

No. 815,794.

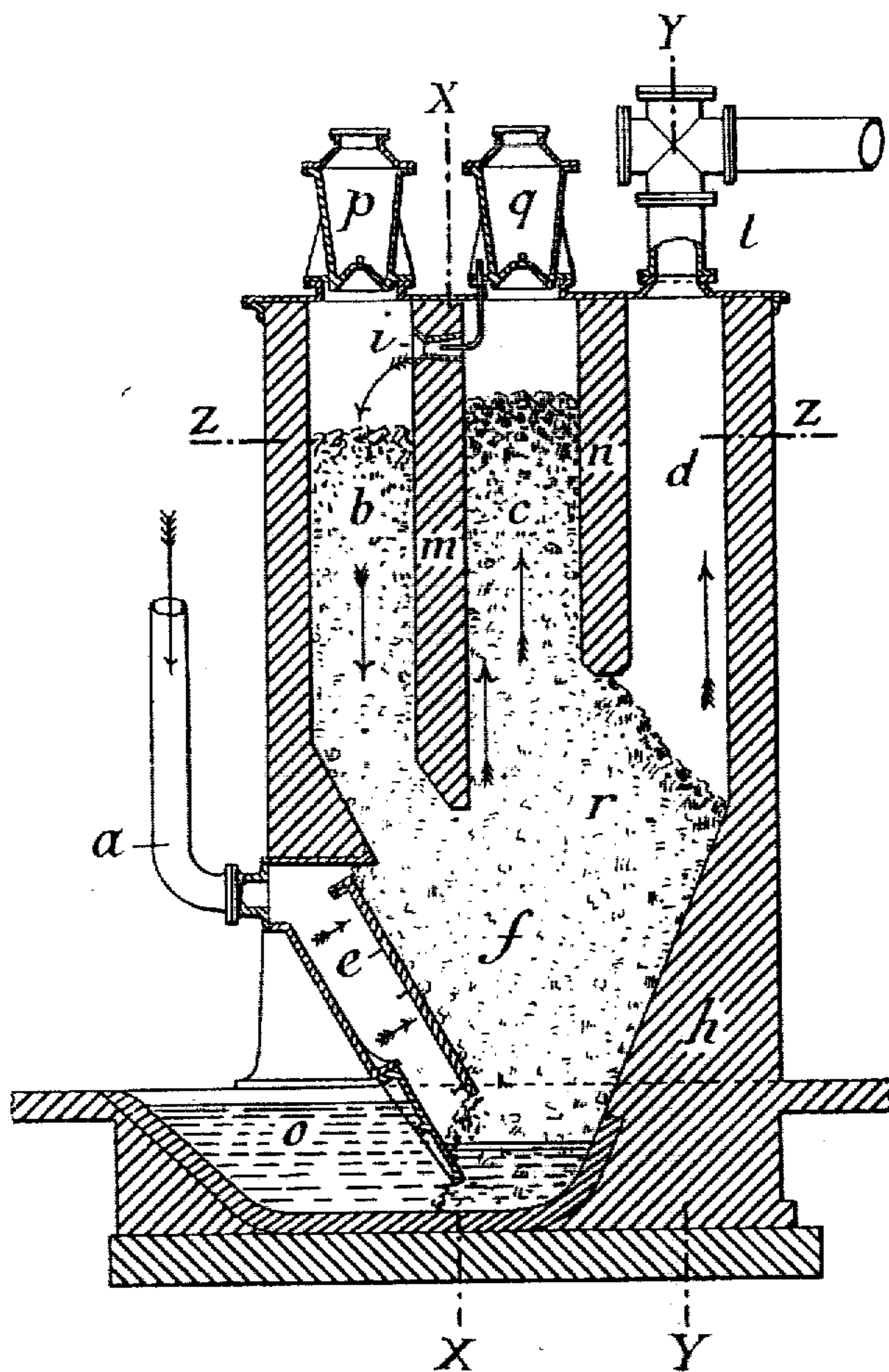
PATENTED MAR. 20, 1906.

A. CERASOLI.  
GAS PRODUCER.

APPLICATION FILED APR. 22, 1904.

4 SHEETS—SHEET 1.

Fig. 1



Witnesses:

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C. D. Kesler

Inventor  
Alberto Cerasoli

By James L. Norrie, Jr.  
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4 SHEETS—SHEET 2.

