No. 776,185. PATENTED NOV. 29, 1904.

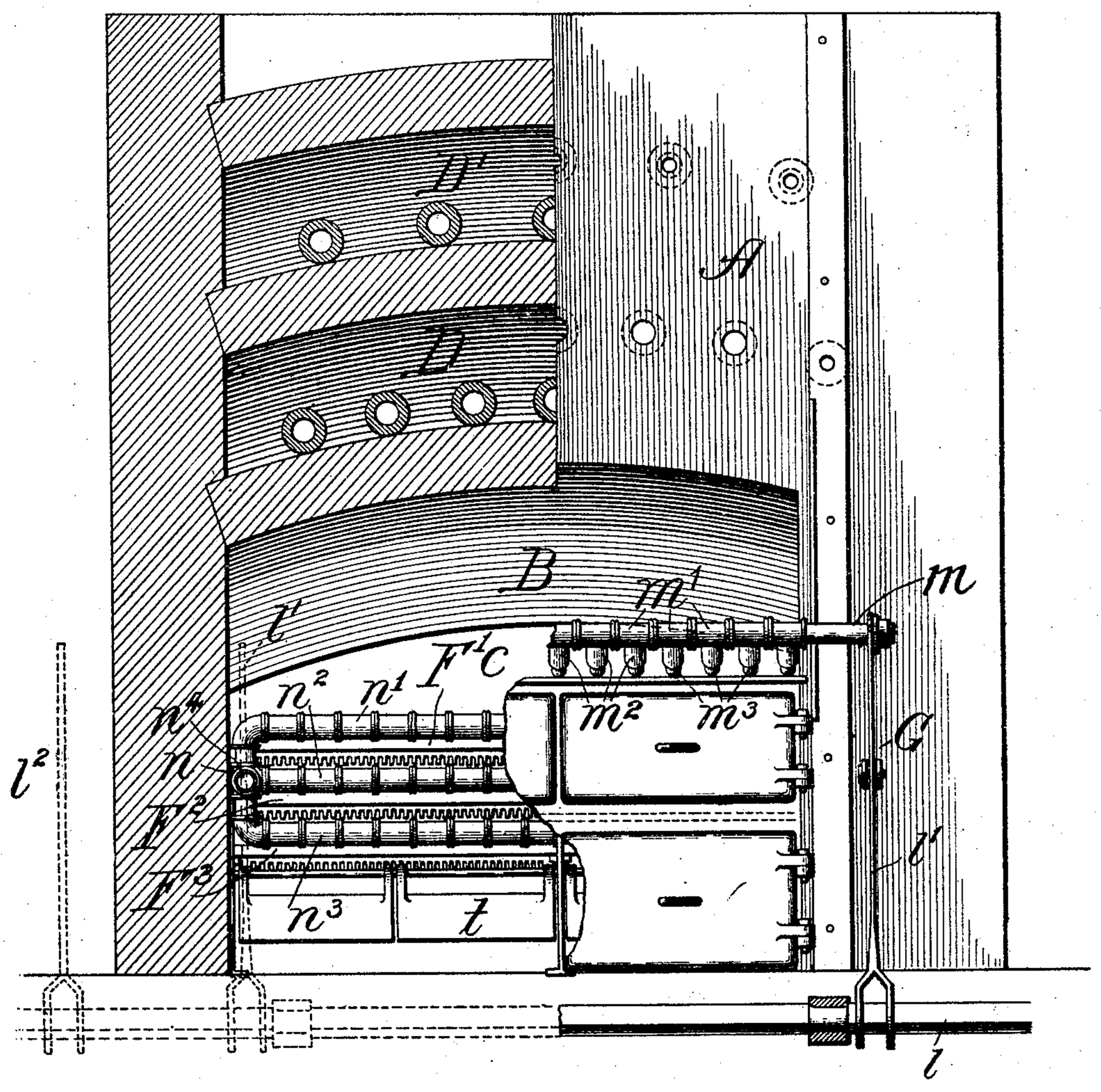
W. A. KÖNEMAN.

FURNACE.

APPLICATION FILED AUG. 31, 1903.

