(No Model.)

2 Sheets—Sheet 1.

J. HENDERSON.

MOLD FOR CASTING STEEL.

No. 315,741. Patented Apr. 14, 1885.

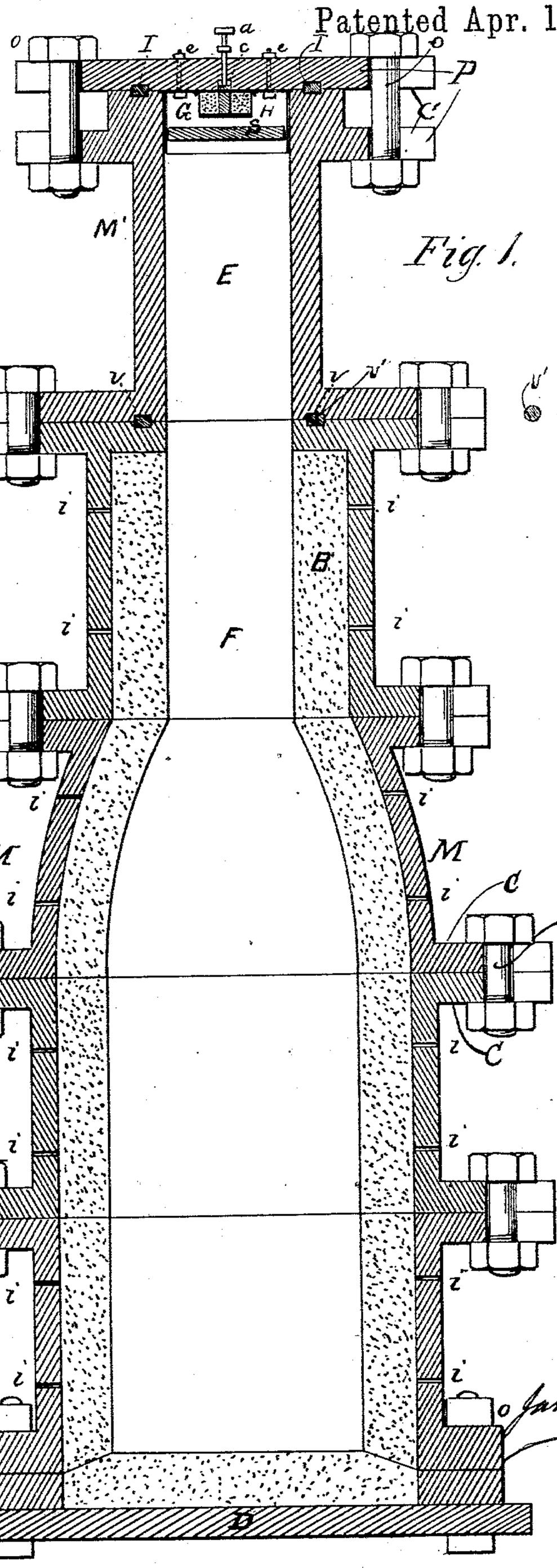


Fig. 1.

(No Model.) 2 Sheets—Sheet 2.

J. HENDERSON.

MOLD FOR CASTING STEEL.

No. 315,741. Patented Apr. 14, 1885.

