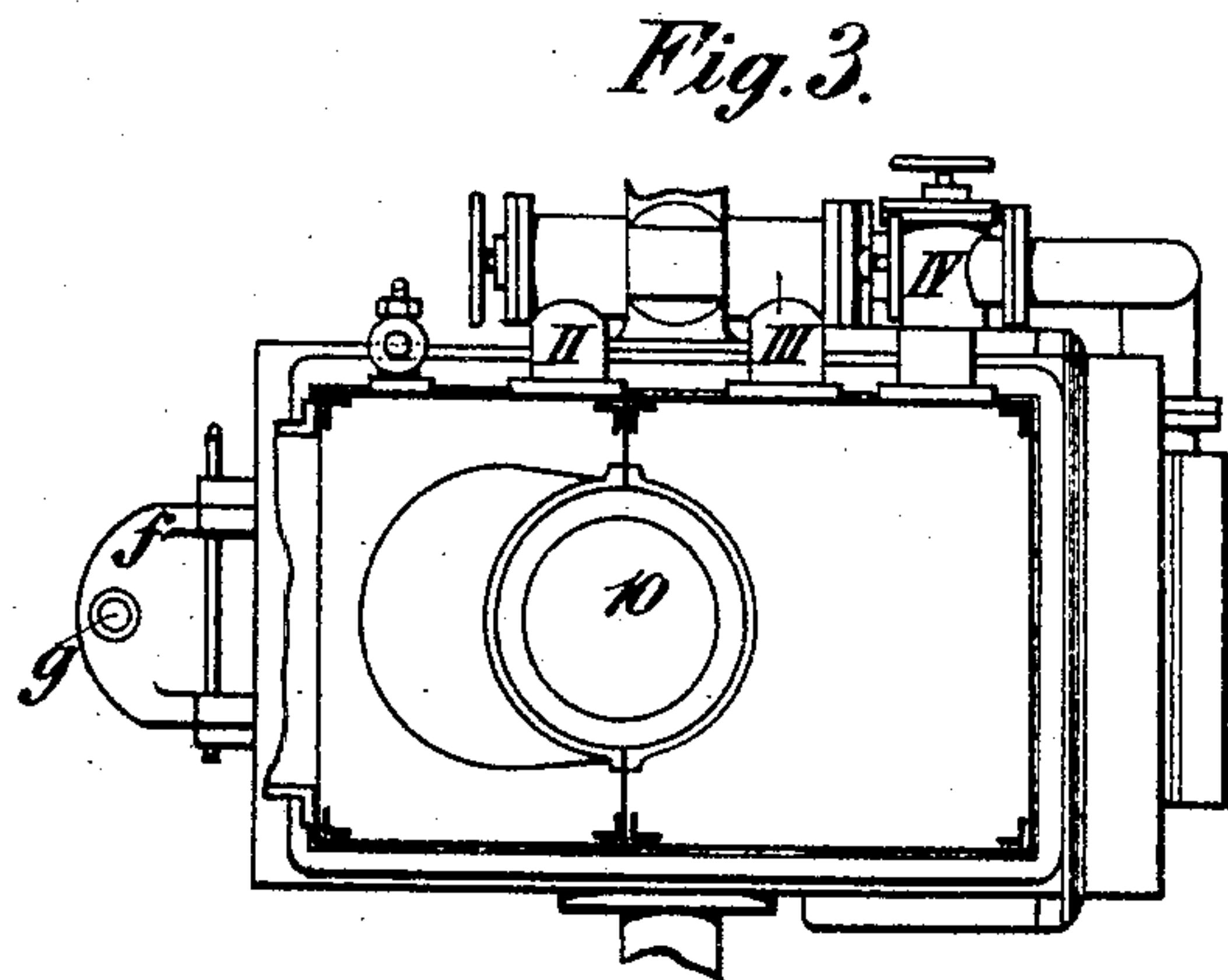