NO MODEL. 5 SHEETS—SHEET 1.

Fig. 1.



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By Dyrenforth, Dyrenforth & Dyrenforth & See,
Att'ys.

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NO MODEL. 5 SHEETS—SHEET 2.

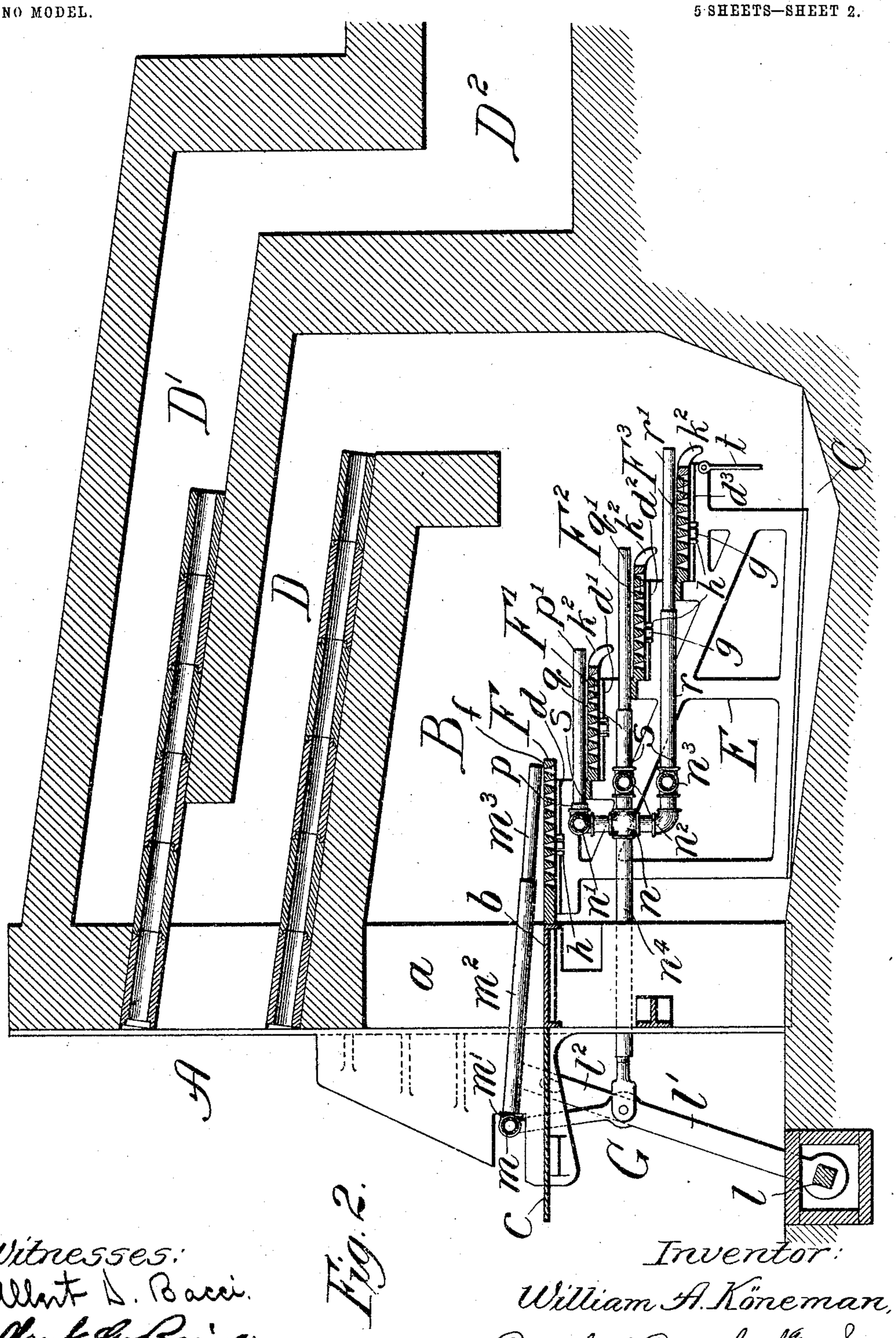

Fig. 2.

