

A. B. RECK.  
CAST IRON BOILER.  
APPLICATION FILED NOV. 30, 1907.

905,366.

Patented Dec. 1, 1908.

3 SHEETS—SHEET 1.

Fig. 1.

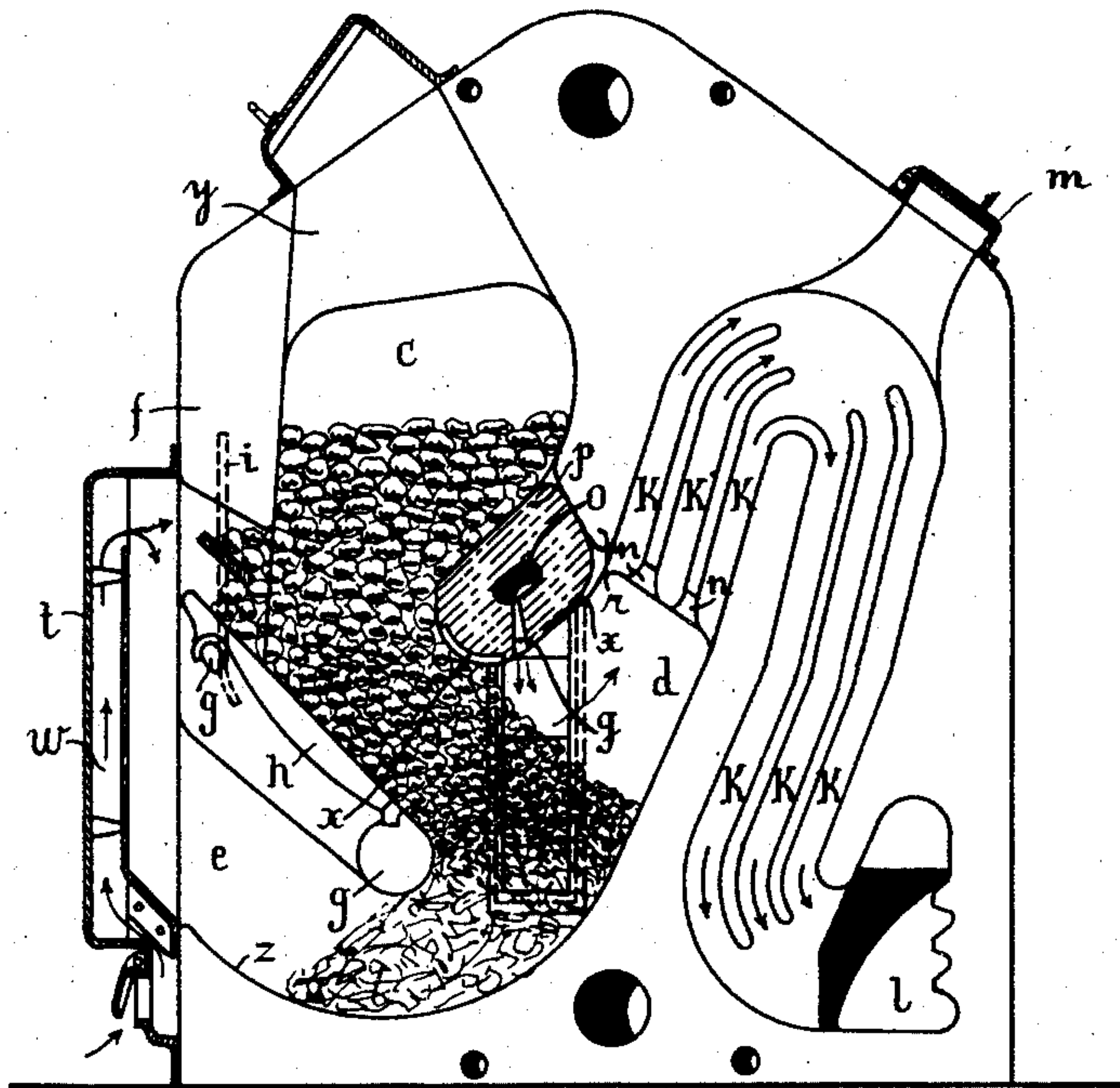
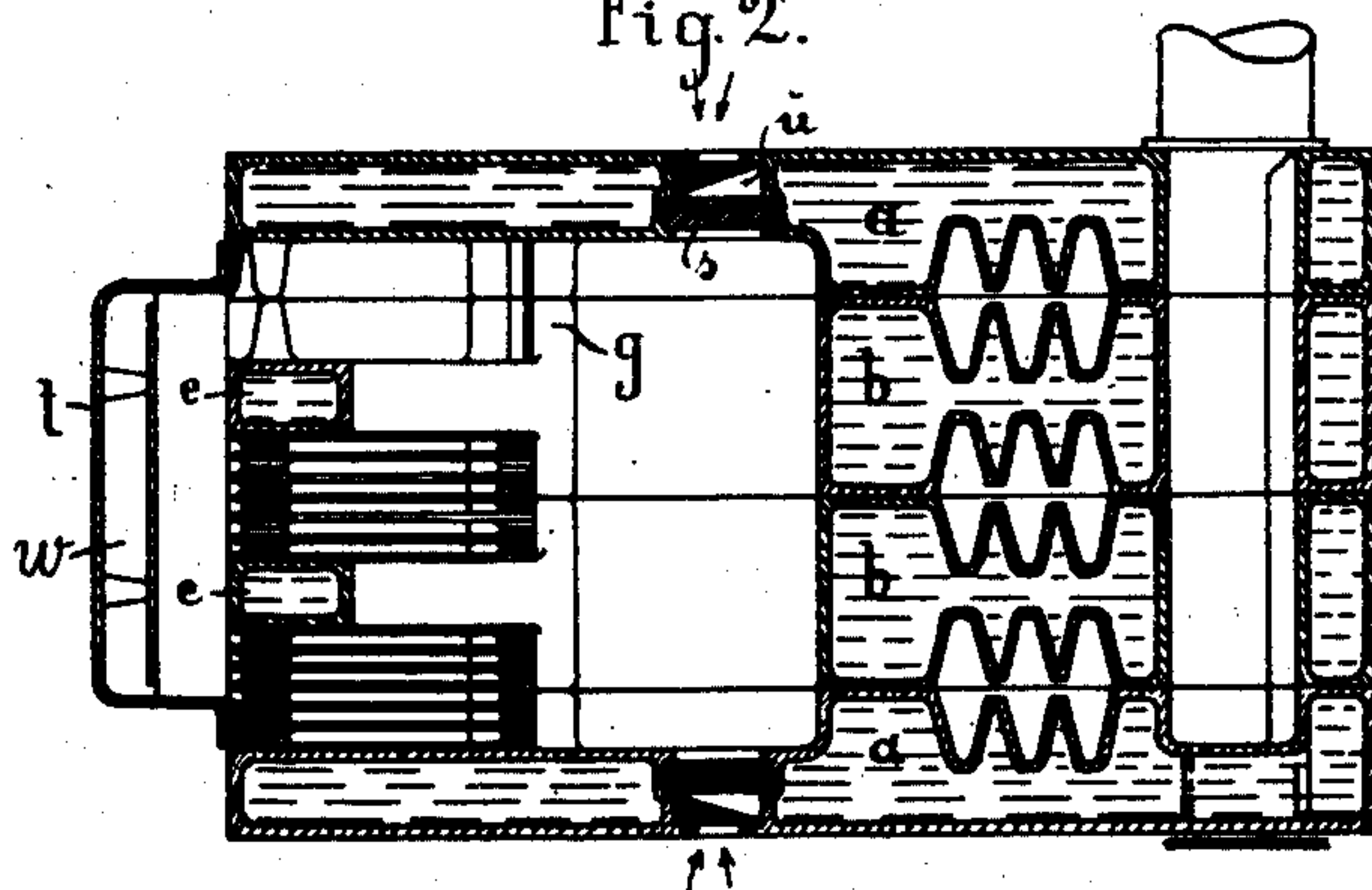


