

*D. Foster.*

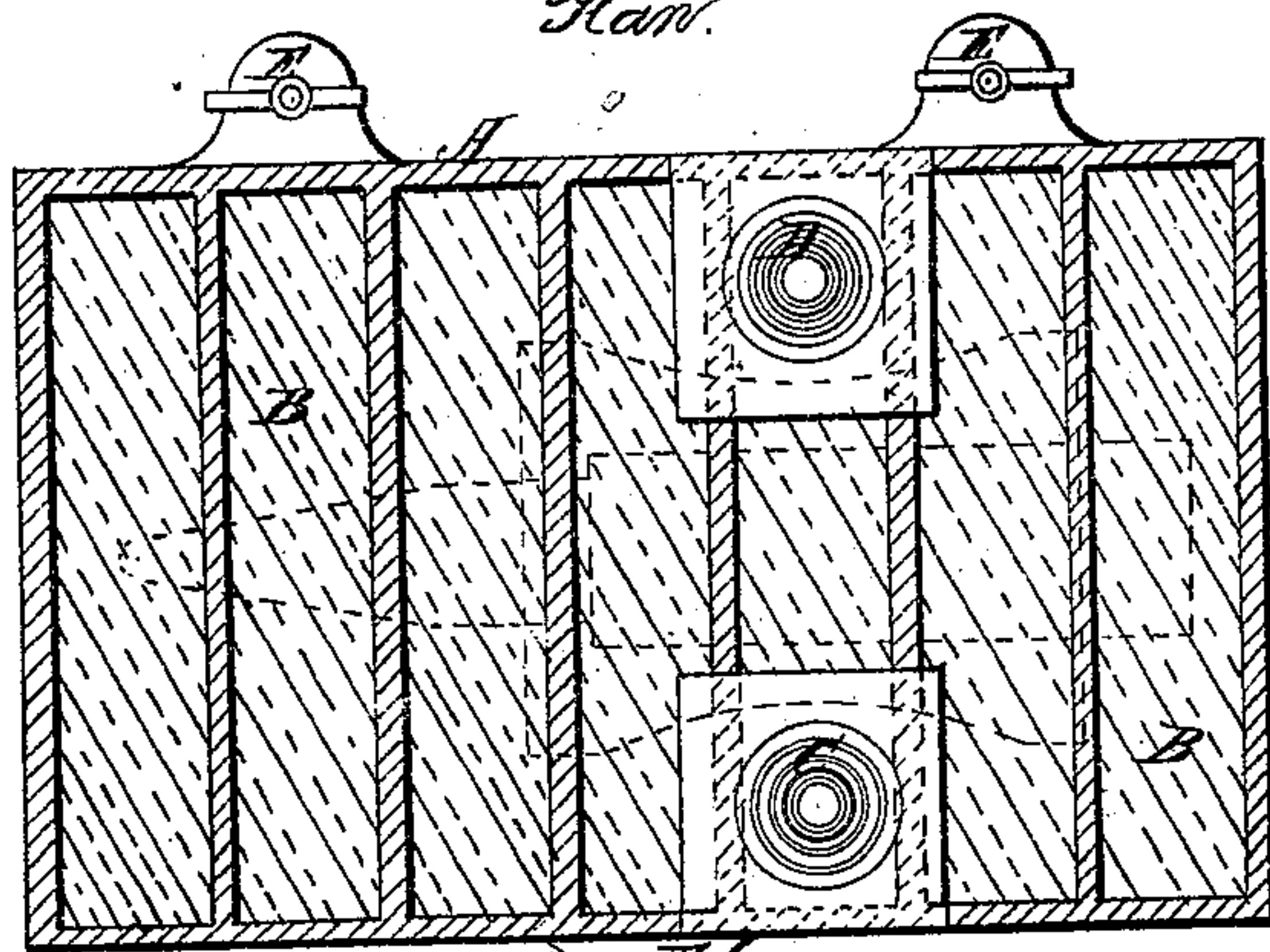
*Making Arrivis.*

*N<sup>o</sup> 95,577.*

*Patented Oct. 5, 1869.*

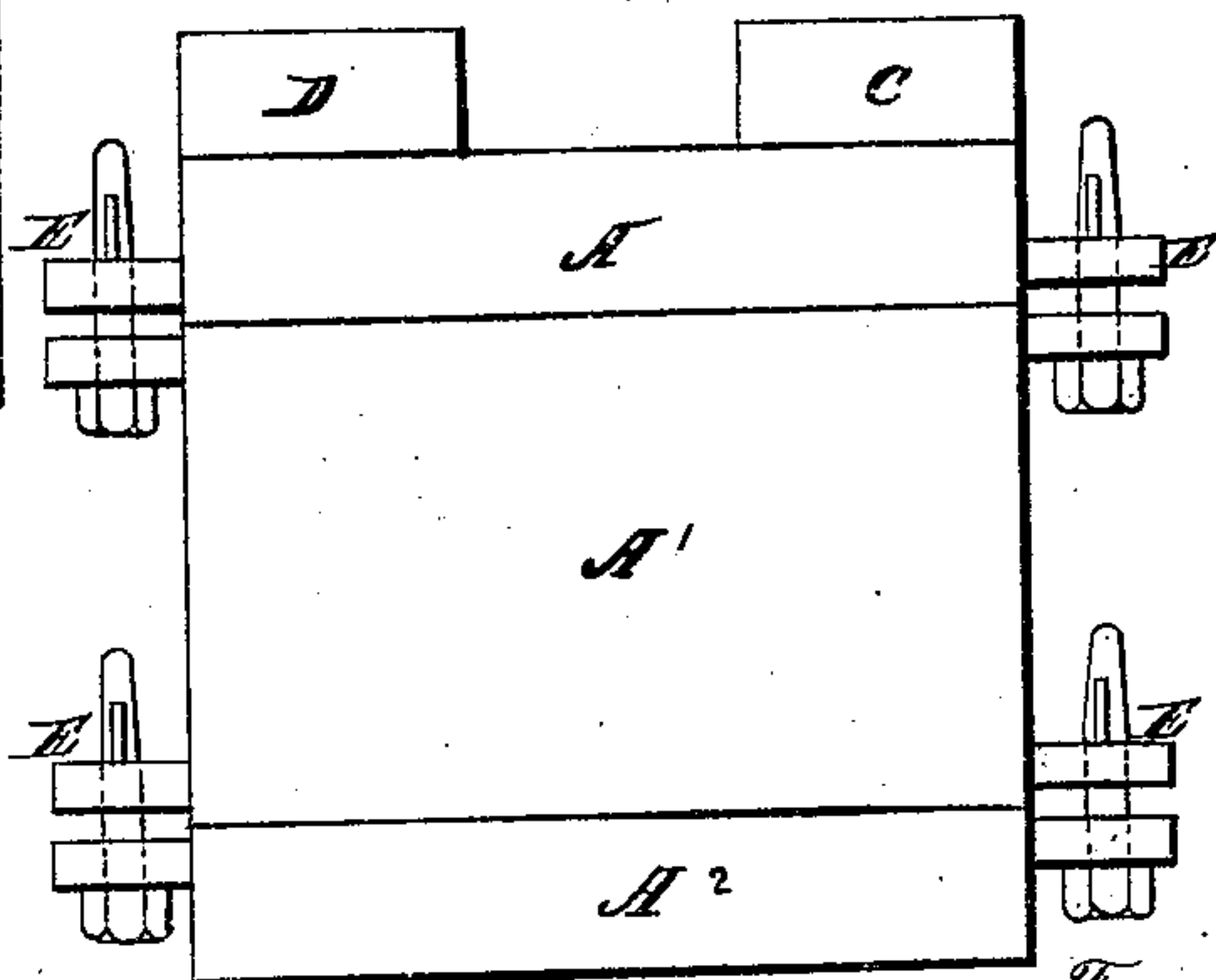
*Fig. 1.*

