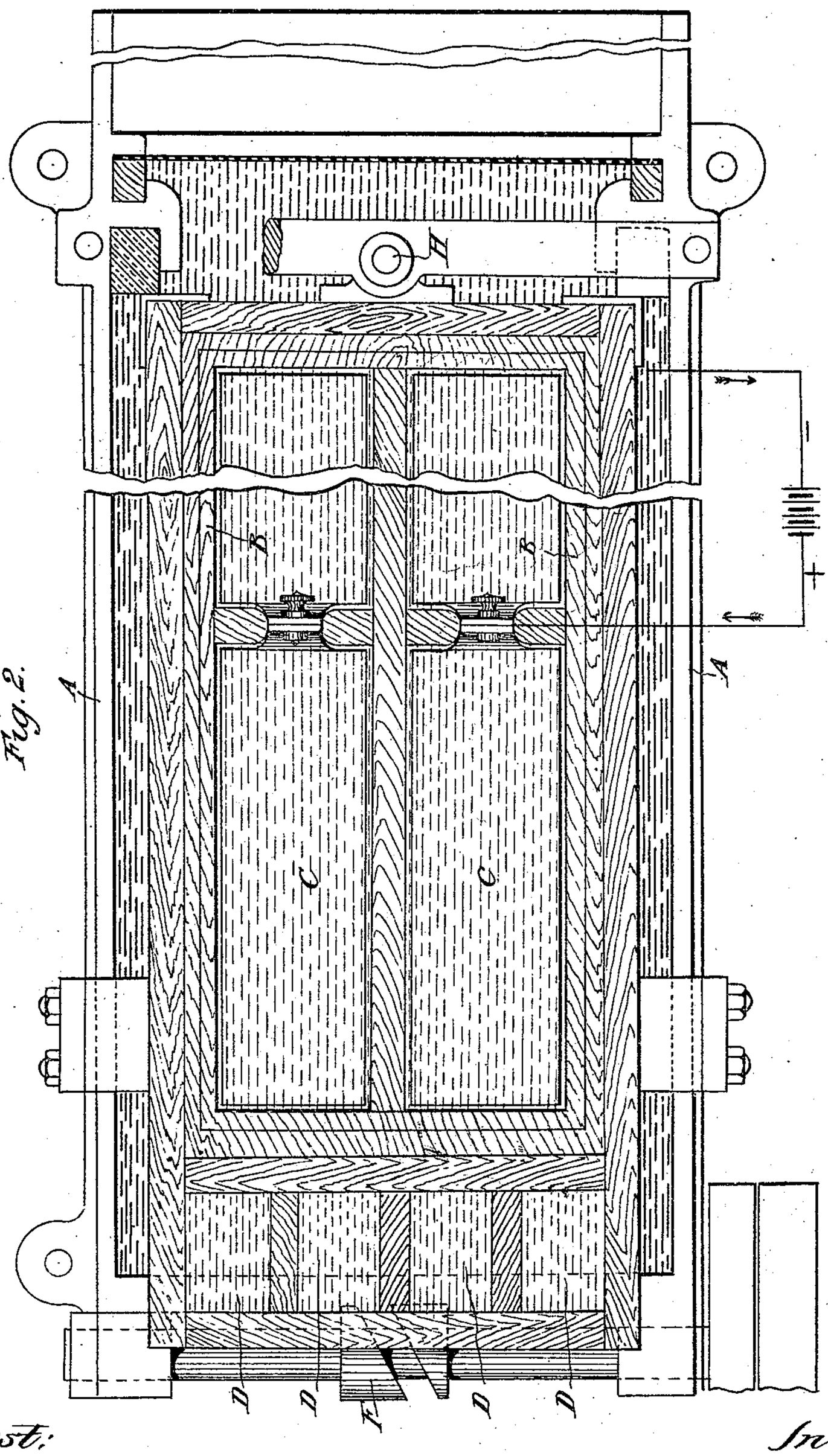

Fig. 2.

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(No Model.) 3 Sheets—Sheet 3.