Fig. 2

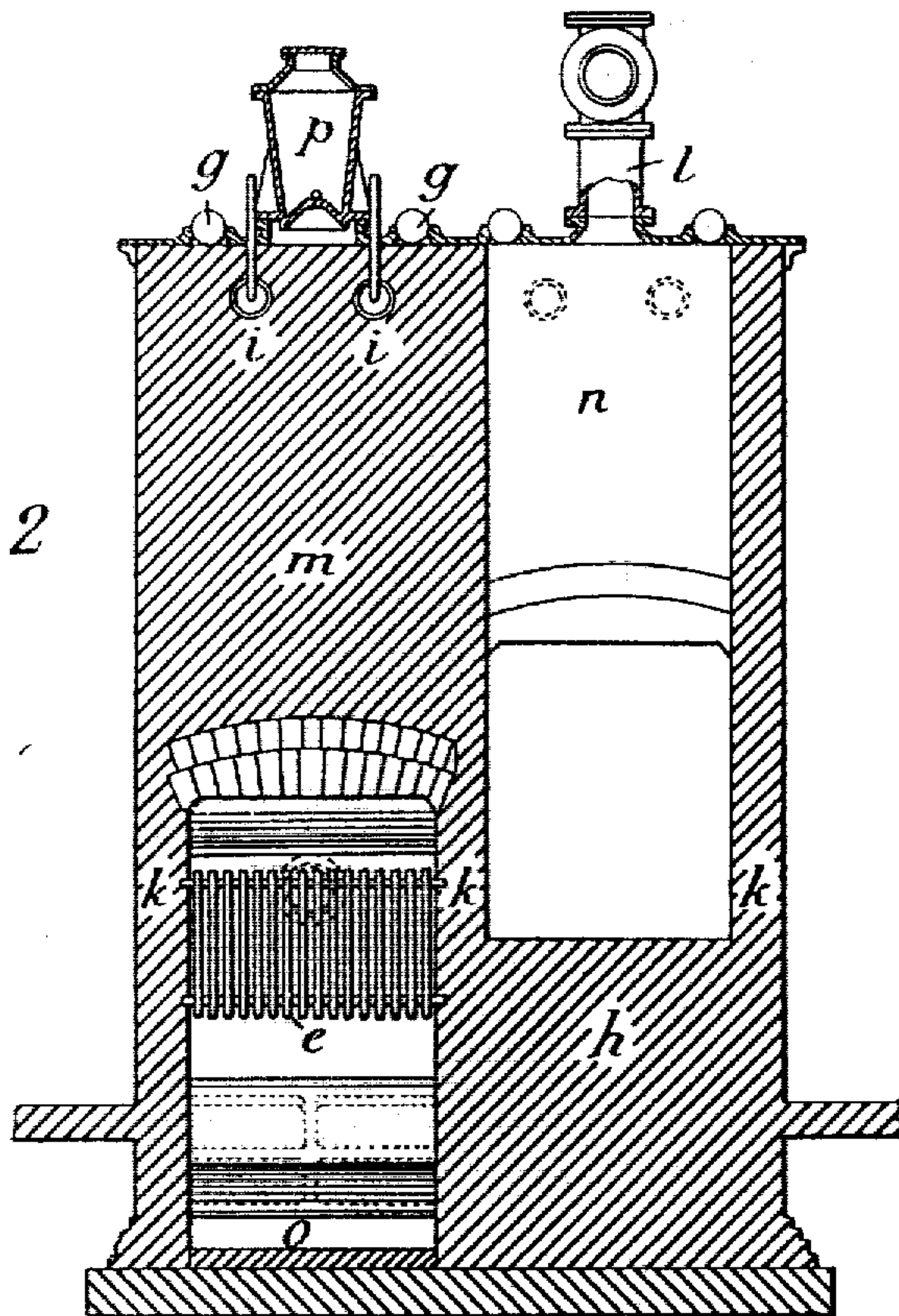
