

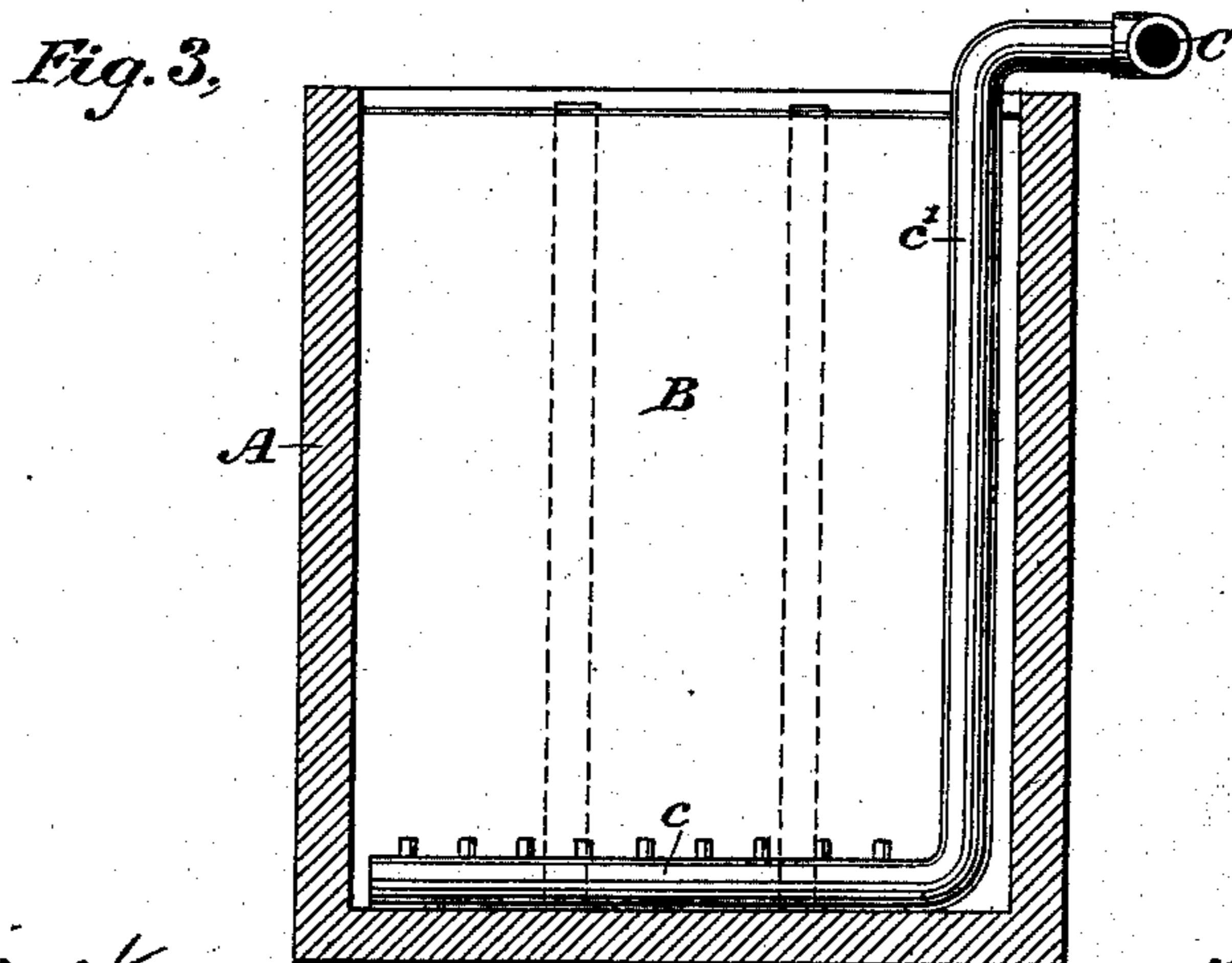