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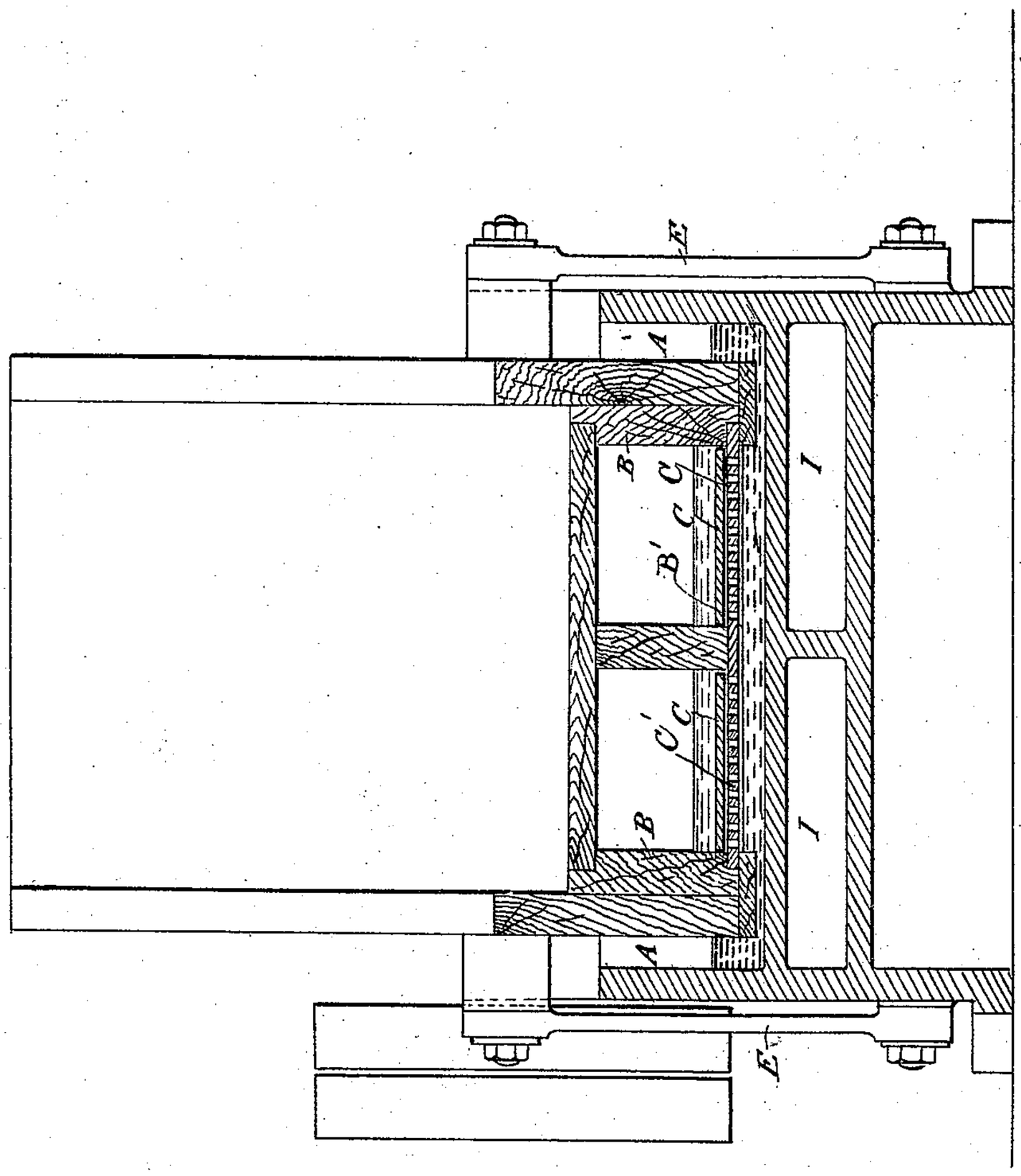
Fig 3



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UNITED STATES PATENT OFFICE.