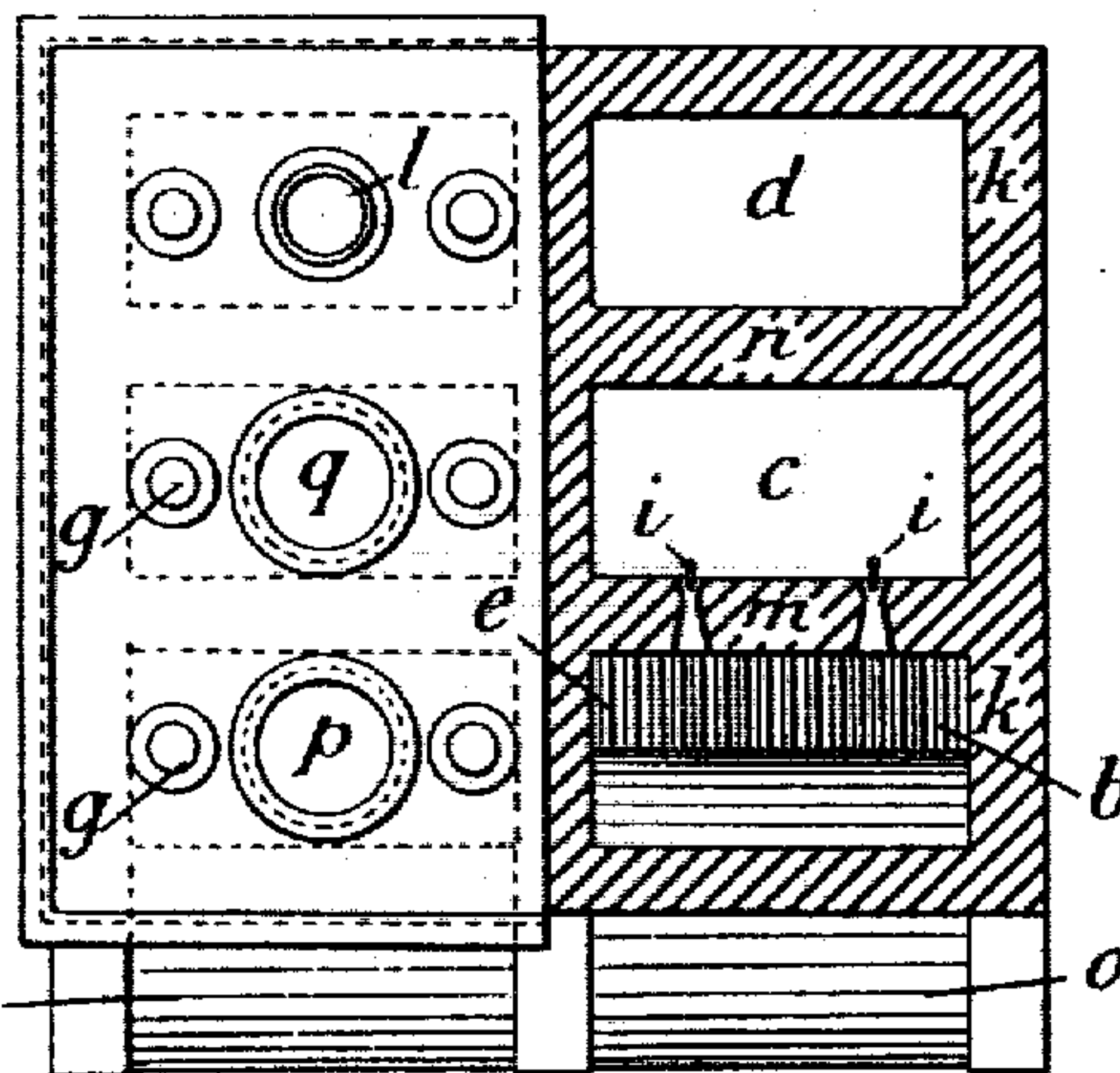