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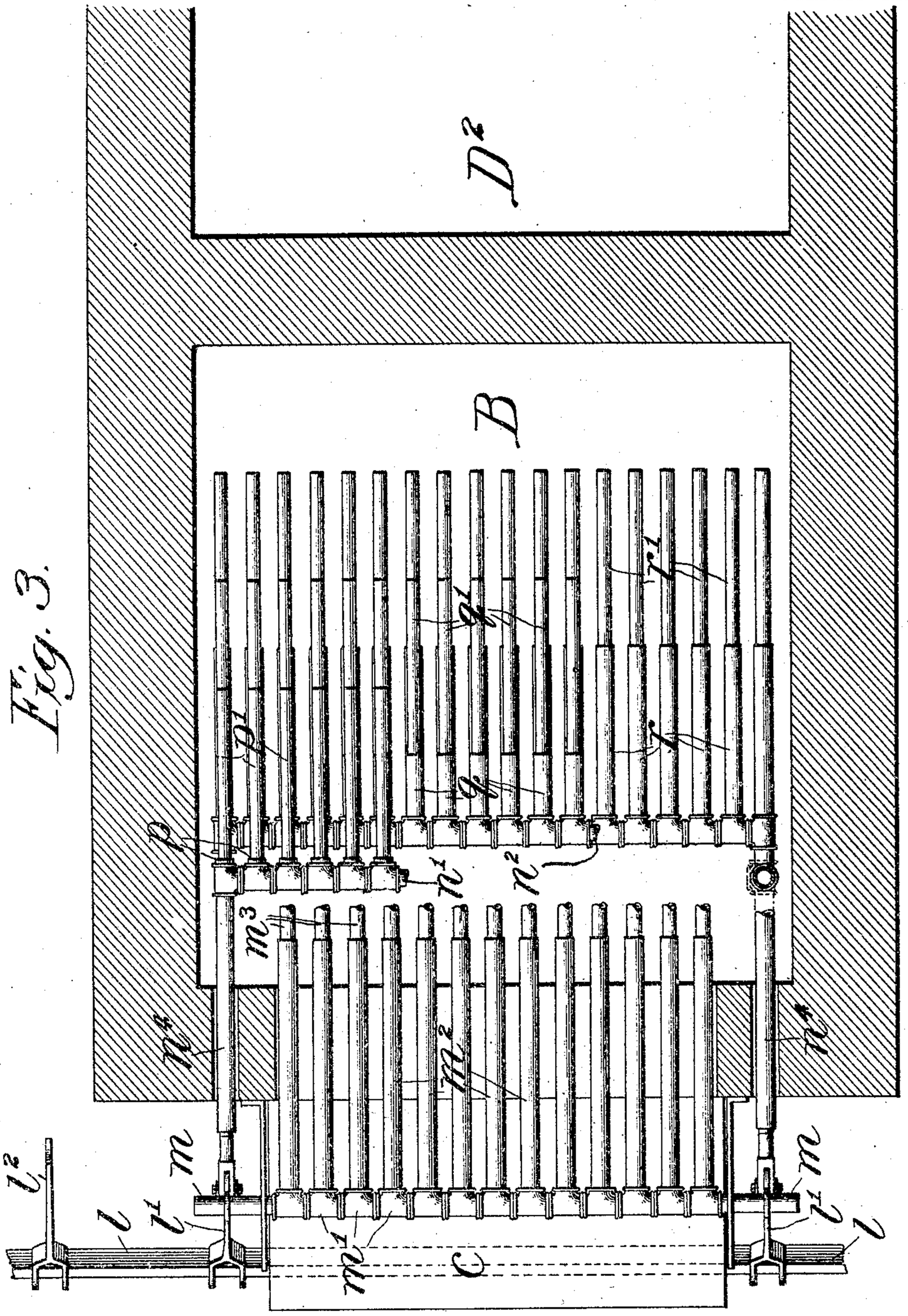
NO MODEL. 5 SHEETS—SHEET 3.



Witnesses:
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NO MODEL. 5 SHEETS—SHEET 4.