Fig. 2

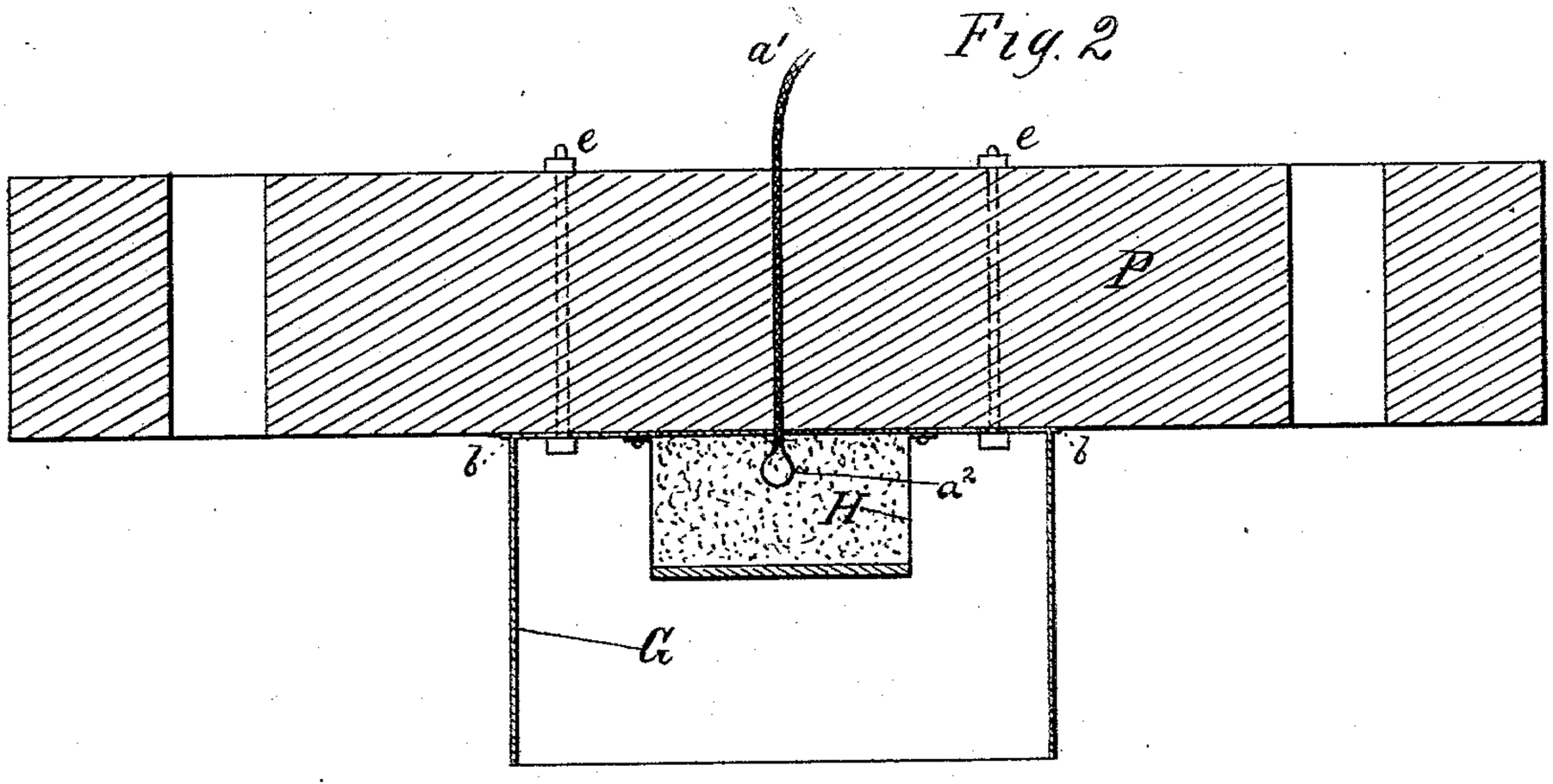
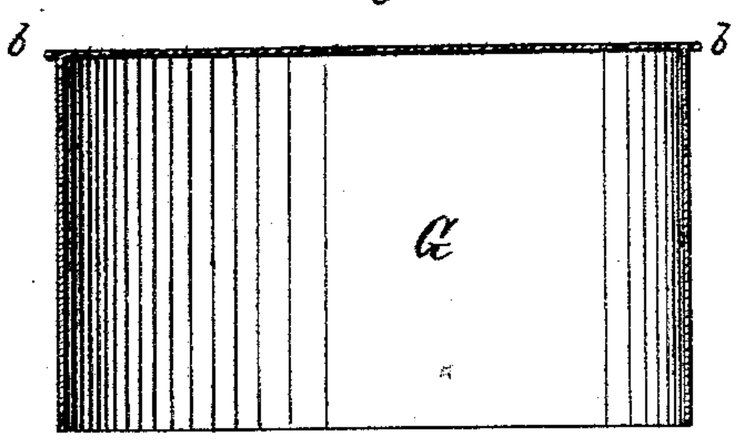


Fig. 3



WITNESSES.

