

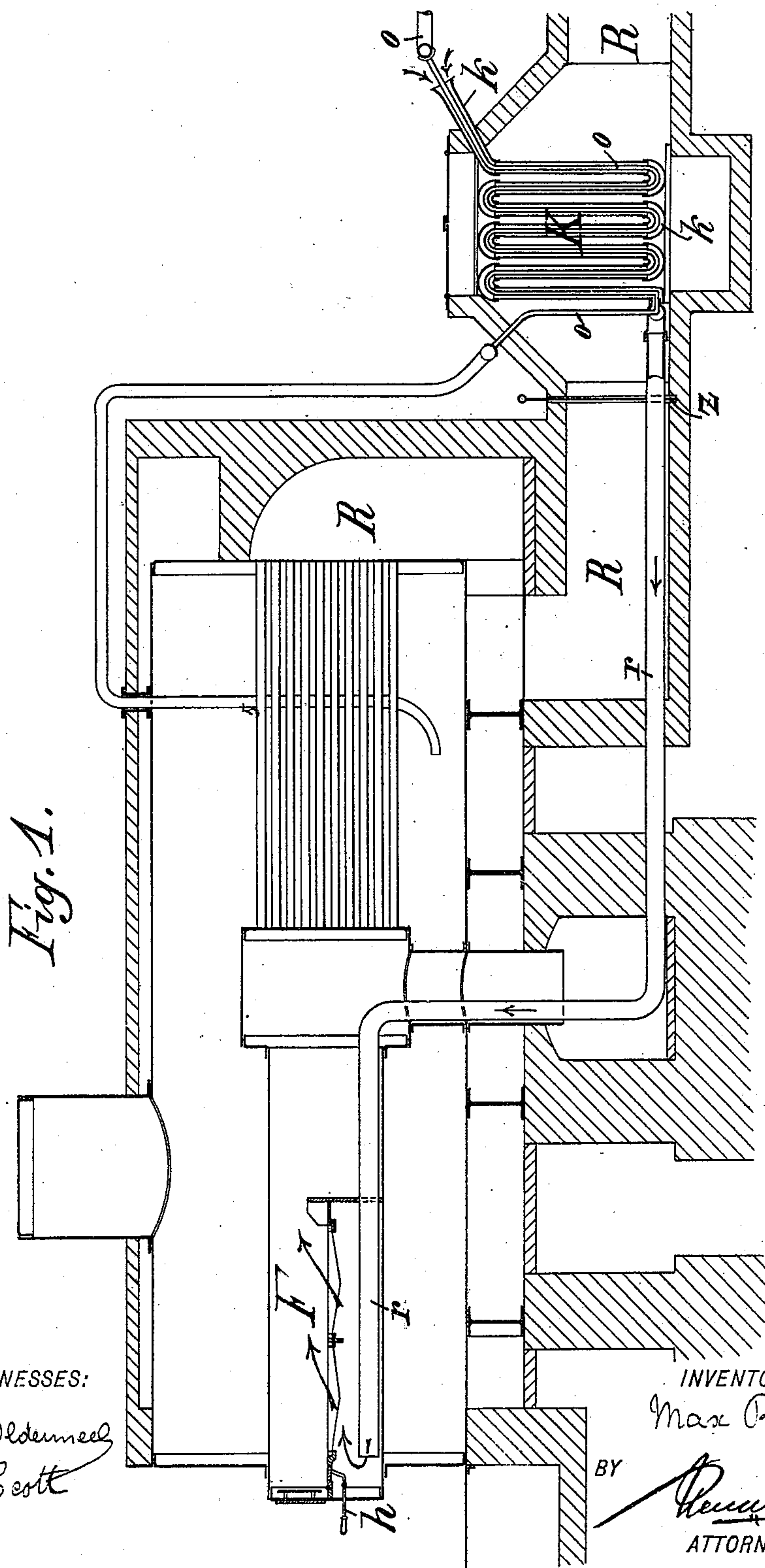
(No Model.)