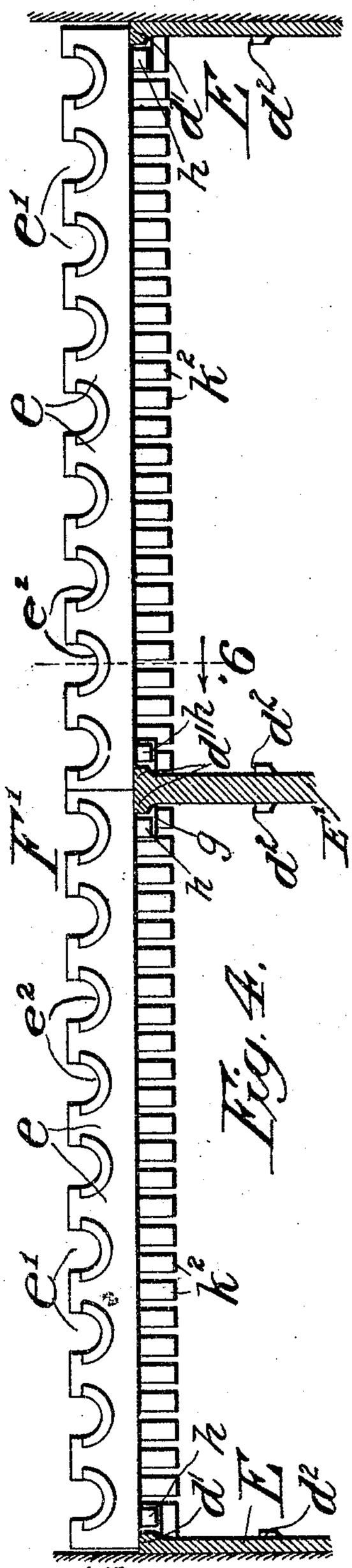

Fig. 4.

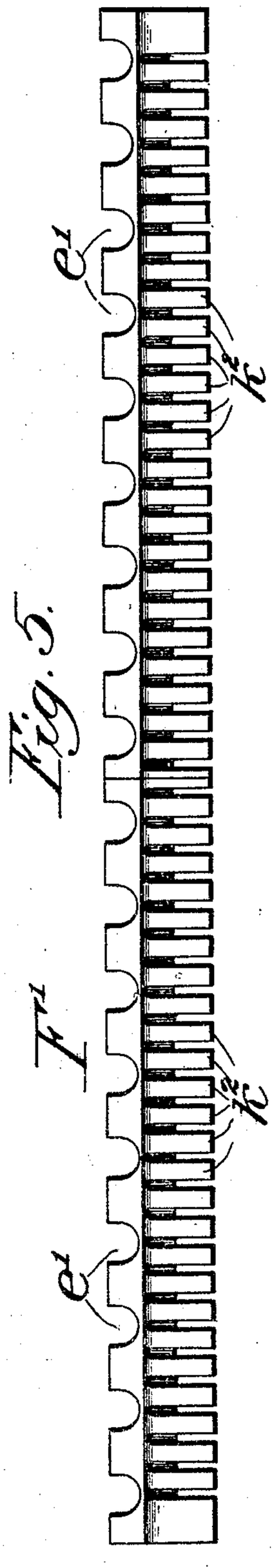

Fig. 5.