Fig. 3



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*C. D. Hesler*

Inventor  
*Alberto Cerasoli*  
*James L. Morris*  
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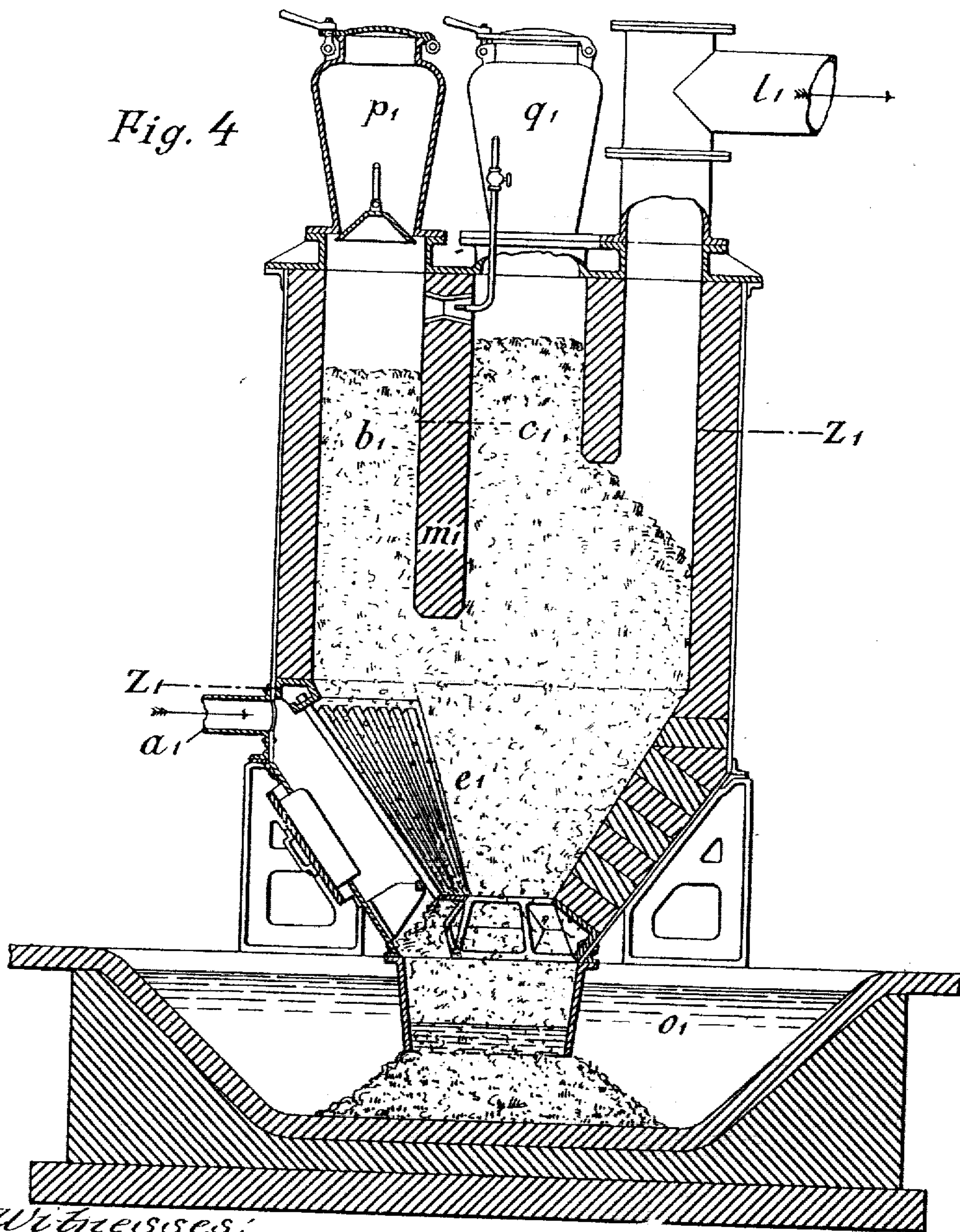
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4 SHEETS—SHEET 3.

Fig. 4



Witnesses:

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No. 815,794.