*Plan.*



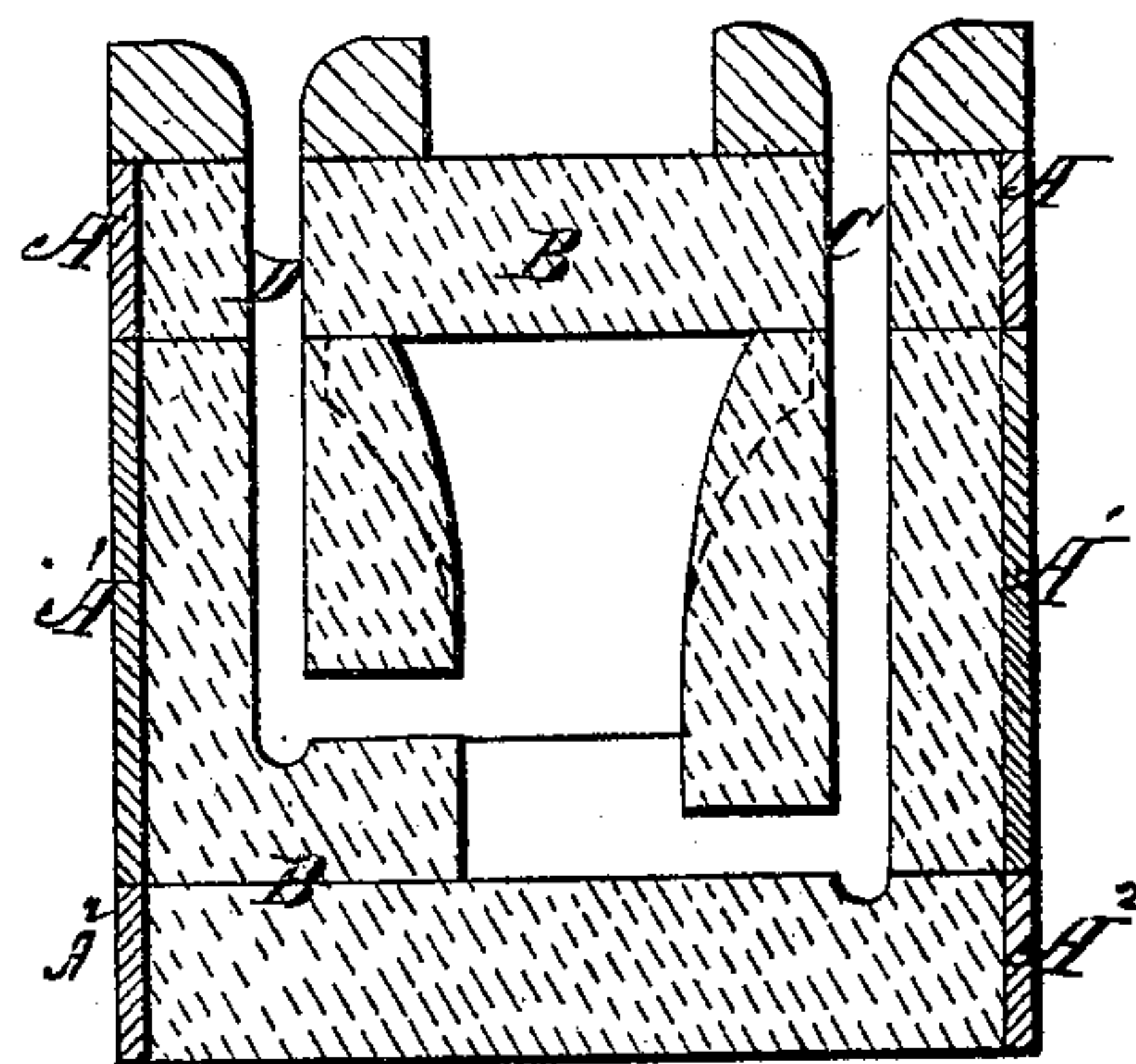
*Fig. 2.*

*End View.*



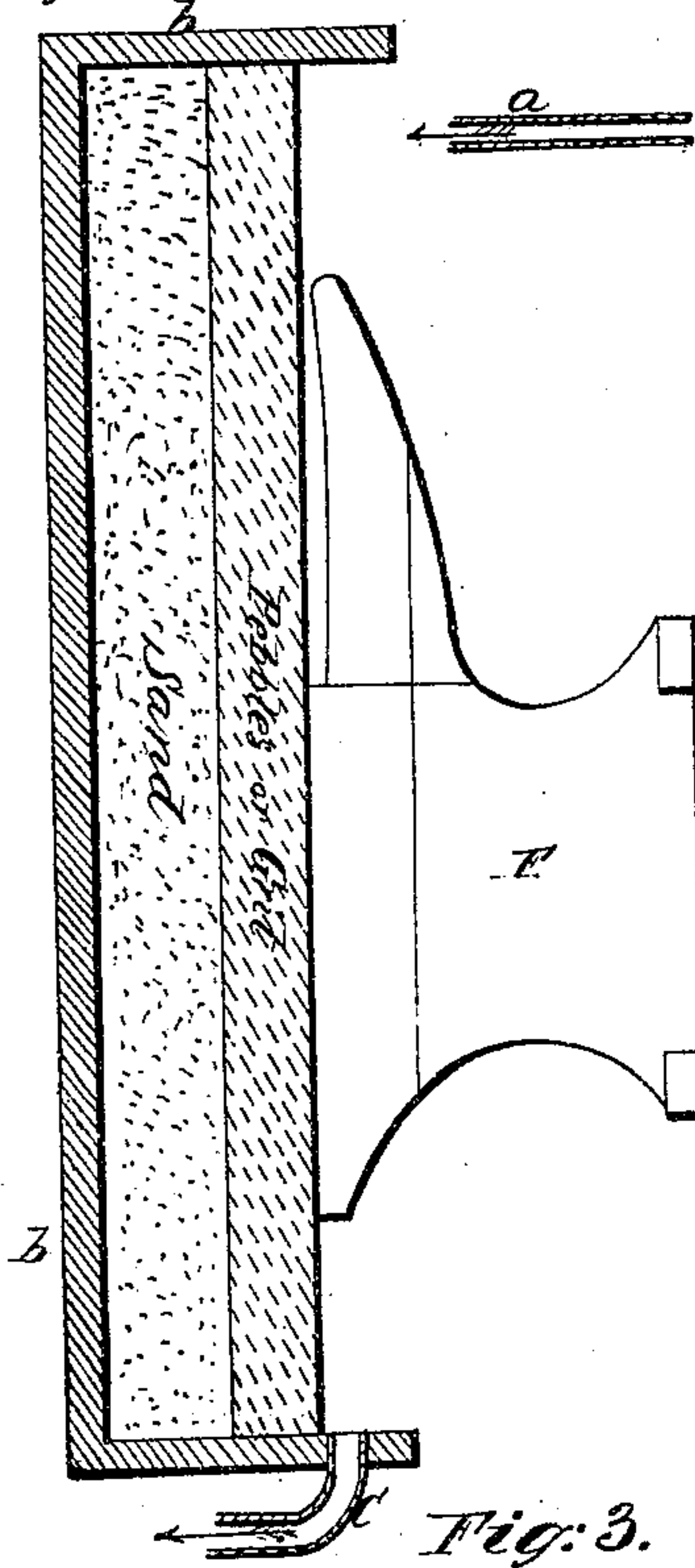
*Fig. 4.*

*Transverse Section.*



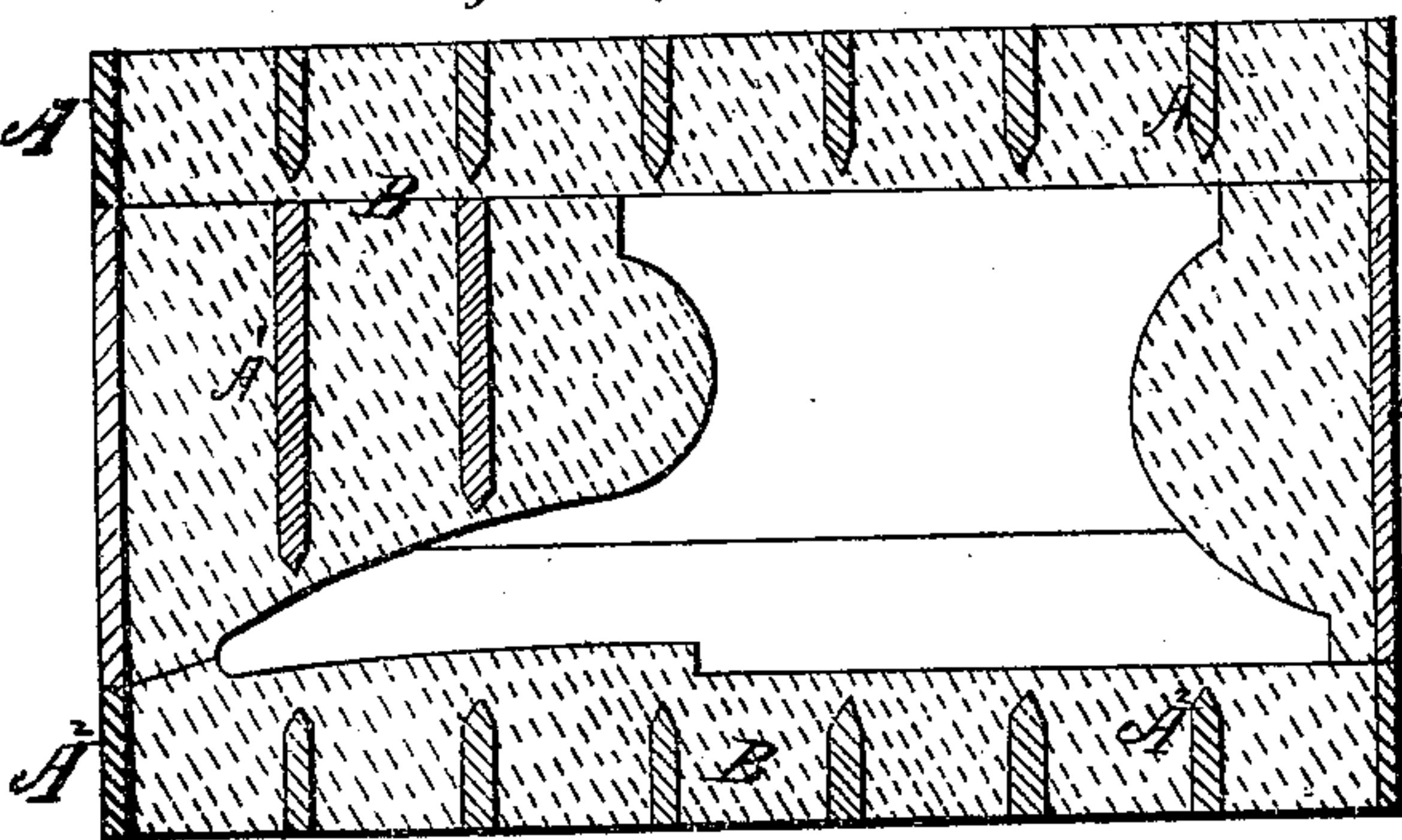
*Fig. 5.*

*Longitudinal Section.*



*Fig. 3.*

*Longitudinal Section.*



*Witnesses*

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*Emma Quinn*

*Inventor*

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# United States Patent Office.

DAVID FOSTER, OF SHEFFIELD, ENGLAND.

Letters Patent No. 95,577, dated October 5, 1869; patented in England, June 4, 1868.

## IMPROVEMENT IN THE MANUFACTURE OF ANVILS, AND THE TOP AND BOTTOM PARTS OF HAMMERS, &c.

The Schedule referred to in these Letters Patent and making part of the same.