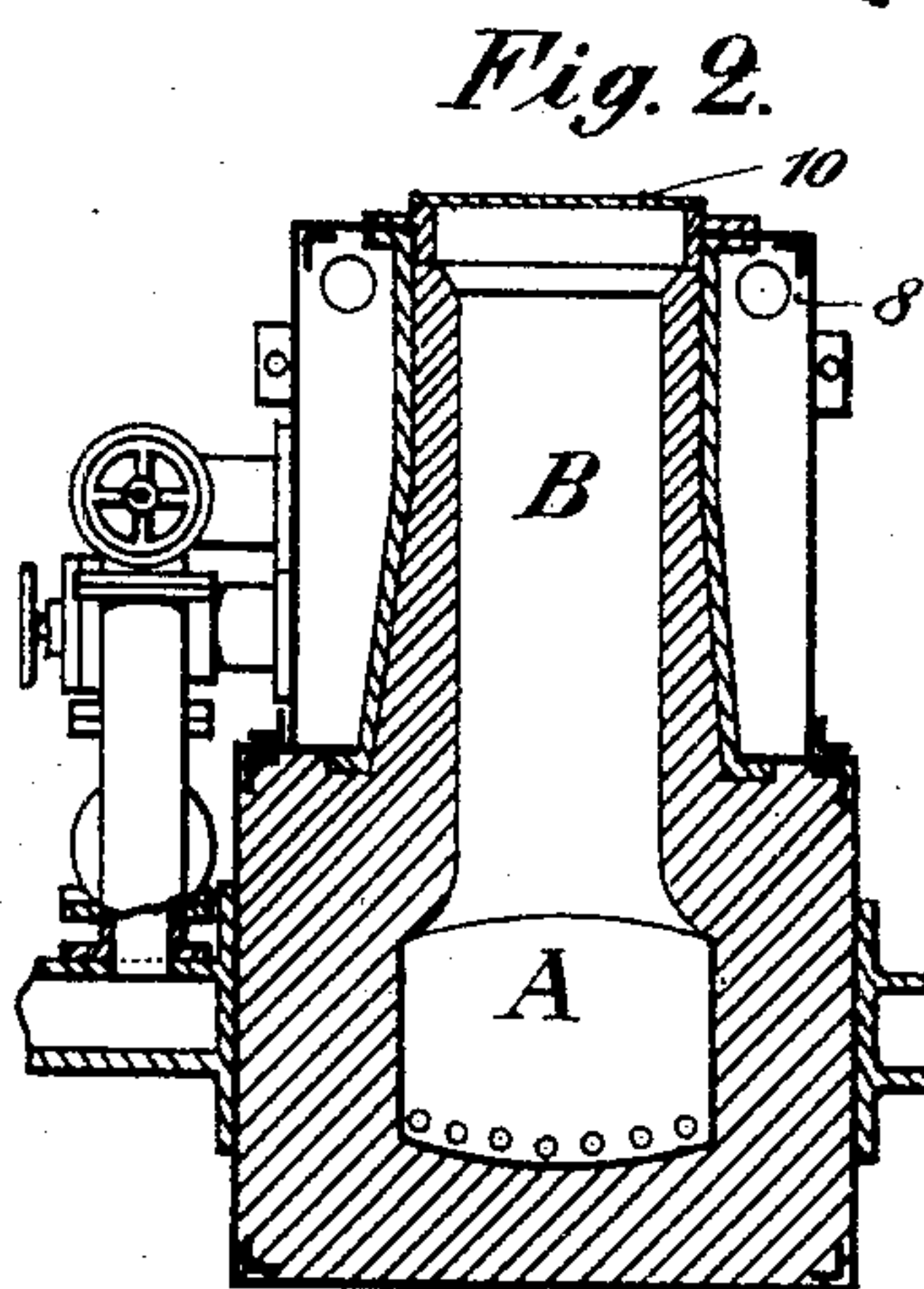