A. B. Williams

C. S. Cook

INVENTOR.

James Henderson

UNITED STATES PATENT OFFICE.

JAMES HENDERSON, OF BELLEFONTE, PENNSYLVANIA.

MOLD FOR CASTING STEEL.

SPECIFICATION forming part of Letters Patent No. 315,741, dated April 14, 1885.

Application filed March 3, 1885. (No model.)

To all whom it may concern:

Be it known that I, JAMES HENDERSON, formerly of the city, county, and State of New York, now of Bellefonte, in the county of Centre and State of Pennsylvania, have made an invention of certain new and useful Improvements in Molds for Casting Steel and other Fluid Materials; and I do hereby declare that the following, in connection with the accompanying drawings, is a full, clear, and exact description and specification of the same.

This invention has reference to the compression or condensation of steel and other materials in molds, and the expulsion of gaseous matter from the material by gaseous pressure; and the invention consists of certain combinations of devices, which are recited in detail in the claims at the close of this specification. In order that the same may be fully understood, I have represented in the accompanying drawings, and will proceed to describe, the best mode which I have thus far devised of embodying the invention for practical use when a cylindrical article—such as an ingot for a steel cannon—is to be cast.

The drawings represent at Figure 1 a central longitudinal section of the mold and its appurtenances for the cannon-ingot. Fig. 2 is a vertical section, on a larger scale, of the cover of the mold, with an inverted cup and powder-chamber secured to it. Fig. 3 is a section of the inverted cup before its application to the cover of the mold.

The mold for the cannon-ingot, as represented in the drawings, is formed, mainly, in a flask, M, whose walls are perforated by orifices *i*, for the escape of gas, the body of the flask being constructed of sections connected by flanges C and bolts *o*, in the usual manner. The flask is closed at its lower end by the bottom plate, D. The interior of the mold in the flask is made, in the usual manner, of damp sand, B, rammed around a pattern, which, for convenience of being drawn from the mold, should be made in sections, held in their proper relative positions to each other by means of pins, as well understood in the art of molding for castings. When the mold has been formed, the sections of the flask are separated, the pattern is drawn out, and the sand lining of the flask is thoroughly dried before the sections are put together to be poured with the fluid metal.

The head M′ of the mold is formed, by preference, of cast-steel, which is connected with the sand-lined flask beneath by means of flanges and bolts; and the joint between the head and flask is made tight, preferably by means of a gasket of copper, which is applied to corresponding grooves, *v*, formed in the adjacent rims of the flask and head, which should be faced off truly to make a close joint. The gasket may have a circular section before it is applied to the grooves, so that when the head of the mold is drawn down to the upper end of the flask by the bolts the gasket will be compressed, and will close the joint hermetically. The upper end of the head of the mold has a cover, P, fitted to it, and the joint between the cover and the head of the mold should be made gas-tight by some suitable means—such, for example, as a gasket, I, of soft metal, or an inverted cup of thin sheet metal, secured to the cover, which cup may be expanded by the pressure of gas generated within the mold. This invention, however, is not restricted to any particular means for making the joint gas-tight. The gaseous pressure for compressing the material in the mold is generated within the mold after its head is closed, and preferably by the burning of a powder composed of eighty parts, by weight, of saltpeter and twenty parts of charcoal, which may be used in quantities of about one hundred and forty-seven grains for each cubic inch of space left in the head of the mold between its cover and the surface of the cast metal, and the mold must be strong enough to withstand this pressure. I estimate that this quantity of the said gas material will produce a pressure upon the cast metal of about eight tons to the square inch. For the purpose of holding this gas material a chamber, H, is secured to the under side of the cover P. This chamber is closed by a bottom which is fitted tightly in the wall of the chamber, but is not fastened thereto. In order that the gas material may be ejected from the chamber, a plunger, *c*, is fitted in the cover P, with the rod of the plunger extended

through a hole in the cover and fitted at its upper end with a knob, *a*, which may be struck by a hammer, and for the purpose of limiting the downward movement of the plunger a collar is secured to the plunger-rod.