3 Sheets—Sheet 1.

M. RICHTER.
SMOKE CONSUMER.

No. 553,542.

Patented Jan. 28, 1896.



WITNESSES:
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C. A. Scott

INVENTOR
Max Richter
BY *[Signature]*
ATTORNEYS

(No Model.)

3 Sheets—Sheet 2.

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Fig. 2.

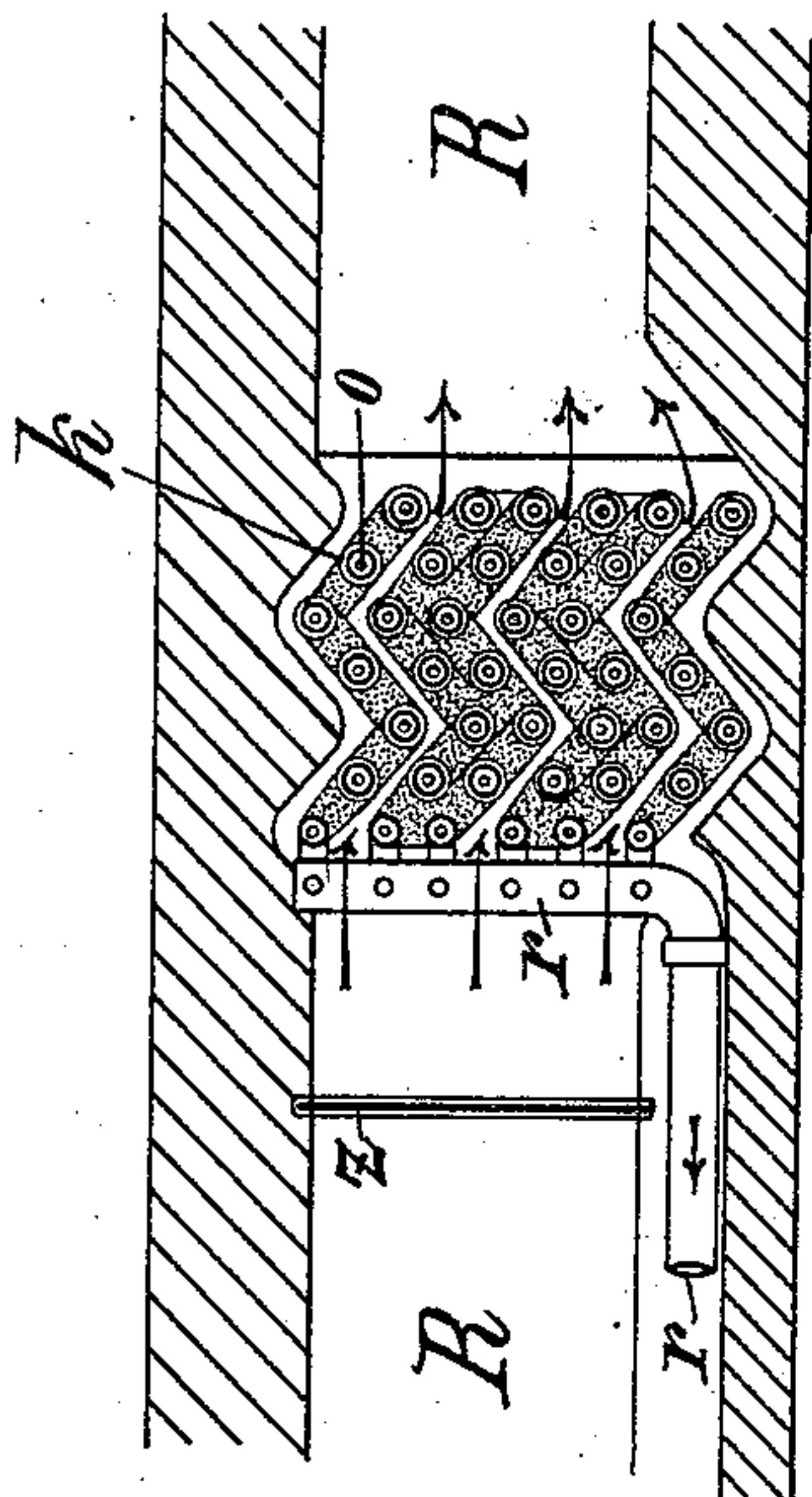


Fig. 3.