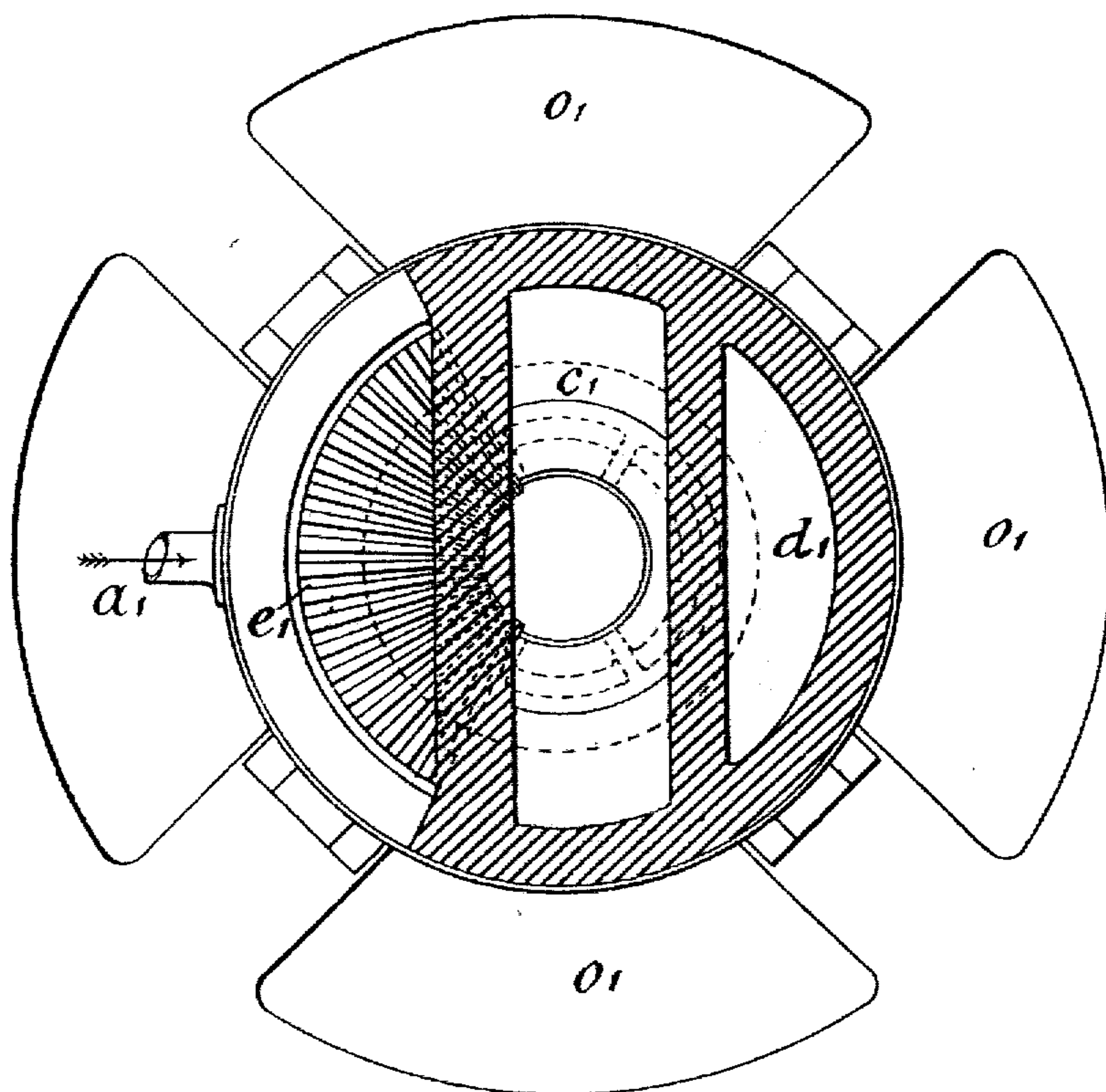
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A. CERASOLI.  
GAS PRODUCER.

APPLICATION FILED APR. 22, 1904.

4 SHEETS—SHEET 4.

Fig. 5



Witnesses:

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Alberto Cerasoli  
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# UNITED STATES PATENT OFFICE.

ALBERTO CERASOLI, OF ROME, ITALY.

## GAS-PRODUCER.

No. 815,794.

Specification of Letters Patent.

Patented March 20, 1906.

Application filed April 22, 1904. Serial No. 204,433.

*To all whom it may concern:*

Be it known that I, ALBERTO CERASOLI, civil engineer, a subject of the King of Italy, residing at No. 64 Via Sistina, Rome, Italy, have invented certain new and useful Improvements in Gas-Producers, (for which I have applied for Letters Patent in Great Britain on September 25, 1903, No. 20,678, and in Italy on February 6, 1904,) of which the following is a full and complete specification.

This invention relates to improvements in gas-generators especially suitable for burning combustibles containing a large amount of moisture—such as lignite, peat, wood, &c.—and combustibles containing large amounts of tarry matters and heavy hydrocarbons, such as some kinds of bituminous fuels, soft slacks, &c.