In order to facilitate the displacement of the bottom of the chamber, a small wooden plug is introduced into the chamber between its bottom and the plate of thin metal of the inverted cup, which forms the top of the chamber next to the under surface of the cover of the mold.

When the mold is to be poured with fluid steel, it is opened at the top by the removal of the cover. The fluid steel is run into the mold preferably by means of a pipe of cast-iron inserted in the mold, and the mold is nearly filled, say, within six inches of the upper end of the head. I prefer to use a steel plate, S, which, previously heated to a red heat, is lowered upon the fluid metal. The cover of the mold with the charge of powder in its chamber is applied and made fast, after which the charge is discharged from its chamber by a blow upon the knob of the plunger *c*. The powder is ignited by the heat of the plate S, upon which it falls, and as the gases generated by its ignition are confined within a small space a strong gaseous pressure is produced, which compresses and condenses the steel. As the flask portion of the mold is lined with dried sand, which is pervious to gas, the force of this pervious lining permits the escape of the gas from the steel which is in the flask portion of the mold when the steel is subjected to the pressure of the gas generated in the head of the mold from the gas material, while as the head of the mold is of metal, which is impervious to gas, it prevents the escape laterally and upward of gas generated by the gas material, and the portion of the fluid metal in the head above the sand-lined flask prevents the downward escape of the gas from the gas material, so that it acts with its full pressure upon the metal in the mold.

From the foregoing description it will be perceived that the invention is characterized by the combination of the body of the mold pervious to gas with a head that is impervious to gas, the former permitting the escape of gas from the cast metal, and the latter confining the compressing-gas generated from the gas material so that the compressing-gas exerts its pressure upon the cast metal.

The invention is not restricted to the use of the above-described compound of charcoal and saltpeter as the gas material, as other gas material may be used for the purpose. Thus, for example, the gas material may consist of water in the form of ice introduced into the chamber H immediately before the cover P is applied to the head of the mold.

I prefer to make the pervious lining B of clean sharp sand—such as fire-sand—intimately mixed with magnesian lime in the proportions of ninety-five parts, by weight, of dry sand to five parts of magnesian lime. The mixture is made preferably by slaking the lime and adding sufficient water to make it of a creamy consistency, and then intimately mixing it with the sand. I also prefer to paint or wash the inner surface of the mold with rye-flour and water. This wash should be thoroughly dried upon the mold before the latter is put together to receive the fluid steel.

In place of expelling the gas-making material from its chamber and igniting it by the heat of the casting, it may be ignited in the chamber by electricity. In this case the electricity is conducted to the gas material, as represented at Fig. 2, by means of a duplex conductor, *a'*, and the two wires of the conductor are connected by a platinum wire, a^2, in the charge of gas material, so that the platinum wire is ignited by the electricity and fires the gas material. When an inverted cup is used for making the joint of the cover of the mold gas-tight, I prefer to construct it, as represented in section at Fig. 3, with a flange, *b*, which can be compressed in the joint.

In order to prevent accidents which may arise from explosions, it is preferred to use a cover of thick boiler-plate balanced by a weight and lowered over the entire mold directly after pouring the metal, and after placing and securing the cover P, this safety-cover being arranged so that in lowering it it forces the plunger upon the top of the cup and causes the powder to be discharged upon the metal.

I claim as my invention—

1. The combination, substantially as before set forth, of the flask pervious to gas, the head of the mold impervious to gas, and the cover of the head, for the purpose set forth.

2. The combination, substantially as before set forth, of the flask pervious to gas, the head of the mold impervious to gas, the cover of the head, and the chamber for the gas material, for the purpose set forth.

In witness whereof I have hereto set my hand this 25th day of February, A. D. 1885.

JAMES HENDERSON.

Witnesses:
EDW. R. BREVOORT,
J. E. WARNER.