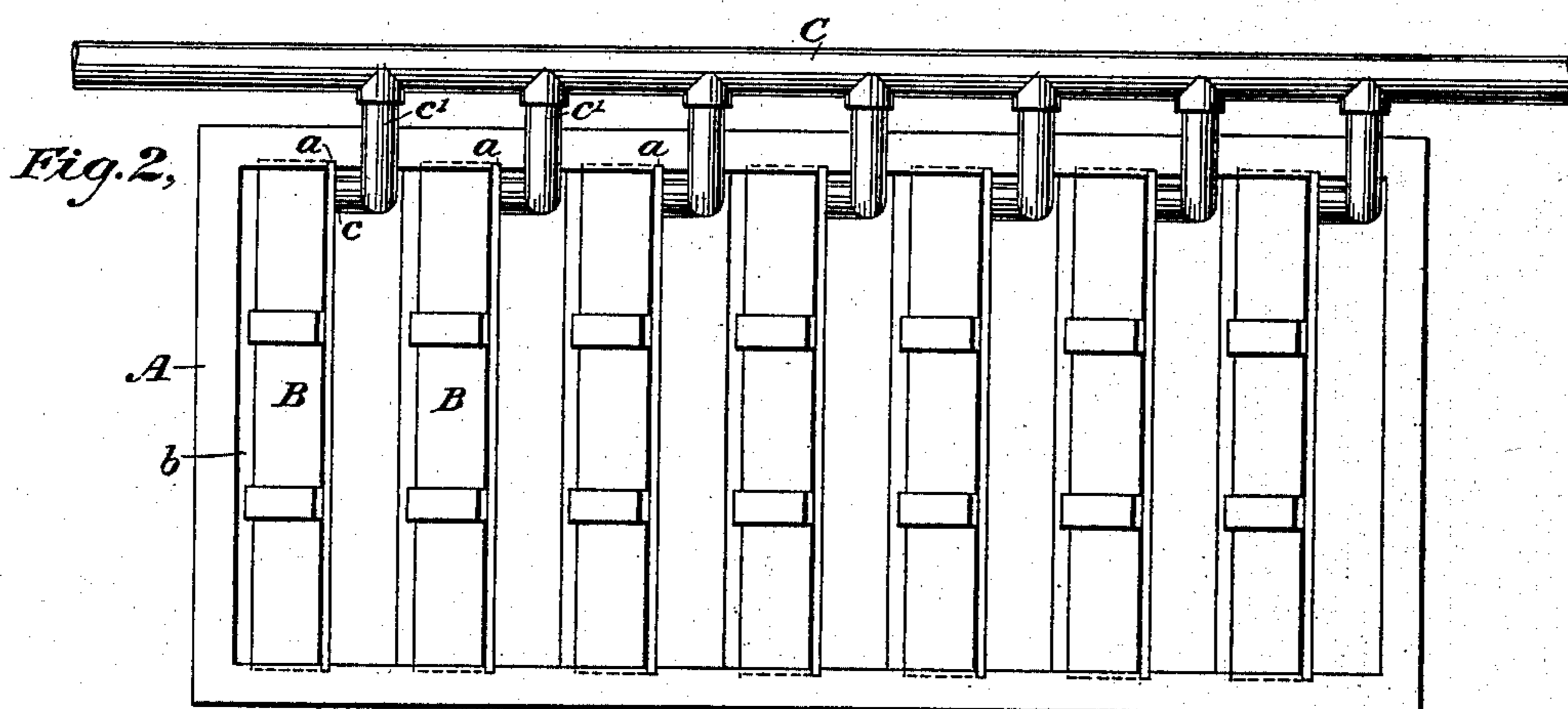