Hitherto great difficulty has been experienced in obtaining from these fuels a gas sufficiently good and pure to be used without the troublesome and expensive preliminary washing and cooling heretofore necessary for most purposes for which the gas can be used. When using fuels containing a large amount of moisture, the gas obtained from these fuels in the producers hitherto employed always contains a large amount of water-vapor which separates from the fresh charge of fuel, and it is necessary to wash with cold water or otherwise condense this water-vapor before the gas can be used for any purpose.

In the case of bituminous fuels, when it is attempted to gasify these in an ordinary producer the large amount of tarry matters and hydrocarbons which separate from each fresh charge of fuel fed into the producer renders the gas issuing from the producer wholly unfit to be used without preliminary scrubbing or washing, or both of these operations. To obviate these difficulties, I have designed a gas-producer which forms the object of my invention and by means of which it is possible to utilize the moisture contained in the fuel to obtain a gas richer in hydrogen.

The following description of the construction and the mode of working of this gas-producer will be better understood by reference to the following drawings, in which—

Figure I represents the new gas-producer in cross-section. Fig. II represents two gas-producers built side by side, the first on a longitudinal section through line X X, Fig. I, and the second in section Y Y, Fig. I. Fig. III represents two gas-producers built side

by side, the first in plan and the second in sectional plan through line Z Z, Fig. I. Fig. IV represents in vertical section a modification of the producer shown in Fig. I. Fig. V is a sectional plan of the producer shown in Fig. IV.

The upper part of the producer (shown in Figs. I, II, and III) is divided into three compartments *b c d* by two hanging partitions. The one, *m*, which is nearest to the grate, is carried down to a greater depth into the body of the producer than the other partition *n*. The two compartments *b* and *c* are provided at the top with hoppers *p q* for charging the fuel. Two or more such hoppers can be placed on the top of each of these compartments instead of one, according to the width of the producer. The compartment *d* serves as the gas-outlet and is connected to the gas-outlet pipe *l*, which takes the gas away from the producer.

The four sides surrounding the lower part of the producer are the two vertical walls *k k*, Fig. 2, opposite to each other and which are arranged at right angles to the above-described partitions *m n*. The third side is formed by the inclined wall *h*, Fig. I, which slopes inward and downward toward the bottom of the producer, and the fourth side is formed by the grate *e*, which is also inclined downward toward the center of the producer and is placed below the partition-wall *m*.

In the upper part of the partition-wall *m* I insert one or more steam-injectors *i i* or its or their equivalents and arrange them so as to draw or suck the gases from the top of the compartment *c* and force them into the upper part of the compartment *b*. The producer is closed at the bottom, preferably, by a water-lute *o*, into which the ashes and clinkers from the burned fuel collect and which can be removed from time to time. The producer is also fitted at the top with poke-holes *g g*, observation-holes, &c.

Figs. IV and V show, respectively in vertical and horizontal sections, a producer having a circular horizontal section, but in other respects is similarly constructed as the producer described above. In this circular producer the grate *e'* is shaped like a sector of an inverted truncated cone and extends for about one-third of the circumference of the producer.

Having described the construction of my producer, I will now describe its action. The fuel is charged into the compartments *c*