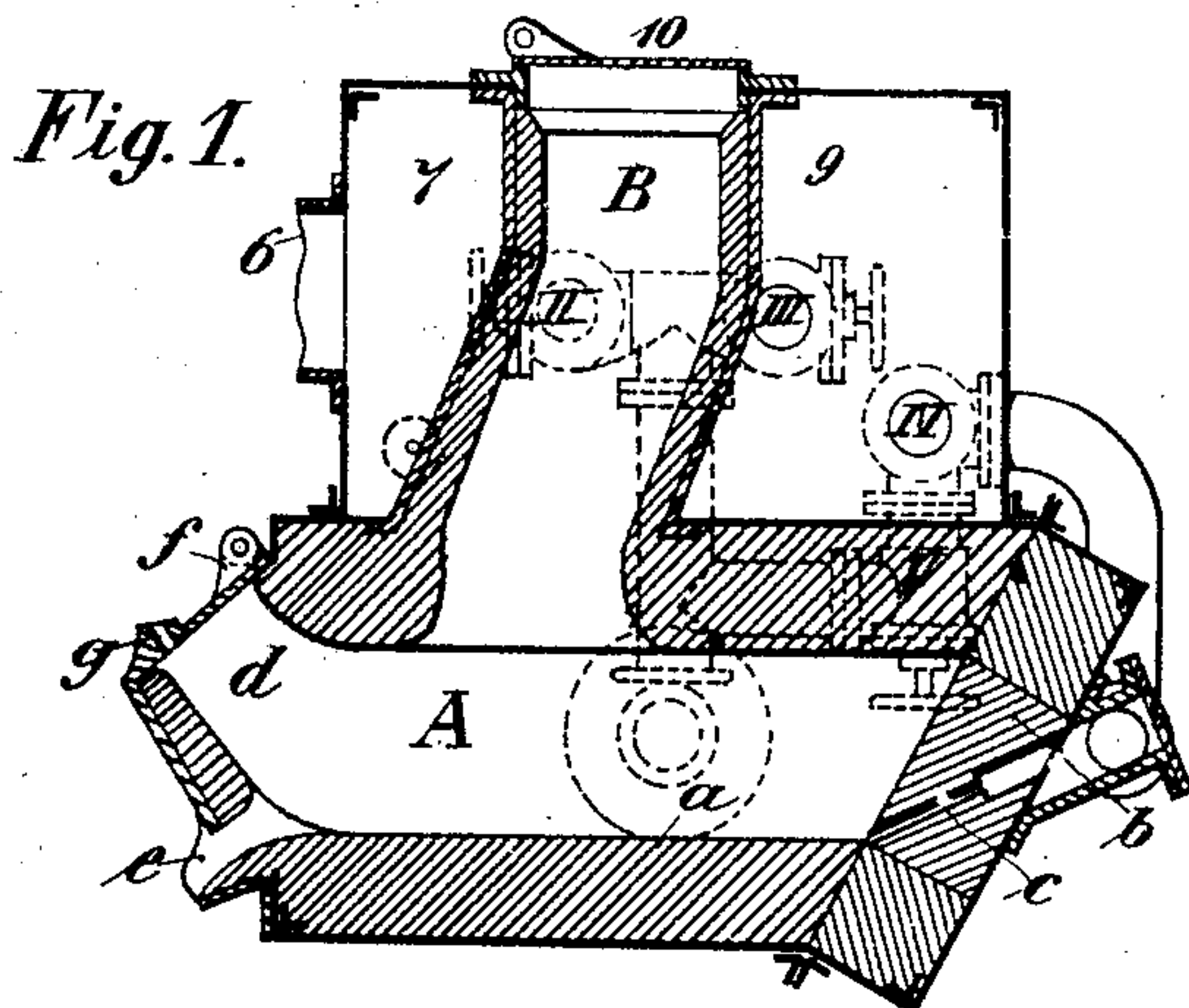