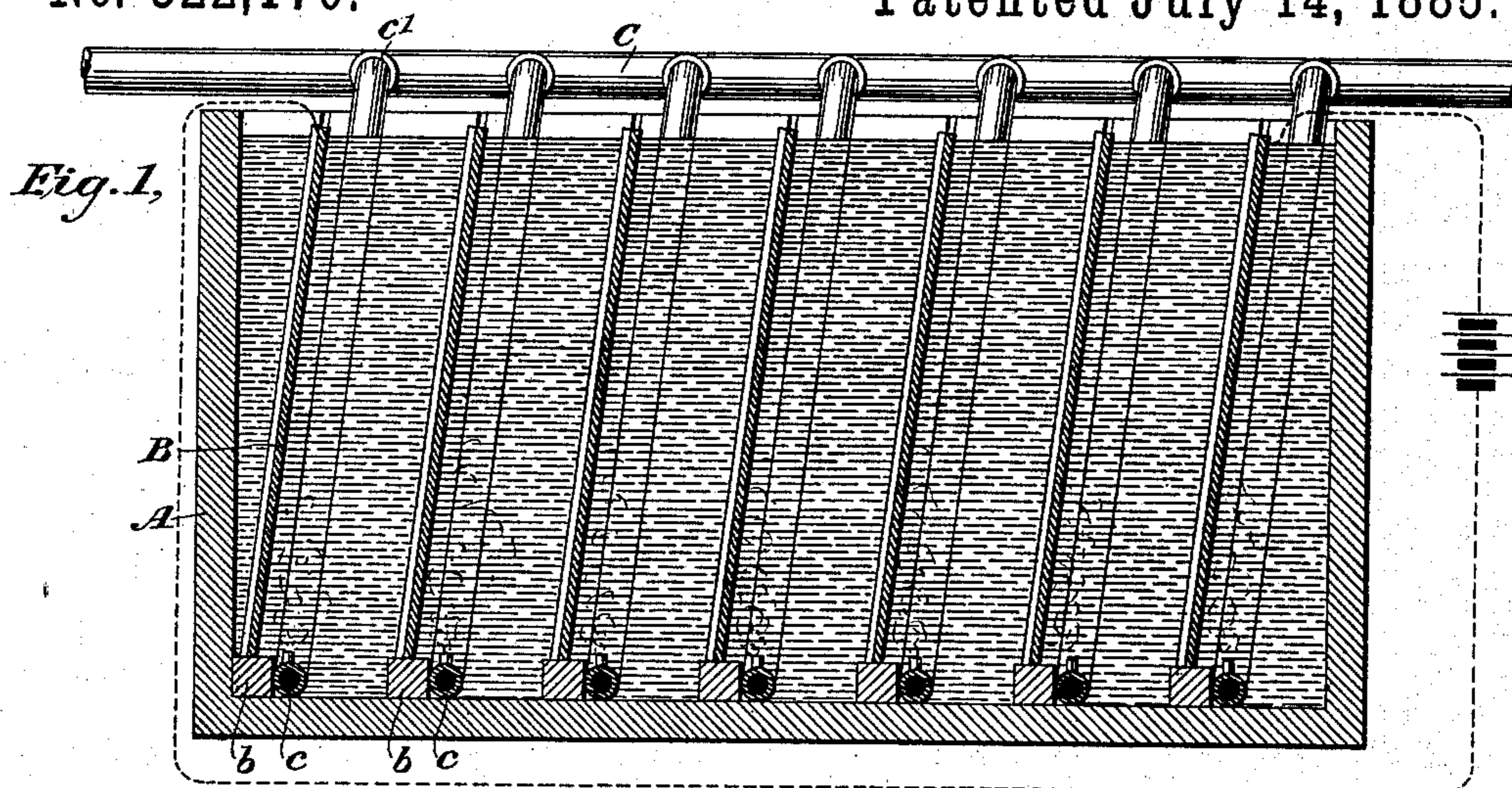
(No Model.)