JOHN EDLINGTON CHASTER, OF SHAWLANDS, ASSIGNOR TO THE REGENT GOLD EXTRACTING COMPANY, LIMITED, OF GLASGOW, SCOTLAND.

ORE-AMALGAMATOR.

SPECIFICATION forming part of Letters Patent No. 492,711, dated February 28, 1893.

Application filed January 16, 1892. Serial No. 418,332. (No model.) Patented in England January 8, 1890, No. 316; in Victoria December 30, 1890, No. 8,388; in New South Wales January 2, 1891, No. 2,714; in Queensland January 2, 1891, No. 1,225; in Cape Colony January 22, 1891, No. 165; in South Australia February 14, 1891, No. 1,855; in New Zealand March 4, 1891, No. 4,879, and in Transvaal April 9, 1891, No. 237.

To all whom it may concern:

Be it known that I, JOHN EDLINGTON CHASTER, electrical engineer, of 7 Regent Place, Shawlands, in the county of Renfrew, Scotland, have invented Improvements in Ore-Amalgamators, (for which I have received Letters Patent in Great Britain, No. 316, dated January 8, 1890; in Victoria, No. 8,388, dated December 30, 1890; in New South Wales, No. 2,714, dated January 2, 1891; in Queensland, No. 1,225, dated January 2, 1891; in Cape Colony, No. 165, dated January 22, 1891; in South Australia, No. 1,855, dated February 14, 1891; in New Zealand, No. 4,879, dated March 4, 1891, and in Transvaal, No. 237, dated April 9, 1891,) of which the following is a specification.

This invention relates to a process for the extraction of metals from ore in the manner hereinafter indicated. It is more particularly applicable to the extraction of gold from its ore, but may also with advantage be applied to other metals which amalgamate with mercury. The extraction is accomplished by amalgamation with mercury, and the mercury is kept active by means of a current of electricity.

The apparatus by which the extraction of gold or other metals from the ore is accomplished consists of a trough containing mercury. In this trough there is a framework carrying an anode, between which and the mercury a current of electricity passes (the mercury thus forming a cathode) while the ore in a finely divided state is floated along the surface of the mercury. Between the anode and the mercury there is a porous diaphragm which may be made of cloth or raw hide, or other suitable substance. This diaphragm is attached to the framework carrying the anode. The framework also carries a chute or pipe through which the ore and water are supplied. The ore in a pulverized or equivalent condition is driven along the surface of the mercury and underneath the diaphragm by a sufficient head of water in the chute or pipe. The bottom of the framework is shaped so that the diaphragm slopes up from the place where the ore first comes in contact with the mercury to the place where water and the tailings are discharged. The area of the anode is nearly as large as the surface of the mercury so that the current of electricity is free to pass between the anode and the whole surface of the mercury. The framework carrying the anode, diaphragm, and chute is supported so as to be capable of being rapidly moved from side to side. This movement of the diaphragm on the surface of the mercury keeps the latter in constant motion, and thus allows the ore to mix freely with clean mercury, which facilitates the amalgamation of the gold or other metal. The gold or other metal after amalgamation with the mercury is extracted in the usual way.

The invention may also be applied to the extraction of metal from sweepings of jewelers' shops.

In the drawings—Figure 1 is a vertical longitudinal section. Fig. 2 is a plan. Fig. 3 is a vertical transverse section through the line *x x*.

A A is an iron trough containing the mercury.

B B is the framework carrying the anode C, which may be of lead, platinoid, carbon, or other suitable substance for forming the anode. The bottom C′ of the framework is made of wood and perforated as shown in Figs. 1 and 3, and is used to support the anode and on the underside of this perforated bottom there is fixed a porous diaphragm B′. This diaphragm may be made of strong canvas, raw hide or any other suitable substance which is porous enough to allow water to pass through to make electrical connection between the anode and cathode but dense enough to prevent the mercury and fine ore reaching the anode, an acidulated liquid may also be placed in the box B to increase the conductivity of the anode.