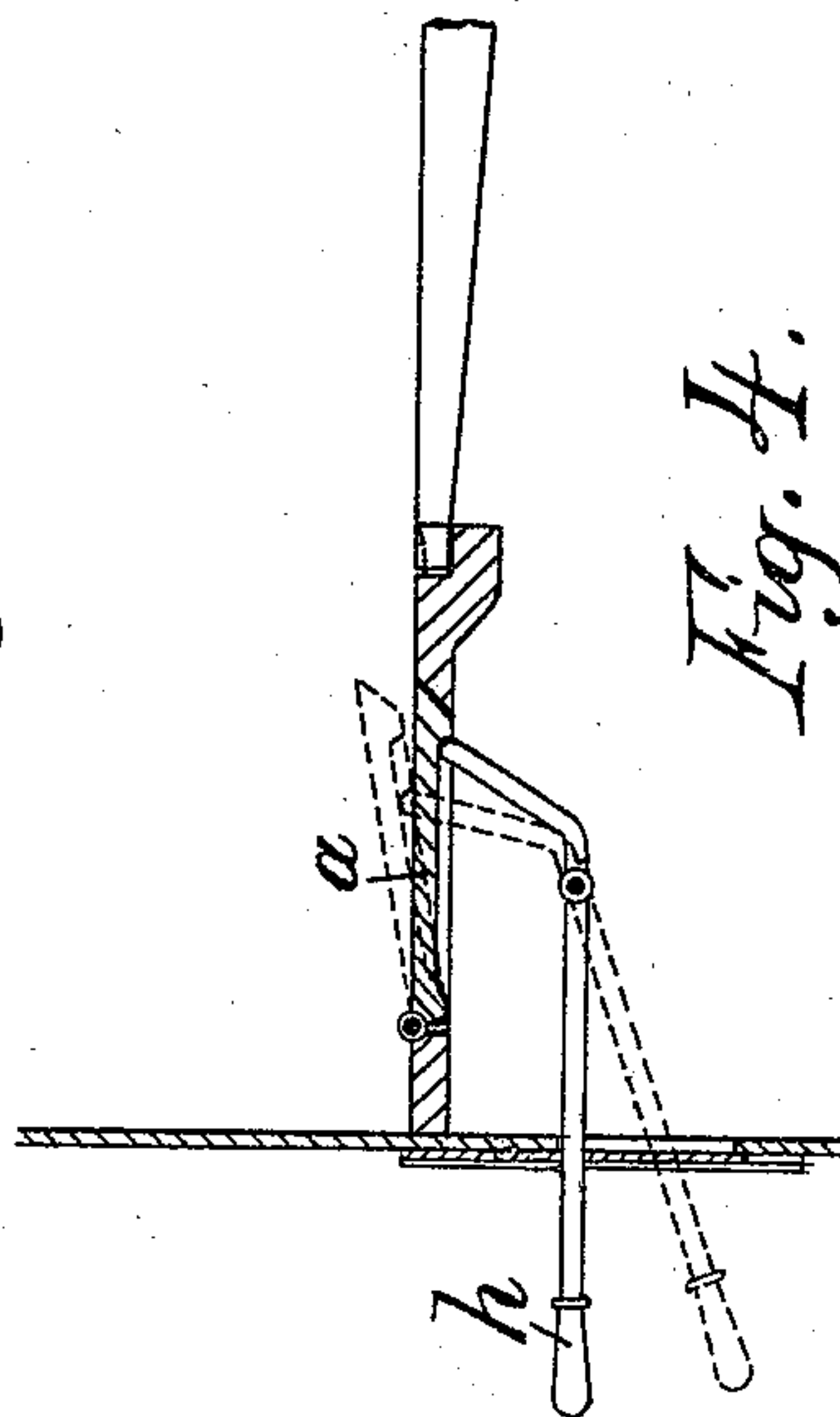