Fig. 2.



WITNESSES

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INVENTOR

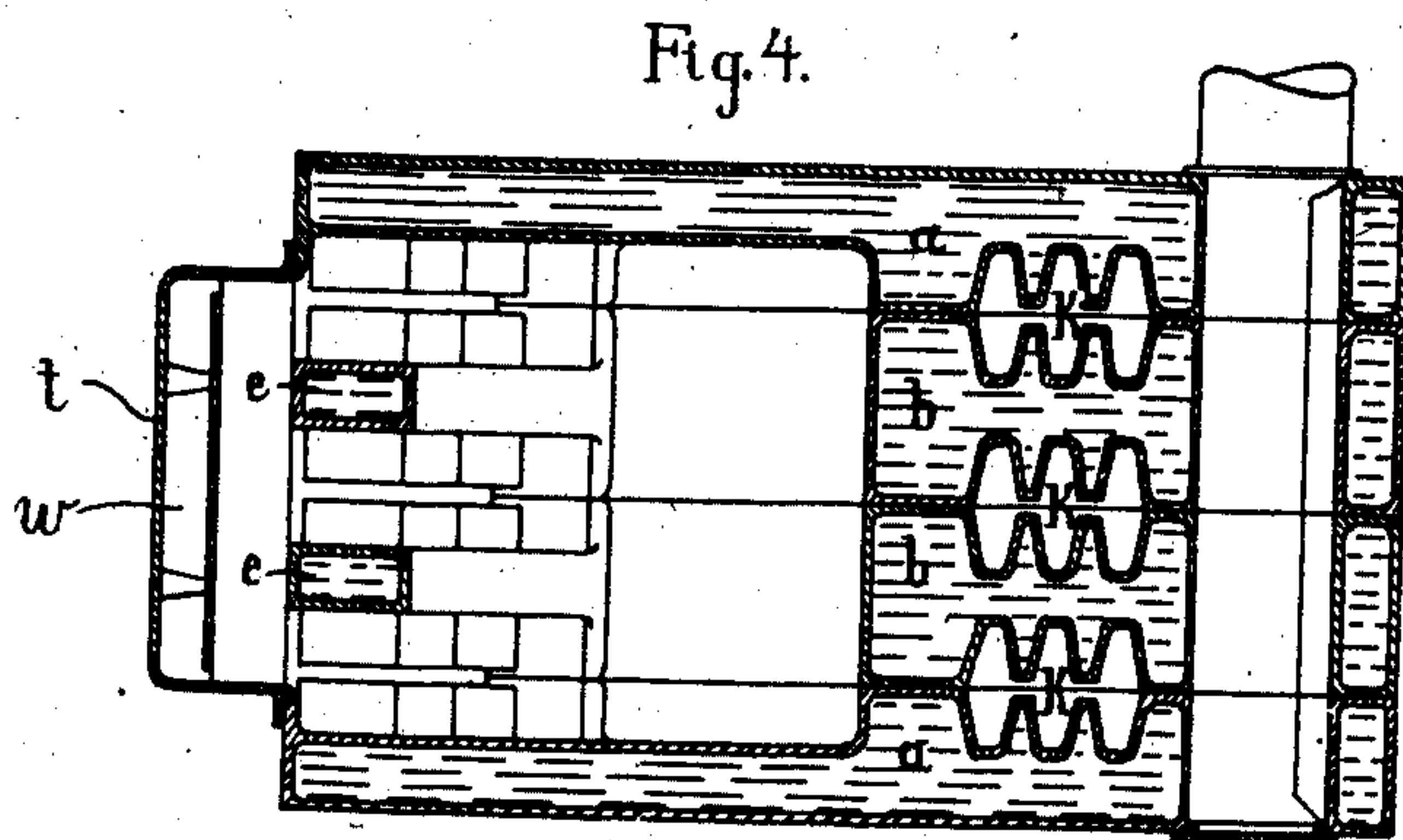