In the apparatus described and illustrated in the drawings the anode is placed on the top of the perforated bottom, but I may attach it to the underside of the perforated bottom and in contact with the porous dia-

phragm. The framework also carries chutes or pipes D, through which the ore and water are supplied. The pulverized ore is driven along the surface of the mercury by a sufficient head of water in the chute. The framework is placed in the trough so that the diaphragm slopes up from the place where the ore first comes in contact with the mercury to the place where the water and tailings are discharged, and the rear wall of the hopper D is lower than the front wall thereof for the purpose of preventing the ore from passing rearward and escaping treatment.

The framework carrying the anode, diaphragm, and chute is supported by springs E so as to be capable of being moved from side to side. This may be done by a revolving shaft carrying a grooved cam F, in the groove of which a pin G attached to the outside of the chute works while the far end of the framework is pivoted at H, Figs. 1 and 2. *a* is a perforated iron plate or wire gauze through which the water and tailings escape, but which prevents globules of mercury being carried along with the tailings. A current of electricity from a battery or small dynamo is kept flowing from the anode through the water and ore as it passes along the surface of the mercury to the mercury, which thus forms the cathode. The action of the electric current prevents the mercury becoming oxidized or sickened. Nascent hydrogen is developed at the cathode when the electric current passes, which prevents the mercury oxidizing or becoming dirty. The clean bright mercury is then able readily to amalgamate with the gold &c.

The process of extracting the metal from the ore is as follows:—The ore in a finely divided state is mixed with water and fed into the chutes or pipes D, while the framework is kept in motion by the revolving shaft F, and a current of electricity is kept flowing between the anode and cathode. Water and ore are fed into the chutes or pipes until there is a sufficient head of water in the chutes or pipes to overcome the head of mercury in the trough and drive the water and ore along the surface of the mercury. The rate at which the ore is driven along the mercury can be regulated to suit different ores by adjusting the slope of the bottom of the framework carrying the anode in any suitable manner as for instance, elevating the pivot H, or by lowering the connections of the springs E. The ore first comes in contact with a certain pressure above atmospheric pressure, and as it passes along the surface of the mercury the pressure gradually diminishes and the tailings emerge from under the diaphragm at the atmospheric pressure having parted with most of the gold or other metal which amalgamates with the mercury. The treating of the ore under pressure and the motion of the framework insure a free mixture of each particle of the ore with the mercury, and the electrification of the mercury keeps it in an active condition. Thus almost all the gold or other metal can be extracted even from refractory ores.

In some cases I find that the extraction of metals from refractory ores is assisted and is more perfectly accomplished by the application of heat. I therefore provide a chamber I underneath the mercury trough through which steam or hot water can be made to circulate in order to keep the mercury hot.

I claim—

1. In apparatus for the extraction of gold or other metals from ore the combination of a bath of mercury forming a cathode with a superposed anode having an area nearly as large as the area of the surface of the mercury, said cathode being separated from the anode by a porous diaphragm whereby an electrical current may be made to pass between the anode and the whole surface of the mercury through the ore as it moves along the surface of the mercury, substantially as explained.

2. In apparatus for the extraction of gold or other metals from ore by amalgamation aided by electricity the combination of a bath of mercury forming a cathode with a superposed anode, porous diaphragm and chute, and an oscillatory framework carrying the anode, porous diaphragm and chute, substantially as explained.

3. In apparatus for extracting gold or other metals from ore, a trough containing a bath of mercury forming a cathode, a chute for delivering ore and water thereinto, and an upwardly inclined perforated partition carrying the anode and porous diaphragm leading from the lower end of the chute, whereby pressure greater than atmospheric pressure at the lower end of the chute, where the ore first comes in contact with the mercury is obtained, substantially as explained.

4. In apparatus for the extraction of gold or other metals from ore electrically, a trough for containing a bath of mercury which constitutes the cathode, a framework in the trough having a perforated bottom, a porous diaphragm secured to the bottom, and an anode supported by said framework, substantially as explained.

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

JOHN EDLINGTON CHASTER.

Witnesses:

JOHN LIDDLE,

ARTHUR HARTLEY YUILE,

Both of 154 *St. Vincent Street, Glasgow.*