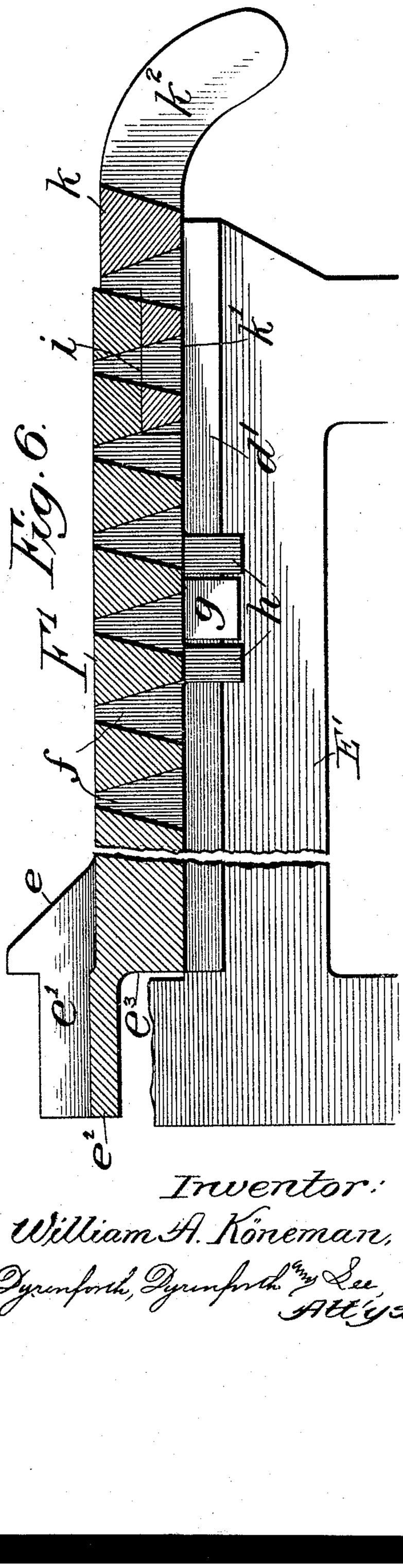

Fig. 6.

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Att'ys

No. 776,185. PATENTED NOV. 29, 1904.

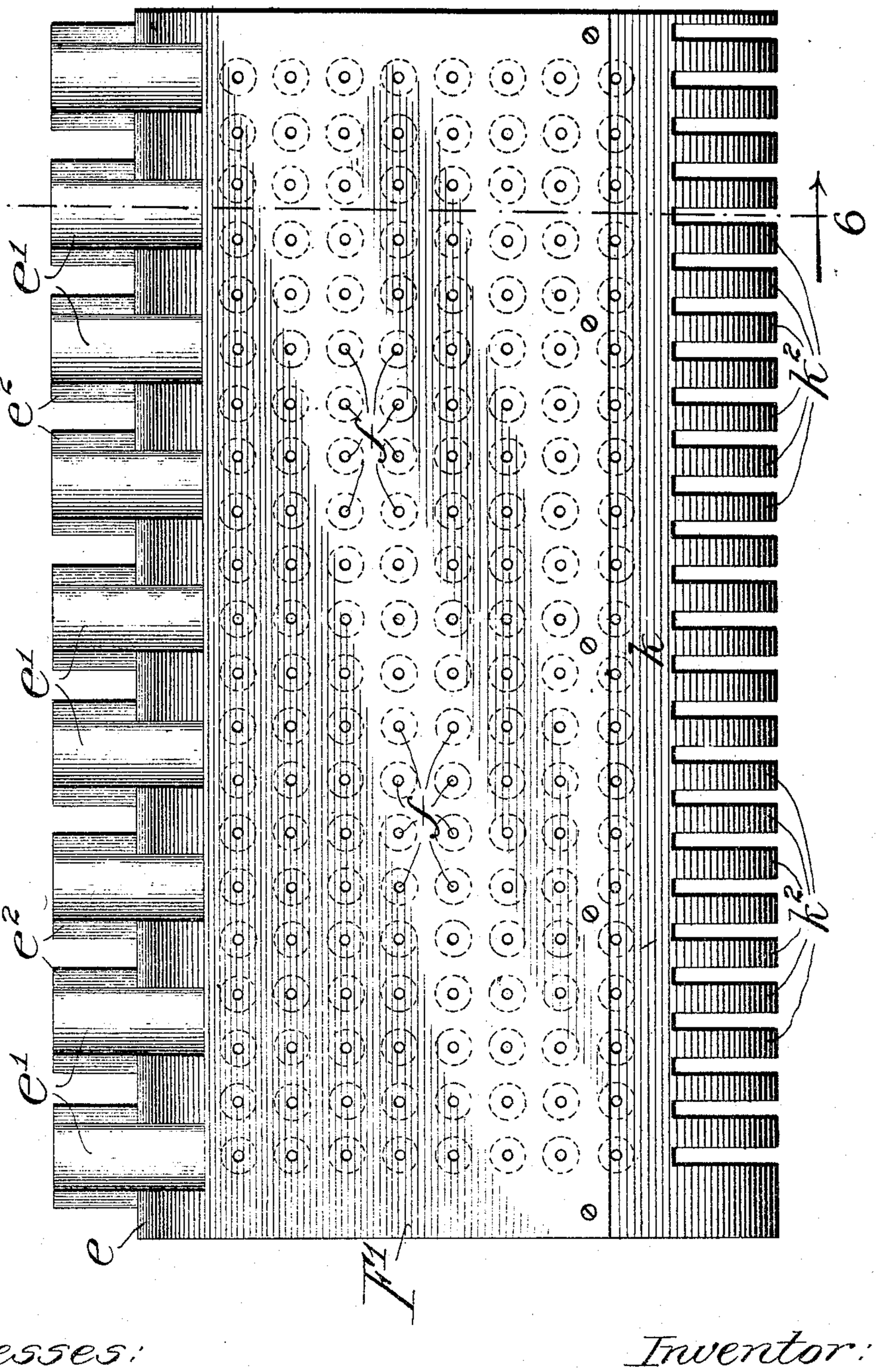
W. A. KÖNEMAN.