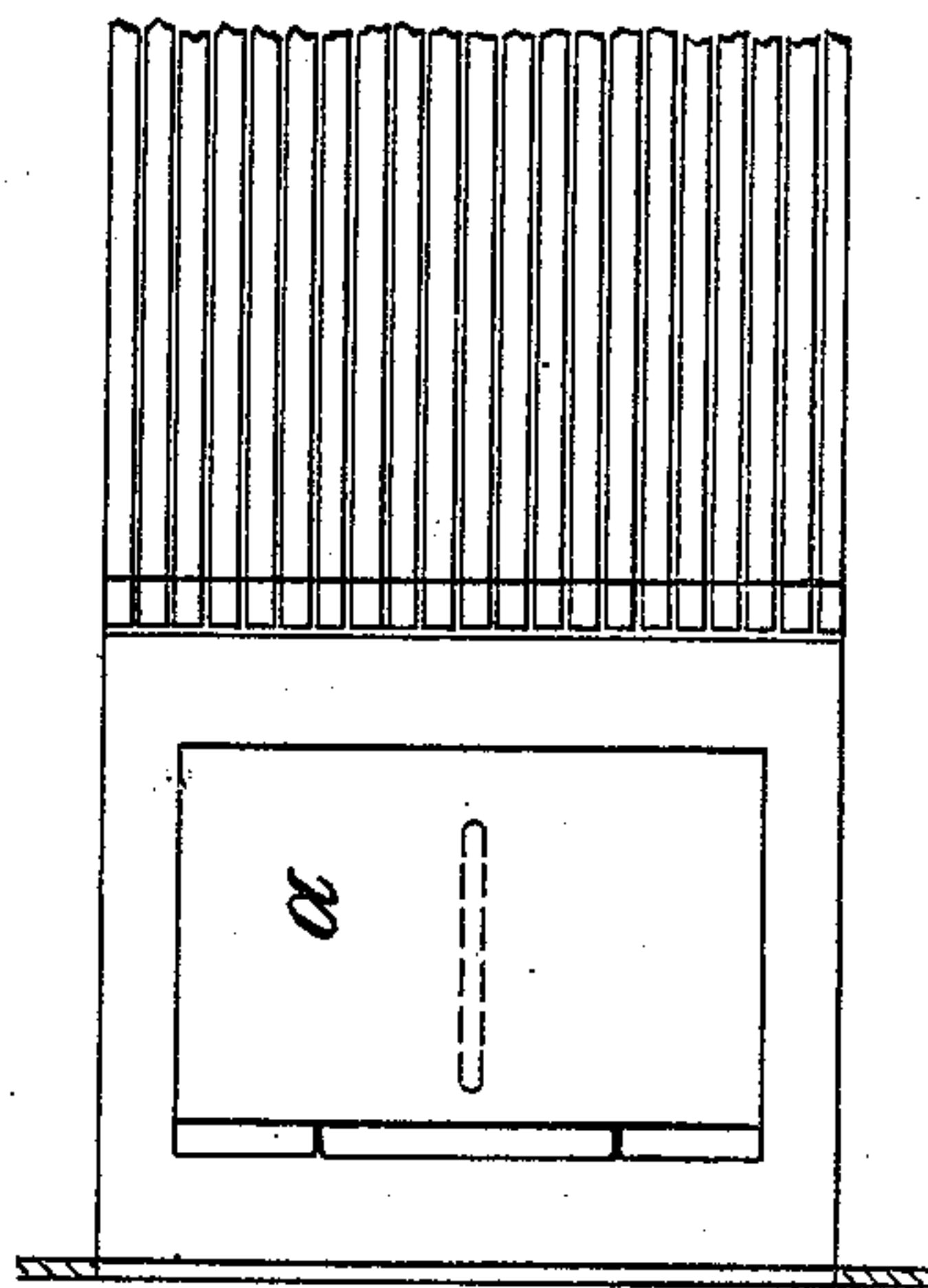