No. 777,746.

PATENTED DEC. 20, 1904.

C. RAAPKE.  
REVERSIBLE CONVERTER.  
APPLICATION FILED FEB. 24, 1902.

NO MODEL.



Witnesses:  
Ludwig Torgenfrey.  
Emil Gwald.

Inventor:  
Carl Raapke.

# UNITED STATES PATENT OFFICE.

CARL RAAPKE, OF GÜSTROW, GERMANY.

## REVERSIBLE CONVERTER.

SPECIFICATION forming part of Letters Patent No. 777,746, dated December 20, 1904.

Application filed February 24, 1902. Serial No. 95,391.

*To all whom it may concern:*

Be it known that I, CARL RAAPKE, a civil engineer, and a subject of the King of Prussia, Emperor of Germany, residing at 10 Wasserstrasse, in the city of Güstrow, in the Grand Duchy of Mecklenburg-Schwerin, Germany, have invented certain new and useful Improvements in Reversible Converters, of which the following is a specification.

10 The hearth-converter shown in the drawings consists of a hearth A, reversible on its shaft and having a flat base *a*, perpendicular side walls, and vaulted top. The rear part of the top being downwardly inclined constitutes the  
15 bottom for the introduction of the blast, which is controlled by the valves II, III, and V, while the front opening *d* acts in part as charge-hole for filling the converter and for removing the steel. The charge-hole *d* is  
20 closed by a cover *f*, which is provided with a small opening *g* for the introduction of additions or reagents during the fusion process. This hole *g* may be kept closed by a clay stopper while the process is going on.

25 In the accompanying drawings, Figure 1 is a vertical section transversely to the axis of rotation of the converter. Fig. 2 is a vertical longitudinal section along the said axis of rotation. Fig. 3 is a plan view.

30 This construction is intended to make it possible at the starting of the blast with the converter only slightly turned over to make use of a so-called "bottom-blowing" for the sake of a better generation of heat. When  
35 an increased heat has been developed, a surface-blowing is started while slightly moving the converter. The iron will then become smoothly distributed upon the hearth, and the slags are forced forward, which causes a favorable oxidation of the foreign impurities,  
40 the iron or steel being but slightly touched by the blast, so as to give sufficient time to the steel which is just in the process of manufacture to remain at rest and to eject all particles of gas and impurities, whereupon it can  
45 be run out from the delivery-opening *e* at the front side, deprived of the slags. This does away with a serious inconvenience in the usual method of working the Bessemer process, inasmuch as heretofore there was always

disturbance and gas in the steel, and it became necessary to ascertain the amount of gas present by repeated tests and to remove the same at last by experiments in a series of trials which was at least accompanied by a  
55 continuous loss of heat.

My construction of hearth shows a further advantage, inasmuch as upon the so-called "flat" hearth cheap phosphoriferous iron may be treated with advantage and in a very simple manner to produce pattern-castings therefrom without the necessity of using a basic lining.

The dephosphorizing which is caused in my invention by the construction of the hearth  
65 is effected in the following manner: To the liquid charge I add dolomite—that is to say, limestone very rich in magnesia—the same being introduced through the front opening *d*. The iron which is distributed upon the  
70 entire base *a* of the hearth is thereby brought into a most intimate contact with the dolomite. Thus the phosphorus contained in the iron forms compounds with the lime of the dolomite and with the magnesia, respectively, so  
75 as to form phosphate of lime and phosphate of magnesia, respectively, resulting in a dephosphorization without the use of a basic lining and without any appreciable wearing away of the lining. Then the hearth-con-  
80 verter presents a further important improvement in the arrangement of an upper structure B, mounted upon the working part A of the converter—that is to say, upon the hearth—thus enabling me to produce very cheap oxy-  
85 gen by means of the already-existing arrangement of blasts and by utilizing the otherwise wasted heat of the converter and with the aid of chemicals at the same time, the blast itself being subjected almost without expense to a  
90 heating process, which causes a most noticeable favorable influence upon the process going on in the converter.