FURNACE.

APPLICATION FILED AUG. 31, 1903.

NO MODEL. 5 SHEETS—SHEET 5.

Fig. 7.



Witnesses:
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No. 776,185. Patented November 29, 1904.

UNITED STATES PATENT OFFICE.

WILLIAM A. KÖNEMAN, OF CHICAGO, ILLINOIS.

FURNACE.

SPECIFICATION forming part of Letters Patent No. 776,185, dated November 29, 1904.

Application filed August 31, 1903. Serial No. 171,331. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM A. KÖNEMAN, a citizen of the United States, residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Furnaces, of which the following is a specification.

My object is to provide a furnace of an improved construction which adapts it to burn coal of any kind, and particularly the cheaper grades of bituminous coal, such as screenings, in a manner to produce substantially perfect combustion, avoiding loss of any material portion of the fuel and preventing the production of smoke.

In carrying out my invention I provide a stepped series of coking-shelves in the form of perforated plates of improved construction which will permit approximately only sufficient air to rise through them to effect preliminary coking of the fuel fed thereon and without permitting any material quantity of the finer particles to fall through unconsumed. Improved mechanical stoking mechanism is also provided to stir and maintain porosity of the fuel upon the shelves and to advance it from step to step, most of the air to supply combustion being fed through channel-spaces between the shelves to pass over the beds of coal upon the shelves.

In the drawings, Figure 1 is a broken front end and partly-sectional elevation of a furnace with my present improvements applied thereto; Fig. 2, a longitudinal vertical section of the same; Fig. 3, a broken sectional plan view with the coking-shelves removed, showing the construction of my improved mechanical stoking mechanism; Fig. 4, an enlarged cross-section of the furnace, showing one of the horizontally-disposed coking-shelves in front elevation; Fig. 5, a rear elevation of the same coking-shelf; Fig. 6, a broken and enlarged section taken on line 6 in Figs. 4 and 7, and Fig. 7 a top plan view of one of the perforate coking-plates of which the shelves are formed.

A is a furnace which, as herein illustrated, contains a fuel-chamber B, an ash-pit C, and supplemental combustion chambers or passages D D′, terminating in a passage D^2, leading to the space below the boiler. (Not here shown.) At the base of the fuel-feed opening *a* is an initial imperforate coking-hearth *b*, at which is a forward-extending platform *c*.