Fig. 4.



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Fig. 5.

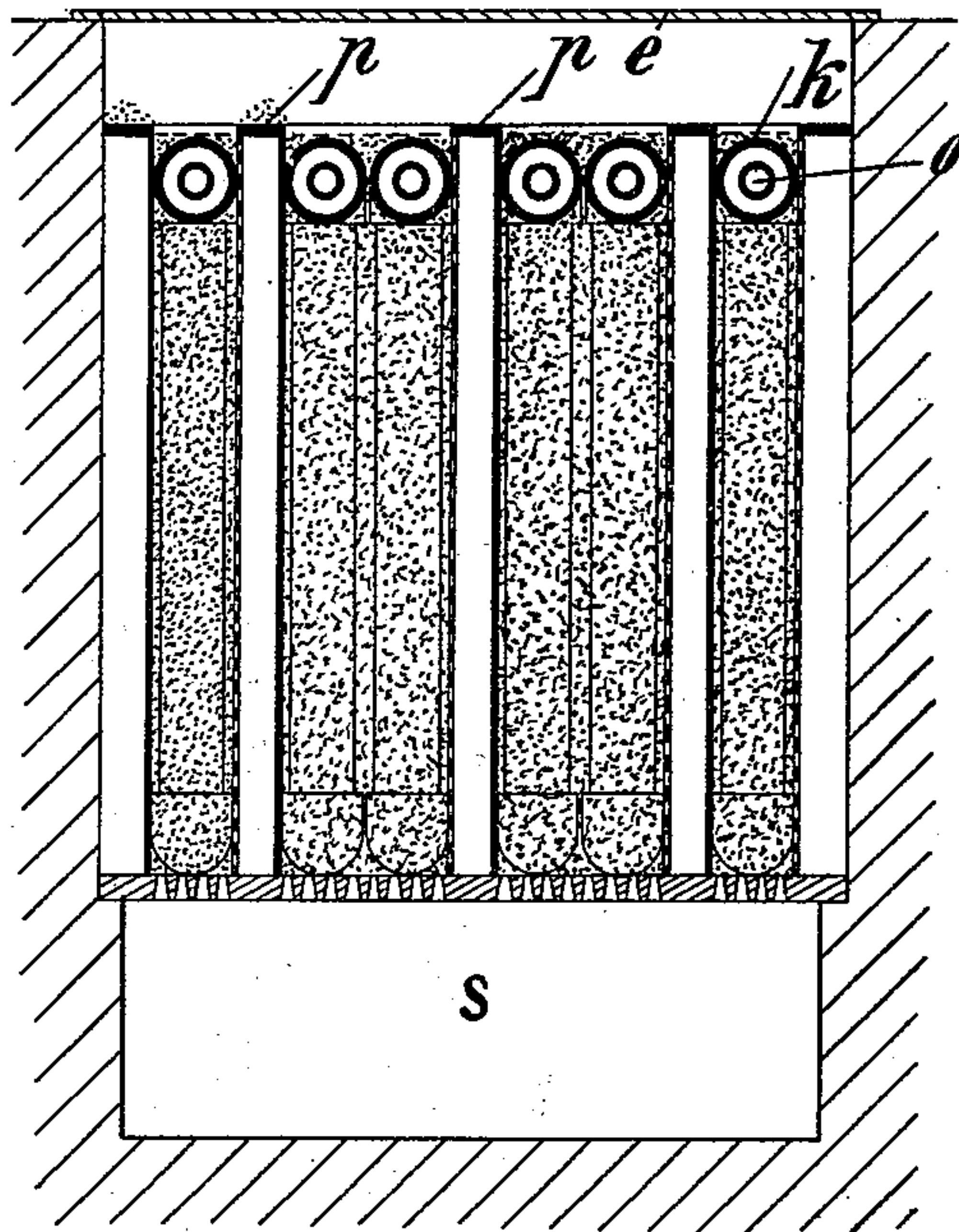
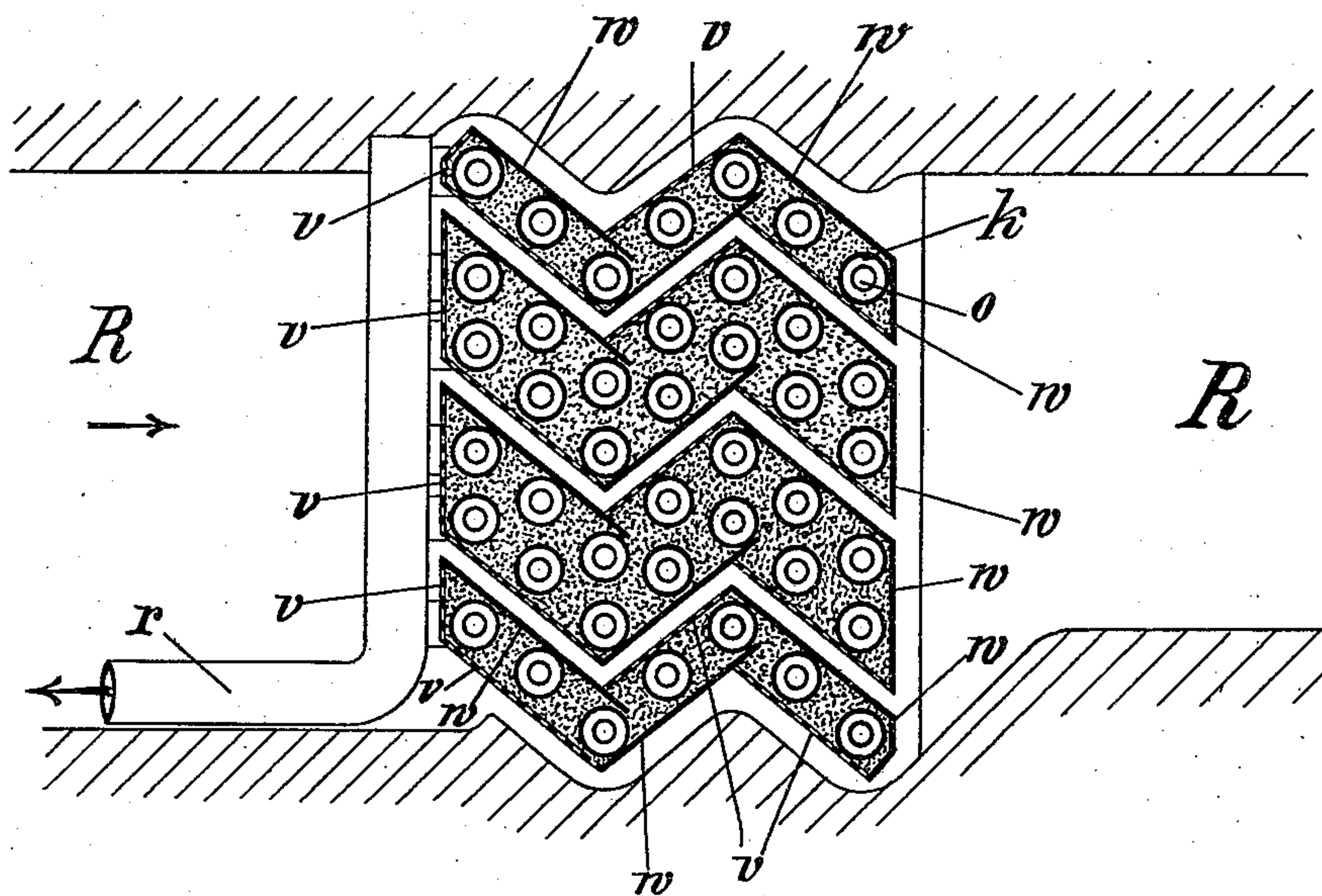