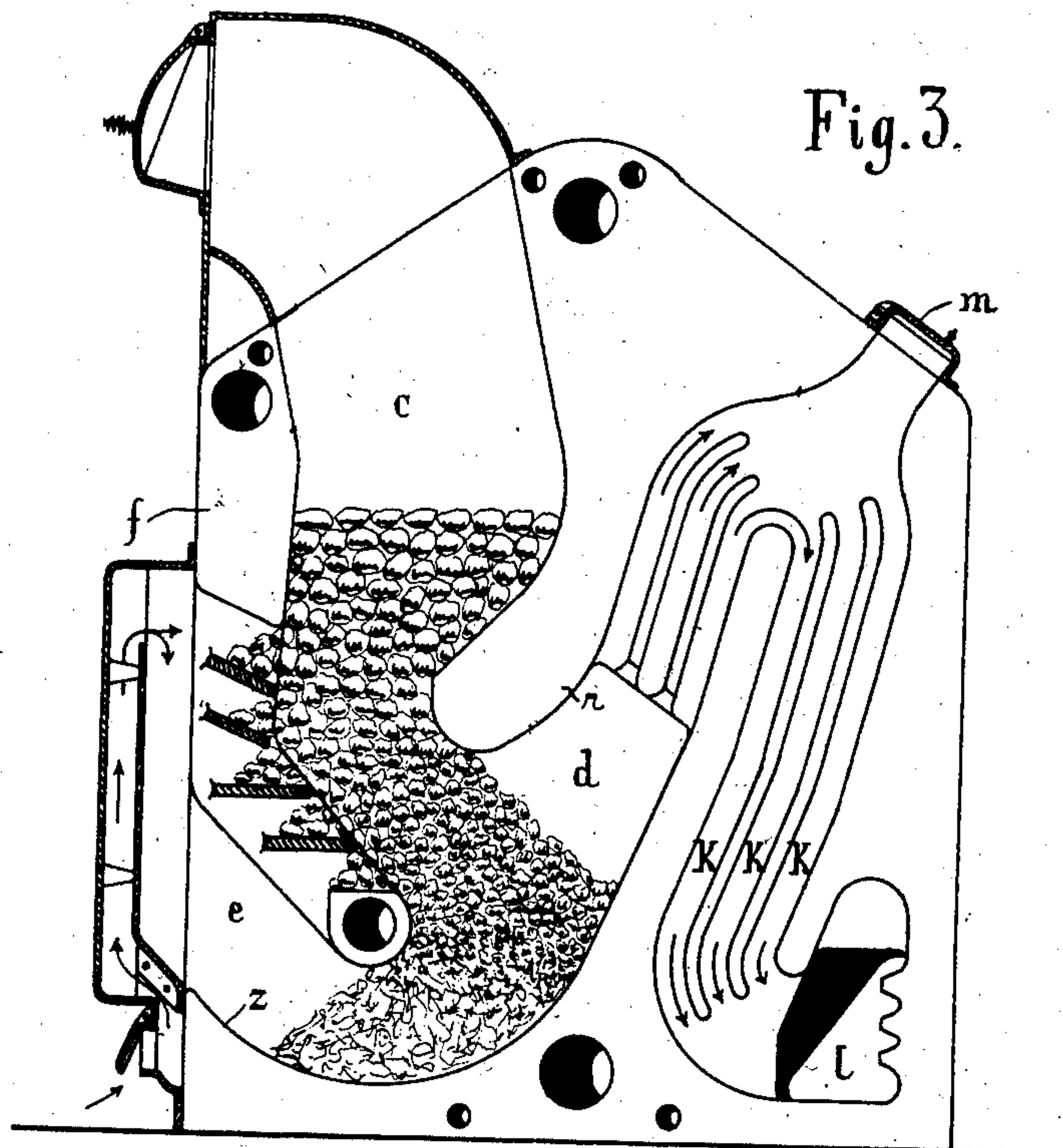
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3 SHEETS—SHEET 2.