At opposite sides of the ash-pit C are skeleton frames E, which may be of the form shown in Fig. 2 and fastened against the masonry, as indicated in Fig. 4. Midway between the frames E is a similarly-constructed frame E′, mounted rigidly in place. The frames are each formed with four stepped bearing-surfaces d d' d^2 d^3, forming supports for the perforate plates or coking-shelves F F′ F^2 F^3. Each of the said shelves consists of two plates each of a length equal to one-half the width of the chamber and formed of cast-iron or other suitable material. The top shelf F is formed of plain flat plates provided with multiple series of perforations *f*, flaring in the downward direction. The forward edges of the shelves F′ F^2 F^3 are provided with upwardly-extending flanges *e*, formed with semicircular guide-grooves e', forward-extending semicircular bosses e^2, and shoulders e^3, and the plates forming the shelves are also provided throughout with multiple series of perforations *f*, flaring in the downward direction. In practice I prefer to provide perforations *f* about one-quarter of an inch in diameter at their upper ends and about an inch in diameter at the lower ends. They may be disposed in the regular order indicated in Figs. 6 and 7 or in any other order, and they may be nearer together or farther apart, as desired.

On the under sides of the plates forming the coking-shelves are lugs *h*, forming sockets and shoulders fitting against the sides of the supporting-frames to hold the plates in place, the supports having lugs *g*, entering the sockets formed by the lugs *h*. The plates forming the coking-shelves F′ F^2 F^3 have recesses *i* at the under sides of their rear edges, and each said plate is provided with a backwardly-extending part or shoe *k*, having a tongue k' to fit the recess *i*, and a downwardly-curved serrated projection k^2 beyond the ends of the supports. The shoes or extensions *k* have perforations registering with and forming extensions of the perforations *f*, as clearly shown in Fig. 6.

G is the stoker, constructed as follows: Journaled in the position shown is a rock-shaft l, to which are rigidly secured upward-extending arms l'. Toward one end of the shaft l is an operating-lever l^2. Pivotally mounted toward its opposite ends in the upper ends of the levers l' is a shaft or pipe m, having thereon a series of collars or unions m', to which are fastened pipes m^2. Fitting into the ends of the pipes m^2 are smaller removable pipes or stoking-bars m^3, resting to slide upon the upper shelf F.

Between the front wall of the furnace and the grate-sections F' F^2 F^3 is a frame n, which may be formed of pipe-sections, as indicated, having end portions to which are secured cross extending pipes n' n^2 n^3 just above the planes of the respective coking-shelves. Each of the pipes n' n^2 n^3 is provided with a series of collars or unions the same as the pipes m. Fastened to the collars on the pipe n' are short pipe-sections p, fitted with removable hollow stoking-bars p', resting on the shelf F'. Fastened in the collars or unions on the pipe n^2 are longer pipes q, fitted at their ends with hollow stoking-bars q', resting on the shelf F^2, and connected with the collars or unions on the pipe n^3 are still longer pipes r, fitted at their ends with removable hollow stoking-bars r', resting on the shelf F^3. The frame n is connected at its opposite ends by means of bars n^4 with the levers l', the connection being pivotal and between the ends of the levers, as shown. In the under sides of all the stoker-pipes close to the frame n are air-inlet openings s. The hollow stoking-bars p' q' r' move in the guides e' of the coking-shelves.

In operation the fuel is dumped upon the plate c and fed inward upon the initial coking-hearth b. Normally the stoking mechanism would be in its forward position, wherein the free ends of the stoking-bars rest in the guides e^2. Occasionally, as required, or at regular intervals, as desired, the lever l^2 is actuated to rock the shaft l and force the stoking-bars to the backward position indicated in the drawings. This movement causes the stoking-bars to plow through and force in a backward direction the fuel upon the shelves. Thus in each operation the fuel upon the shelf F is stirred and partially moved onto the next lower step or shelf F', that upon the step or shelf F' is stirred and partially moved onto the next lower step, and so on. The openings s in the stoking-pipes permit air from the ash-pit to pass through the pipes, thus operating to prevent overheating of the stoking-bars and also contributing a volume of heated air to the volume of air entering between the coking-shelves to supply combustion.

Each charge of fuel to the furnace is caused to move intermittently backward and downward while being consumed, and the fuel is constantly broken up and kept open and permeable to insure thoroughness of combustion. The feeding and stoking may be so timed that practically all the combustible constituents of the fuel will be extracted before the material is swept from the lowermost step or shelf F^3 into the ash-pit C. In order to insure the final combustion of residual carbon, I provide a deep ash or cinder pit at the back end, provided with a stationary plate or swinging doors t, which retains the ash and permits it to be easily removed by drawing it out beneath the lower edge of the plate or door.