Fig. 6.



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UNITED STATES PATENT OFFICE.

MAX RICHTER, OF MILDENAU, AUSTRIA-HUNGARY.

SMOKE-CONSUMER.

SPECIFICATION forming part of Letters Patent No. 553,542, dated January 28, 1896.

Application filed June 1, 1895. Serial No. 551,400. (No model.)

To all whom it may concern:

Be it known that I, MAX RICHTER, manufacturer, an Austrian subject, residing at Mildenau, near Raspenau, in Bohemia, Empire of Austria-Hungary, have invented a certain new and useful Process for the Utilization of Smoke by Combustion, of which the following is a specification.

The products generated when fuel is only partially consumed by fire escape in the form of smoke, which essentially consists of soot, tar-vapors, and powder-ashes.

Smoke will be formed when the products of combustion of the respective fuel have not attained the temperature of inflammation, and the fact that the cold atmospheric air flowing toward the fire, besides the coal getting in a cooled state on the fire, strongly cools down the flame, contributes not a little to the generation of smoke.

A complete smokeless and at the same time profitable combustion will be obtained by the device specified hereinafter, according to which the departing smoke-gases are conducted through a special fireplace—a kind of fiery filter—which for the passage of the smoke-gases may be made as deep as it is desired, where the same, as far as they are altogether combustible, must be consumed, and the heat getting free is utilized for the heating of the air required for the principal fireplace, and in any other manner adapted to the respective circumstances—for instance, for the heating of the boiler feed-water.

The heated air is led in the most rational way under the grate of the smoke-generating fire, and this grate is at the same time provided with a contrivance to let the air surely pass over the grate to the fire.

The smoke-consuming apparatus, which completely bars the smoke-channel, (flue,) consists, as is to be seen from the drawings, of a tube system which is contrived in such a way that between every two rows of tubes the burning or glowing material may be placed, whereas the smoke-gases pass through the not-barred neighboring rows and are to be burned in contact with the burning or glowing material. This tubular system consists of an inner tube conduit in which, for instance, the boiler feed-water is conveyed, and of an outer tube conduit inclosing the

former and containing the combustion-air. No particular mention is needed that the two tube-conduits may also be placed in juxtaposition.

If the incombustible products of ignition departing to the chimney have still in leaving the smoke-consuming apparatus such a high temperature that it would be against the principles of economic utilization of the generated heat to let it escape unutilized, these gases may be cooled down to any required degree by the means of extending the tube system of the smoke-consuming apparatus in the direction toward the chimney without enlarging at the same time the glowing-surface of the same.

The combustibles to be used in the smoke-consuming apparatus are to burn without smoke; but they may also be mixed with other materials, so that a non-smoking combustible (coke) may be used, or such a one mixed with smoking combustibles, (coal, wood,) or even smoking wastes. In using mixtures the smoking fuel must be placed in the fore part of the smoke-consuming apparatus, so that the products of combustion passing through and generated in the smoke-consuming apparatus must at any rate pass through a layer of material burning without smoke before they arrive in the chimney. To the smokeless-burning feeding material of the smoke-consuming apparatus may also be mixed glowing matters (pieces of fire-bricks, silicates) in not too large quantities. (About fifty per cent.)

In the accompanying drawings, Figure 1 is a sectional elevation of a furnace embodying my invention. Fig. 2 is a horizontal cross-section of the smoke-consumer. Figs. 3 and 4 are details of the grate. Figs. 5 and 6 are enlarged sectional detail views of the smoke-consumer.

The smoke and fire gases starting from the fire-hearth F of the illustrated boiler-fireplace construction go through the flue R to the smoke-consumer K, which is traversed by tubes *o* containing the boiler feed-water. These tubes *o* are inclosed by tubes *k* of far larger diameter, whose open ends extend to the open air to suck air, whereas the other ends join the air-conducting tube *r*, which gathers the combustion-air heated in the smoke-consumer and conveys it to the fireplace F.

The tube *r* ends under the fireplace *F* and under the front grate of the same. Before this grate there is a clack *a* separating the fireplace from the ash-box, which clack may be
 5 lifted by means of a hand-lever *h* for the purpose of securing the access of the heated air to the fire, also when the grate is obstructed, or when the fire is fed with fresh fuel, &c.