To all to whom it may concern :

Be it known that I, DAVID FOSTER, of Sheffield, in the county of York, engineer, a subject of the Queen of Great Britain, have invented or discovered new and useful "Improvements in Combining and Casting Various Qualities of Metal, in the Manufacture of Anvils, Top and Bottom Faces for Hammers, for drawing-out purposes, projectiles, and other articles;" and I, the said DAVID FOSTER, do hereby declare the nature of the said invention, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof; that is to say—

As is well understood in the manufacture of anvils, top and bottom faces for hammers, projectiles, railway-crossings, dies, and other articles, some of the surfaces or parts, which have to resist wear or injury, are formed of steel, and other parts of iron, and the manufacture of such articles is greatly improved and facilitated, when, in place of the parts being forged or welded together, molten iron and steel are then run into a suitable mould, the steel to form the hard or wearing-surface being run into the mould separately from the iron, but so that the iron and steel unite at the point of juncture, and form one casting of the desired shape, steel at one part, and iron at another.

I am aware that it has been before proposed to combine steel and iron in one casting, as above described, but I am not aware that such manufacture has been carried into successful operation, inasmuch as the steel surface produced has been too expensive, or has not been satisfactory, and has required to be hammered and otherwise heated, subsequently to the casting.

Now, I have discovered in practice that articles, where steel and iron are combined into one casting, can be successfully manufactured with a highly-durable and satisfactory quality of steel surface, at a moderate cost, by forming such steel surface of a combination or mixture of charcoal and three descriptions or qualities of metal, namely, what are known as "Bessemer-steel scrap," "Swedish bar-iron or steel," and "*spiegel eisen*."

These three qualities of metal I place in a crucible, with a suitable quantity of charcoal, and, when melted, I pour so much of the molten mixture into the mould as will form the steel surface of the article to be manufactured, and fill the remaining space with iron, so as to form the combined steel and iron casting, the steel surface of which can be afterward ground and hardened or tempered.

In forming the mixture, the three qualities of metal above named may be used in various propor-

tions, more or less of the "Bessemer-steel scrap," or the "Swedish bar-iron or steel," being used respectively, according to the degree of hardness or toughness required, but I have found the following proportions produce a satisfactory surface for anvils, viz:

A little charcoal, thirteen-sixteenths of "Bessemer-steel scrap," two-sixteenths of "Swedish bar," and one-sixteenth of "*spiegel eisen*."

In forming the mould for casting articles, as above described, I prefer to use moulding-boxes of suitable form, and I employ patterns or shapes of the required form to form the mould in the sand or composition employed, that part of the mould into which the steel is run, being formed of the composition usually employed when making steel castings, and the other part of ordinary moulding-sand, and the "gets" or apertures, through which the metal is run into the mould are so arranged that the steel mixture is first poured into the mould, and the iron afterward through an aperture, so arranged that the iron will flow over the steel and rise into the mould, without disturbing the steel which was first poured in.

Figures 1, 2, 3, and 4, of the drawing hereunto annexed, show views of a moulding-box suitable for casting anvils according to my invention.

A<sup>1</sup> A<sup>2</sup> are the moulding-box, formed in three parts, connected together by means of pins and collars at E.

B is the sand, in which the mould is formed.

The steel mixture above described is first run into the mould, through the "get" or aperture C, and the iron afterward through the "get" or aperture D, so as to rise into the mould and flow over the steel, which has been first poured in, without disturbing it.

Figure 5 shows a vertical section of the apparatus I employ for hardening the faces of anvils, and other articles cast partly of steel and partly of iron, as above described.

b is a trough, in which is placed a layer of sand, and upon that a layer of pebbles or grit, as shown in the drawing.

a is a pipe, through which water is supplied to the trough b, and

c is an overflow outlet-pipe, through which the water passes away, after traversing the trough b.

The anvil F to be hardened, is placed upon the surface of the granular contents of the trough b, and the stream of water passing over and through the contents of the trough b, hardens the steel face, without coming in contact with the other parts of the anvil, so avoiding unequal contraction or fracture during the hardening-process.

Having now described the nature of my invention, and the best means I am acquainted with for carrying the same into operation, I would have it understood that I do not confine myself to the precise details herein described; but

What I claim, is—

Forming the wearing or resisting-surfaces or parts of anvils, hammers, projectiles, railway-crossings, dies, or other articles, of the combination or mixture of

metal herein described, when such articles are cast partly in iron, and partly in steel, substantially as herein shown and described.

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