The advantage just referred to is attained in the following manner: As already stated,  
95 the hearth A—that is to say, the working part of the converter—is provided with an upper structure B, which is divided into two chambers 7 and 9, communicating with each other by the passage 8. Through these cham- 100



bers the exit-pipe for the gases from the converter is conducted. This pipe, which is protected at its inside against destruction by burning through, serves to heat both chambers.

5 The first chamber, 7, is provided at its front side with a charge-opening 6. Through this opening a mixture of pyrolusite and caustic soda which has been previously heated up to 300° centigrade is introduced while the lining

10 of the converter is becoming heated. Then the blast is forced through the chamber and the mixture, respectively, so as to form manganate of sodium in a short time, whereupon the blast is given another direction. The

15 blast is introduced into the converter by the passage *c*. The manganate of sodium is then decomposed by the action of heat, so as to form large quantities of oxygen, the amount of which may be regulated according to re-

20 quirements under the influence of the existing heat. As soon as the steel begins to be blown the oxygen is carried with the blast into the converter, for the two chambers are connected with each other, and the arrangement of the

25 blast-conduit is such that the blast may be conducted in any quantity through the oxygen-chamber and into the chamber intended for the preliminary heating, and its passage being so regulated as to strike only the heat-

30 ing-chamber or to be prevented from striking any of the chambers. The second chamber, 9, as already mentioned, only serves for the heating of the blast and of the oxygen, thus increasing the high combustion value of the

35 oxygen and producing a most favorable influence upon the process carried on in the converter. The upper structure B is intended to utilize the waste heat from the converter for the heating of the chambers 7 and 9, of which

40 the chamber 7, as stated, serves for the introduction of oxygen-generating reagents. The structure B may be closed by a cover 10 during the filling of the converter in order to avoid the cooling down of the converter. As

45 soon as the converter is charged the cover 10 is opened, while the cover *f* is closed, the converter is turned over for about thirty degrees to the rear, and the blowing is started. By this means the blast enters at the bottom

50 of the charge and rises up through the mass, and thereby produces a very considerable in-

crease of heat. After some time the converter is returned to its horizontal position, when the blast is acting more upon the surface of the charge, the slag being blown to 55 the front part of the converter, while the fused mass itself is left comparatively undisturbed. Any additions necessary in this stage are introduced through the hole *g*. After the process is finished the converter is in-

60 clined with its front part, the upper cover 10 is closed, and the delivery-opening *e* is opened, and the finished steel is allowed to run out. The opening *e* is then closed up again, the cover 10 is again opened, and the liquid slag 65 is allowed to run out from the charge-opening *d*. This process allows to draw off the slag during the melting operation and to separate the steel therefrom and to run the pure steel out in a liquid condition free from the slag, as 70 in the Martin or open-hearth process. Owing to its construction and to the application of a flat hearth the converter described in this application is particularly adapted to the treat-

75 ment of phosphoriferous iron, inasmuch as owing to this construction there will be sufficient time for the combination of the phosphorus with the addition to the charge, dolomite and the like.

What I claim, and desire to secure by Letters Patent of the United States, is—

A reversible hearth-converter, comprising an oblong converter, means to turn the converter about its transverse axis, a passage communicating with the interior of the converter 85 and substantially at right angles to its longitudinal axis and to its axis of rotation, chambers, communicating with each other and surrounding said passage, a blast-pipe connected with said chambers and with the bottom of 90 the converter, the converter being provided with a suitable charging and with a suitable delivery opening, one of the said chambers being provided with a side opening and suitable covers to close the said openings, sub-

95 stantially as described.

In witness whereof I have hereunto set my hand in presence of two witnesses.

CARL RAAPKE.

Witnesses:

WOLDEMAR HAUPT,  
HENRY HASPER.