WITNESSES

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3 SHEETS—SHEET 3.

Fig. 5.  
SECTION. α-b.

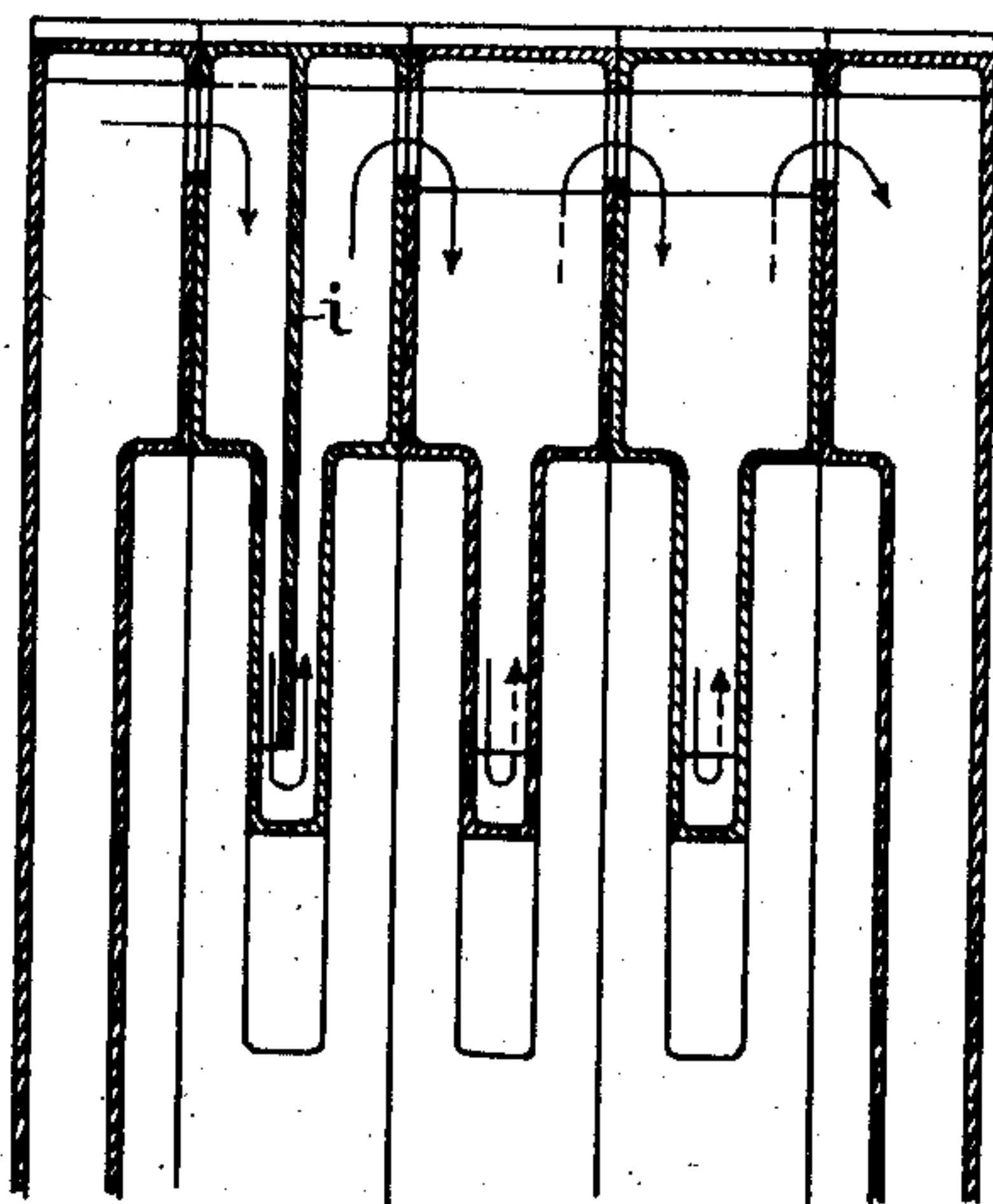


Fig. 6.  
SECTION. e-f

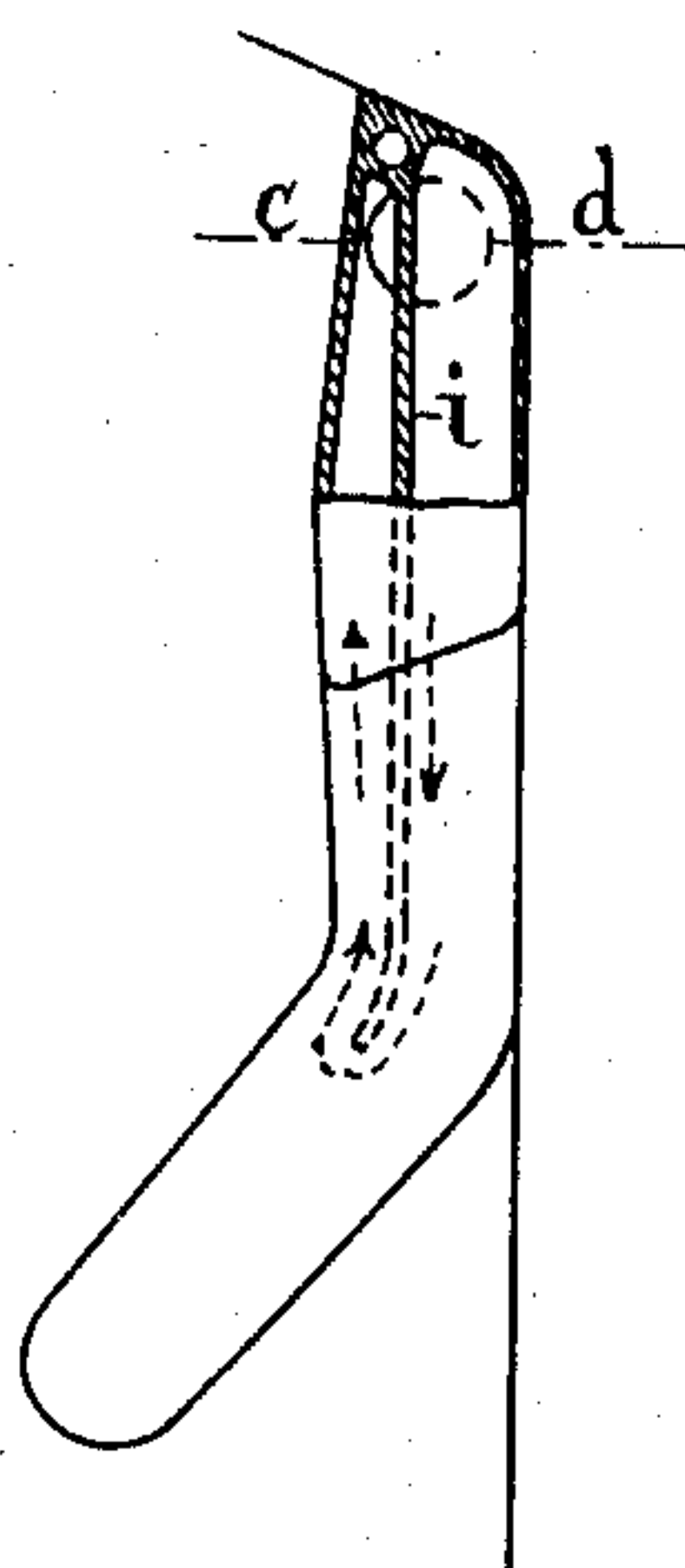
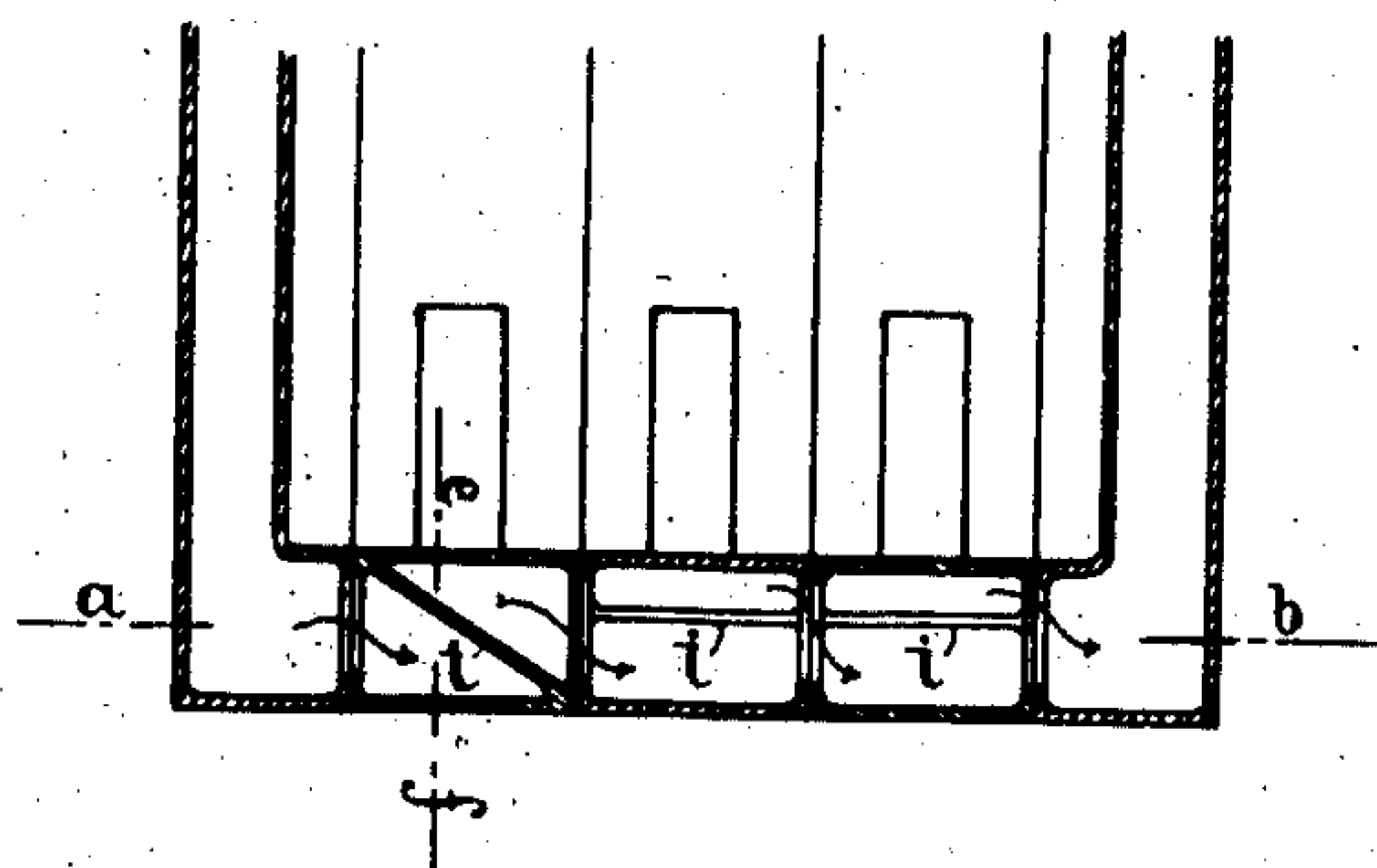


Fig. 7.  
SECTION. c-d



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# UNITED STATES PATENT OFFICE.

ANDERS BORCH RECK, OF HELLERUP, DENMARK.

## CAST-IRON BOILER.

No. 905,366.

Specification of Letters Patent.

Patented Dec. 1, 1908.

Application filed November 30, 1907. Serial No. 404,622.

*To all whom it may concern:*

Be it known that I, ANDERS BORCH RECK, captain, citizen of Denmark, residing at Christiansvej 16, Hellerup, in the Kingdom of Denmark, have invented new and useful Improvements in Cast-Iron Boilers, of which the following is a specification.

It has been proposed to build cast iron boilers in sections having such a form and connected in such a manner that the area of the grate and to some extent the area of the flue vary proportionately with the number of sections employed. Such boilers can also, as is known, be supplied with a fuel magazine situated above the combustion space, the size of which may be varied proportionally to the number of sections.