d by the hoppers p and q. The blast consist-  
 ing of cold or heated air or a saturated or su-  
 perheated mixture of air and steam is ad-  
 mitted into the producer by the blast-inlet  
 5 pipe a and comes in contact with the fuel after  
 passing through the grate e, on which the fuel  
 partly rests. The gas which is produced by  
 the blast traversing the mass of fuel in the  
 10 lower zone of the producer passes into the  
 outlet-chamber d and is taken away from the  
 producer by the gas-outlet pipe l. The ac-  
 tion of the injector or injectors i is to draw a  
 portion of the said producer-gases generated  
 15 in the lower part of the producer through  
 the fuel contained in the compartment c,  
 which fuel is distilled by coming into direct  
 and intimate contact with these hot gases,  
 and all the water-vapor and bituminous con-  
 20 stituents produced by this distillation, to-  
 gether with the producer-gas, are blown into  
 the upper part of the compartment b, and  
 thence they pass through the fuel contained in  
 the compartment b, whereby also the mois-  
 25 ture contained in this fuel is completely or  
 partially evaporated and the fuel is partly  
 distilled. The portion of producer-gas, after  
 having circulated through the two com-  
 partments c b and effected the complete or  
 30 nearly complete distillation of the fuel con-  
 tained in the compartment c and to a lesser  
 degree the distillation of the fuel contained in  
 the compartment b, enter into the hot zone of  
 combustion r, where the water-vapor and the  
 35 distillation-gases with which these gases are  
 charged are decomposed by the reducing ac-  
 tion of carbon at such a high temperature.  
 The water-vapor will form hydrogen, and the  
 two oxids of carbon and the distillation-  
 40 gases will form fixed gases, chiefly carbon  
 monoxid and methane. By this arrange-  
 ment the moisture contained in the fuel, and  
 which is given off as water-vapor, together  
 with the condensable gases produced by the  
 45 distillation in traversing the incandescent zone  
 of fuel, as described above, is utilized, thus  
 effecting a considerable saving in steam  
 which otherwise would have to be supplied  
 from external sources for the production of  
 the gas and for the recovery of the ammonia.  
 50 The fuel charged into the compartment b de-  
 scends gradually into the hot combustion  
 zone f, where it comes into contact with the  
 blast and is thereby burned, the products of  
 this combustion being chiefly carbon dioxid,  
 55 water-vapor, and hydrocarbon, or condens-  
 able gases, which products in passing subse-  
 quently through the combustion zone r are  
 decomposed into fixed gases, chiefly carbon  
 monoxid and hydrogen. The gas obtained  
 60 from this producer will therefore also be com-  
 paratively dry and free from bituminous con-  
 stituents and condensable gases, and it can  
 therefore be applied directly to most of the

uses to which ordinary producer-gas is ap-  
 plied without any preliminary washing or 65  
 scrubbing.

When it is desired to recover the ammonia  
 from the gas, it is preferable to reduce the  
 quantity of gas circulating inside the pro-  
 ducer by the action of the injectors to such a 70  
 point, so that the temperature in the com-  
 partment c may not exceed the temperature  
 required for the evaporation of the moisture  
 and for the distillation of the more volatile hy-  
 drocarbons. At this temperature the nitrogen 75  
 contained in the fuel does not form ammonia;  
 but this reaction takes place in the combus-  
 tion zone r, from whence the ammonia goes  
 out of the producer, together with the pro-  
 ducer-gas, without traversing any zone of 80  
 high temperature which would cause its de-  
 composition.

Having now fully described my said inven-  
 tion and the manner in which the same is to  
 be performed, I declare that what I claim, and 85  
 desire to secure by Letters Patent, is—

1. A gas-producer having a slanting grate  
 in the lower part thereof and the upper part  
 of which is divided into several compart-  
 ments of different depth by hanging parti- 90  
 tions parallel or quasi parallel to the slanting  
 grate, two or more adjoining compartments  
 being provided with hoppers on the top to  
 charge them with fuel so that a portion of  
 this fuel is delivered by gravitation direct 95  
 onto the grate and in the body of the pro-  
 ducer and so that the fuel is distilled by com-  
 ing into direct contact with the hot gases, and  
 the other of said compartments forming a gas-  
 outlet chamber, and a gas-outlet pipe com- 100  
 municating with said gas-outlet compart-  
 ment, substantially as set forth.

2. A gas-producer having a slanting grate  
 in the lower part thereof and the upper part  
 of which is divided into several compart- 105  
 ments of different depth by hanging parti-  
 tions parallel or quasi parallel to the slanting  
 grate, two adjoining compartments being  
 provided with hoppers on the top to keep  
 them charged with fuel and also with one or 110  
 several injectors or their equivalents, fixed in  
 the partitions dividing these two compart-  
 ments for circulating the products of the dis-  
 tillation taking place in these compartments  
 inside the producer and forcing them through 115  
 the hot zone of combustion, and the other  
 of said compartments forming a gas-outlet  
 chamber, and a gas-outlet pipe communi-  
 cating with said gas-outlet compartment, sub-  
 stantially as set forth. 120

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

ALBERTO CERASOLI.

Witnesses:

G. B. ZAUARDO,  
 A. RAZZI.