A nearly complete combustion taking place
 10 already in the fireplace *F*, the smoke-consumer *K* is able, even if the glowing-surface is not over large, to get all the combustible products of combustion conveyed to it actually burned, and to utilize the caloric thereby
 15 set free for the heating of the feed-water and air.

The fireplace construction described hereinbefore will operate the better, if the diameter of the air-supply pipe is large enough, the
 20 more hermetically the fire-doors and ash-box openings can be closed.

Figs. 5 and 6 show a form of construction of the smoke-consumer which will hold good in most cases. The air and water conveying
 25 pipes *k* and *o*, which traverse the smoke-consumer, are inclosed by walls for the reception of fuel in such way that between the fuel-receptacles there remain zigzag ways for the traversing products of combustion of the main
 30 fireplace *F*. In order to cause these gases to stop as long as possible in the smoke-consumer, the walls *w* of the fuel-receptacles, which face the openings for the departing gases, are constructed in full, whereas the
 35 walls *v*, turned to the opposite direction, are pierced.

In order to facilitate the insertion of fuel into the smoke-consumer, it is covered with a plate *p*, which is formed of a zigzag shape.
 40 A lid *e* forms the upper, the ash-box *s* the lower, closing of the smoke-consumer. For the regulation of the smoke-passage serves the slide *z*.

Hot air being conveyed to the smoke-forming fire, the generation of smoke is diminished by complete combustion; and as the gases passing around the boiler will thereby attain a higher temperature, the generation of steam will increase.

50 One may look upon smoke as the calories escaping from the smoke-forming fuel. As these are recovered by the process specified herein, a nearly complete utilization of fuel is obtained by the latter. As also the fuel of
 55 the smoke-consumer burns without smoke—the hot combustible smoke-gases and the hot combustion-air being conveyed to it—all the calories of the materials in the tubular system are utilized, without a new formation of smoke
 60 taking place; but as now also the feed-water is conveyed to the boiler with a higher tem-

perature, a smaller consumption of coal will be the consequence. In consuming an equal quantity of coal, a larger quantity of steam will thus be obtained in making use of the
 65 specified process than without the smoke-consuming and utilizing contrivance.

A small burning or glowing surface of the smoke-consumer would already suffice for the combustion of the combustible ingredients of
 70 the smoke; but as the same is made large on account of the more profitable utilization even with a very bad feeding of the principal fireplace with fuel, a complete consuming of smoke and the utilization of the calories
 75 hereby set free will be certain.

The smoke-consumer must be fed independently and set on fire in due time, so that it may be ready to perform its duty at the beginning of the setting on fire of the main fire-
 80 place.

I claim—

1. In combination with a furnace having a flue *R* for the products of combustion and a smoke consumer *K* located in said flue, said
 85 smoke consumer including a feed water pipe communicating with the boiler, and an air pipe for supplying air to the furnace grate, substantially as described.

2. In combination with a furnace having a
 90 flue *R* for the products of combustion, a smoke consumer *K* including an air pipe arranged in zigzag form in said flue for supplying heated air to the grate, and a smaller feed water pipe within the air pipe and communicating with
 95 the boiler, substantially as described.

3. In combination with a furnace having a flue as *R* for the products of combustion, a smoke consumer comprising a tube system including air pipes communicating with the
 100 furnace grate and feed water pipes contained within the air pipes and communicating with the boiler, the pipes of said tube system being arranged in groups with partitions separating or bounding said groups and forming
 105 gasways or flues, substantially as described.

4. In combination with a furnace having a flue as *R*, a smoke consumer located in said flue and including air pipes and interior feed water pipes, said pipes being arranged in
 110 groups, zigzag plates or partitions inclosing said groups and forming gasways or flues, the plates on the side toward the furnace being perforated and the plates facing toward the chimney being imperforate, substantially as
 115 described.

Signed at Reichenberg, Bohemia, Austro-Hungarian Empire, this 17th day of May, 1895.

MAX RICHTER.

Witnesses:

ANTON T. SALOMON,
 PAUL J. HAGEDORN.