The present invention relates to boilers of this class.

Owing to the form of the sections hitherto used, it has not been possible to obtain a practical arrangement of a sloping or vertical grate, and consequently horizontal grates have exclusively been used. For cast iron boilers which have to be run for a prolonged period without attention and for boilers using bituminous fuel it is of great importance that the grate should not become easily choked by ashes and clinkers as is the case with horizontal grates, and that the grate should be so arranged that the incombustible part of the fuel may be collected at the bottom of the furnace without interference with the combustion. This result has been achieved in wrought iron boilers by using a sloping and partly vertical grate, and this is the arrangement which is applied to sectional cast iron boilers such as above referred to, which according to the present invention are so constructed as to allow a practical arrangement of a sloping or a partly sloping and partly vertical grate. This is achieved by constructing the various sections of which the boiler consists with the ash-pit door, through which the grate is attended to, placed at right angles to the side walls of the sections, the depth of the furnace and consequently the form and length of the grate being constant whether the boiler consists of two or more than two sections. By having the depth of the furnace the same whether the boiler has few or many sections, it becomes possible to use in cast iron boilers of this class either a vertical grate or a grate which is partly vertical and partly sloping, the length and slope being dependent on the

number of sections, while its area varies with the number of sections.

The following description and the accompanying drawings show examples of the said invention.

Figure 1 shows a vertical section, taken between two boiler sections, of a boiler having sloping and loose grate bars which is especially adapted for firing with bituminous fuel. Fig. 2 shows a sectional plan section of the same boiler consisting of two middle sections and two side sections. Fig. 3 shows a vertical section through a boiler especially adapted for firing with coke and supplied with a grate formed in steps. Fig. 4 shows a sectional plan section of the boiler of Fig. 3. Figs. 5, 6 and 7 show details of how the front partitions of the middle sections can be made if they are made as independent castings.

The boiler is constructed in the known manner of separate sections, two side sections *a*, and one or more middle sections *b*. As shown in Fig. 1 the middle sections can be constructed in one piece to form both front and rear portions of the boiler and having a large hollow space between the two side sections partly forming the fuel magazine *c* and partly the combustion chamber *d* and the ash-pit *e*. The front of the magazine *c* is constituted by the water filled front portions *f* of the sections, which in Fig. 1 are shown as bags or pockets connected only at their upper ends with the rear water space parts of the sections by horizontal passages *g*, but they could also be independent castings and could be connected to the side sections both above and below as shown in Fig. 3 or only above as shown in Figs. 5, 6 and 7. The said horizontal connections *g* Fig. 1 between the front and rear parts are narrow with intervals between them, through which the fuel can be charged into the fuel magazine. The lower part of the front water space of the sections is inclined towards the combustion chamber in a sloping direction and is more narrow than the remaining part of the section to provide intervals between the sections in which the grate bars *h* are placed, and is further provided with projecting bosses *g* as shown in Figs. 1 and 2 forming supports for the grate bars *h*. The supports for the grate bars will in this manner be kept cooled by the water of the boiler, and this is of great importance, especially in the case of the lowest grate bar, which might



soon be destroyed if not cooled by water. As the grate bars themselves have usually very considerable durability and can moreover be easily replaced if necessary, this cooling is of the greatest importance, and this also applies to the water cooled bottom of the ash-pit. Besides the sloping grate formed by the grate bars *h* some of the front parts *f* will also act, as shown in Figs. 1 and 3, as a vertical grate, whereby the primary combustion air can enter into the fuel magazine on the lower part of its vertical front wall, which is of great importance to boilers which have to be run without attention for a prolonged period; as it is evident that in any case the vertical part of the grate may very easily be choked up by ashes and clinkers which by and by fall to the bottom as the combustion is effected.

In order to get the best circulation of the water in the bag-shaped front part as shown in Fig. 1, a vertical partition wall *i* may be placed in the water space of this front wall as shown by dotted lines in Fig. 1. As aforesaid the Figs. 5, 6, and 7 show a construction of the front partitions *f* in such cases where they are made as independent castings, and they further show a vertical partition wall *i* in order to obtain a good circulation of the water through the front portions. In order to force the water in a fixed direction through the front portions, the partition wall in one of the outer front portions is led quite up to the top while the partition walls in the other portions do not quite reach the top. From the combustion chamber *d* the combustion products are led through the flues *k*. As shown by the figures the flues are arranged in such a manner that each pair of sections has its own system of flues which at one end open into the combustion chamber *d* and at the other end into a common flue *l* leading to a chimney. The flues *k* are made as long as possible in proportion to the size of the boiler section so as to offer the maximum heating surface to the water. Accordingly the flues are given the S-form shown in Figs. 1 and 3, which also has the advantage that the cleaning of the flues can easily be done through a door *m* situated opposite the upper bend of the S in the rear of each pair of sections, the partitions *n* between the separate flues of which the flue system of each section consists stopping short on each side of the door *m* for this purpose. The special form given to the flues also enables a fuel magazine of large capacity to be provided in the boiler sections.