M. G. FARMER.

APPARATUS FOR REFINING COPPER BY ELECTRICITY.

No. 322,170.

Patented July 14, 1885.



Witnesses

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APPARATUS FOR REFINING COPPER BY ELECTRICITY.

SPECIFICATION forming part of Letters Patent No. 322,170, dated July 14, 1885.

Application filed April 18, 1885. (No model.)

To all whom it may concern:

Be it known that I, MOSES G. FARMER, a citizen of the United States, residing in New York, in the county and State of New York, have invented certain new and useful Improvements in Apparatus for Refining Copper by Electricity, of which the following is a specification.

The invention relates to the class of apparatus employed for refining copper by electrolysis. It has been customary to place copper in an impure state in electrolyzing vats and to connect the same with a source of electricity. The pure copper is deposited upon suitable cathodes, while the impurities remain with the mass of copper constituting the anodes, or else fall to the bottom of the vats.

The object of the present invention is to provide means for maintaining the anode plates clean and free from the collection upon their surfaces of the impurities, and also to cause an agitation of the liquid electrolyte sufficient to promote the electrolytic action.

The invention consists, essentially, in placing the impure copper in the vats in the form of plates which are held in an inclined position. The positive pole of a source of electricity is connected with a plate at the end of the vat, from which the upper ends of the vats incline, and the negative pole with the plate at the opposite end. In this manner the upper surfaces of the plates become cathodes and the under surfaces anodes. When a current is passed through the vat pure copper is taken from the anode surface of each plate and deposited upon the cathode surface of the confronting plate. In this manner the one side of each plate is gradually reduced while the other is built up, and ultimately each plate will be transformed from its impure state to a plate of pure copper. As the copper is removed from the anode side of the plates the impurities fall to the bottom of the vat, for the reason that the plates slant downward so that the anode surfaces are underneath. For the purpose, however, of insuring that the surfaces shall be kept clean, and for the additional purpose of removing any acid which may tend to collect on the cathode surfaces, a system of non-conducting air-pipes is employed. This system consists of a series of horizontal perforated pipes, one being along the base of each plate beneath the

anode side. A suitable supply-pipe communicates with them all, and air is forced either constantly or at intervals into them. The air escaping through the perforations serves to keep up a circulation of the liquid electrolyte, removing the free acid from the cathode sides of the plates, allowing a portion of the solution which contains more of the salt to take its place. This more highly acidified portion is caused to impinge against the anode side of the confronting plate, and thus the process is continued. At the same time the air-currents by impinging against the under sides of the plates wash off the impurities which would otherwise adhere thereto, and these impurities are allowed to fall to the bottom of the vat.

In the accompanying drawings, Figure 1 is a transverse section of a vat involving the features of the invention, and Fig. 2 is a plan of the same. Fig. 3 is an end view showing the wall of the vat in section.

Referring to the figures, A represents the wall of the vat, which is of any convenient form and construction. In the side walls of the vat there are formed slanting grooves *a a*, which are designed to receive the edges of plates B B and hold them in position. The impure copper is formed into the flat plates B, which are inserted in the vats, their edges being placed in the grooves, and they stand thus in an inclined position. The bottoms of the plates preferably rest upon suitable transverse bars, *b b*, which extend preferably across the bottom of the vat. The mud due to the impurities collects between these bars. A system of perforated pipes *c c c* of non-conducting material is applied to the vats, one pipe being placed along the base or bottom of each plate. Each pipe *c* is connected with a supply-pipe, C, by a connecting portion, *c'*, and any suitable means are employed for forcing air into the pipe C, and thus through the pipes *c* into the vat at the bases of the plates. The function and operation of these pipes have already been sufficiently explained. The electrolyte employed is some suitable solution of copper salts, and its density and temperature are so regulated with reference to the density of the current as to give a good reguline deposit of pure copper. Very little if any of the liquid can pass from one compartment formed by the plates to another. A suitable source of electricity has its posi-

tive pole connected, as indicated, with the plate at the end of the series from which the plates incline—that is to say, the anode end, and the negative pole is connected with the cathode end. When thus connected the copper is taken up from the anode sides of the plates and deposited upon the cathode sides until finally the entire plates are transformed from impure to pure copper. Upon the upper or cathode surfaces of the respective plates there may be placed strips of wood or other material which will not be acted upon by acids. These serve to divide the deposited copper into rectangular blocks or plates convenient for handling. This portion of the invention, however, is described and claimed in another application of even date herewith.

I claim as my invention—

1. The hereinbefore-described process of refining copper by electrolysis, which consists in placing plates of the impure metal in inclined

positions, constituting the under surfaces anodes and the upper surfaces cathodes, and dissolving the pure metal from the anode surfaces and depositing it upon the cathode surfaces by electrolysis. 25

2. The hereinbefore-described method of refining copper, which consists in placing plates of the impure metal in inclined positions, constituting the upper surfaces cathodes and the under surfaces anodes, dissolving from the anodes and depositing upon the cathodes pure metal by electrolytic action, and washing the anode surfaces by forcing jets of air, gas, or steam upward against the same. 30

In testimony whereof I have hereunto subscribed my name this 16th day of April, A. D. 1885. 35

MOSES G. FARMER.

Witnesses:

WILLIAM B. HEATHERTON,
A. BOURNE.