The downwardly-curved fingers k^2 tend to prevent the stoking-bars in their return-stroke movement from dragging an undue amount of fuel and depositing it in the spaces between the shelves or in the ash-pit. By providing the shelves with perforations f, as described, air can readily enter through them in volume sufficient to supply combustion in the mass itself to free the volatile constituents thereof; but the main volume of air to support combustion enters through the channel-spaces between the steps or shelves and passes over the beds of fuel to effect the further and substantially complete combustion of the volatile constituents.

The fuel should be fed into the opening a to spread in a more or less thin layer over the hearth b. Here the mass is subjected to heat and ignition, which tends in a measure to coke and agglomerate the finer particles. The perforations f of the shelves are so small that the more or less agglomerated particles will not pass through them to any material extent. Owing to the downward-flaring shape of the perforations, fine ashes may pass through without danger of clogging.

The frame n is of a particularly strong and durable construction and being connected at opposite ends to operating-bars n^4 is held against danger of warping to an extent which would tend materially to retard the movement of the stoking-bars in the guides e^2.

In practice the shelves or grate-sections are in planes several inches apart, and each of the three upper sections projects at its rear edge over the forward edge of the section next below it, overlapping the same several inches. Thus the channel-spaces at the forward edges of the coking-shelves are sufficiently large to permit the desired large volume of air to enter and pass across the fuel to supply combustion. The stoking-bars merely rest upon the fuel-plates, and the fuel-chamber is absolutely free from any mechanical attachments—such as levers, hinges, pivots, pistons, and the like—which are objectionable. The stoking mechanism is self-contained and may be readily and completely removed from the furnace when desired.

While I prefer to construct my improvements throughout as shown and described, they may be variously modified in the matter of details of construction without departing

from the spirit of my invention as defined by the claims.

What I claim as new, and desire to secure by Letters Patent, is—

1. In a furnace, the combination with the combustion-chamber and ash-pit of an interposed stepped series of coking-shelves with channel-spaces between them and provided with numerous small perforations, whereby a limited supply of air is fed through the shelves to effect coking of the coal thereon and a comparatively large supply of air passes through said channel-spaces to promote combustion of the coal, hollow, air-conducting and heating, stoking-bars mounted to move through said spaces and to discharge air across said shelves and operating means for said bars at the outer side of the furnace, substantially as and for the purpose set forth.

2. In a furnace, the combination of a stepped series of coking-shelves with channel-spaces between them, and stoking mechanism comprising a frame having cross extending bars in the planes of said channel-spaces, horizontal series of parallel stoking-bars on said cross extending bars, and passing through said channel-spaces, and operating-bars connected with opposite ends of said frame and extending out through the furnace-wall.

3. In a furnace, the combination of a stepped series of coking-shelves with channel-spaces between them, and stoking mechanism comprising a frame having cross extending bars in the planes of said channel-spaces, horizontal series of hollow parallel stoking-bars on said cross extending bars and passing through said channel-spaces, operating-bars connected with opposite ends of said frame and extending out through the furnace-wall, and lever mechanism at the outer side of the furnace connected with both said operating-bars.

4. In a furnace, the combination of a stepped series of coking-shelves with channel-spaces between them, and stoking mechanism comprising a frame having cross extending bars in the planes of said channel-spaces, horizontal series of hollow, parallel stoking-bars on said cross extending bars provided with air-inlets toward their forward ends and air-outlets at their rear ends and passing through said channel-spaces, and operating means for the stoking mechanism extending to the outside of the furnace.

5. In a furnace, a stepped series of coking-shelves supported, with channel-spaces between them, to form the base of the combustion-chamber, and comprising plates each provided, approximately throughout, with numerous downward-flaring perforations, the plates below the top shelf having each an upward-extending flange at the forward edge constructed with stoking-bar-guide recesses and a removable serrated downward-extending shoe at its rear edge, substantially as and for the purpose set forth.

WILLIAM A. KÖNEMAN.

In presence of—
ALBERT D. BACCI,
SAML. G. PRINCE.