The ash-pit door *t* is placed in front of the ash-pit and the grate and may be double walled as shown in Figs. 1 and 2 in order to enable the primary combustion air to be pre-heated by passing through the channel *w*, made for that purpose, in the door, thereby

utilizing the heat which would otherwise radiate from the front part of the boiler.

An additional supply of air for combustion may be provided for boilers in which it is desired to burn bituminous fuel. As shown in Figs. 1 and 2 it is admitted through a horizontal channel *o* which is led through brickwork *p* placed between the tongues *r* in front of the flues *k* and resting on the ribs *x*. The said horizontal channel *o* may be placed in communication with one or several vertical channels *u* which are led up through the side sections *a* where they are lined on the furnace side by the fireproof brickwork *s* (see Fig. 2) the air supply being regulated by a valve. In passing through these vertical channels the secondary combustion air is heated intensely by radiation from the brickwork *s* before it reaches the channel *o* whence it finally passes into the combustion chamber through the opening *q*.

Boilers which are not intended to be fired by bituminous fuel do not require the secondary supply of air and the channels *o* and *u* as well as the fire-proof brickwork *p* and *s* can be omitted as shown in Fig. 3.

Instead of using the loose inclined grate bars as shown in Fig. 1 other grate arrangements may be substituted, as for example the stair grate shown in Fig. 3, which may consist either of loose steps or of ribs affixed to the front parts *f* and the side sections *a*.

Having now described my invention, what I claim as new and desire to secure by Letters Patent is:

1. In a sectional cast iron boiler for steam or hot water the combination of a sloping grate, grate bars, a fuel magazine situated above the grate, end- and middle-sections touching one another in planes placed at right angles to the front wall of the boiler, the said middle-sections having water filled front portions *f*, lining the front part of the fuel magazine and having their lower part sloping down against the rear and forming water cooled supports for the grate-bars which are situated between the lower parts of the said front portions *f*, said supports having intervals between their rear ends and the bottom of the ash-pit in such a manner that ashes and clinkers can be drawn out of the combustion chamber through said intervals.

2. In a sectional cast iron boiler for steam or hot water the combination of a sloping grate, grate bars, a fuel magazine situated above the grate, end- and middle-sections touching one another in planes placed at right angles to the front wall of the boiler, the said middle-sections having water filled front portions *f*, lining the front part of the fuel magazine and having their lower part sloping down against the rear and forming water cooled supports for the grate-bars



which are situated between the lower parts of the said front portions *f*, said supports having intervals between their rear ends and the bottom of the ash-pit in such a manner that ashes and clinkers can be drawn out of the combustion chamber through said intervals, a horizontal main flue *l* and smoke-flues *k* between the sections of the boiler, the said flues commencing in the combustion chamber *d* and ending in the horizontal main flue *l*.

3. In a sectional cast iron boiler for steam or hot water the combination of a sloping grate, grate bars, a fuel magazine situated above the grate, end- and middle-sections touching one another in planes placed at right angles to the front wall of the boiler, the said middle-sections having water filled front portions *f*, lining the front part of the fuel magazine and having their lower part sloping down against the rear and forming water cooled supports for the grate-bars which are situated between the lower parts of the said front portions *f*, said supports having intervals between their rear ends and the bottom of the ash-pit in such a manner that ashes and clinkers can be drawn out of the combustion chamber through said intervals, a horizontal main flue *l*, and smoke-flues *k* between the sections of the boiler, the said flues commencing in the combustion chamber *d* and ending in the hori-

zontal main flue *l*, and having an *S* form, ribs *n*, forming the partition walls between the separate flues, and section at the doors *m* situated at the rear of the sections.

4. In a sectional cast iron boiler for steam or hot water the combination of a sloping grate, grate bars, a fuel magazine situated above the grate, end- and middle-sections touching one another in planes placed at right angles to the front wall of the boiler, the said middle-sections having water filled front portions *f*, lining the front part of the fuel magazine and having their lower part sloping down against the rear and forming water cooled supports for the grate-bars which are situated between the lower parts of the said front portions *f*, said supports having intervals between their rear ends and the bottom of the ashpit in such a manner that ashes and clinkers can be drawn out of the combustion chamber through said intervals, the side sections of the boiler having air channels *u* therein which communicate with the combustion chamber.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

ANDERS BORCH RECK.

Witnesses:

J. NIELSEN,  
JULES AERGAARD.