

No. 706,032.

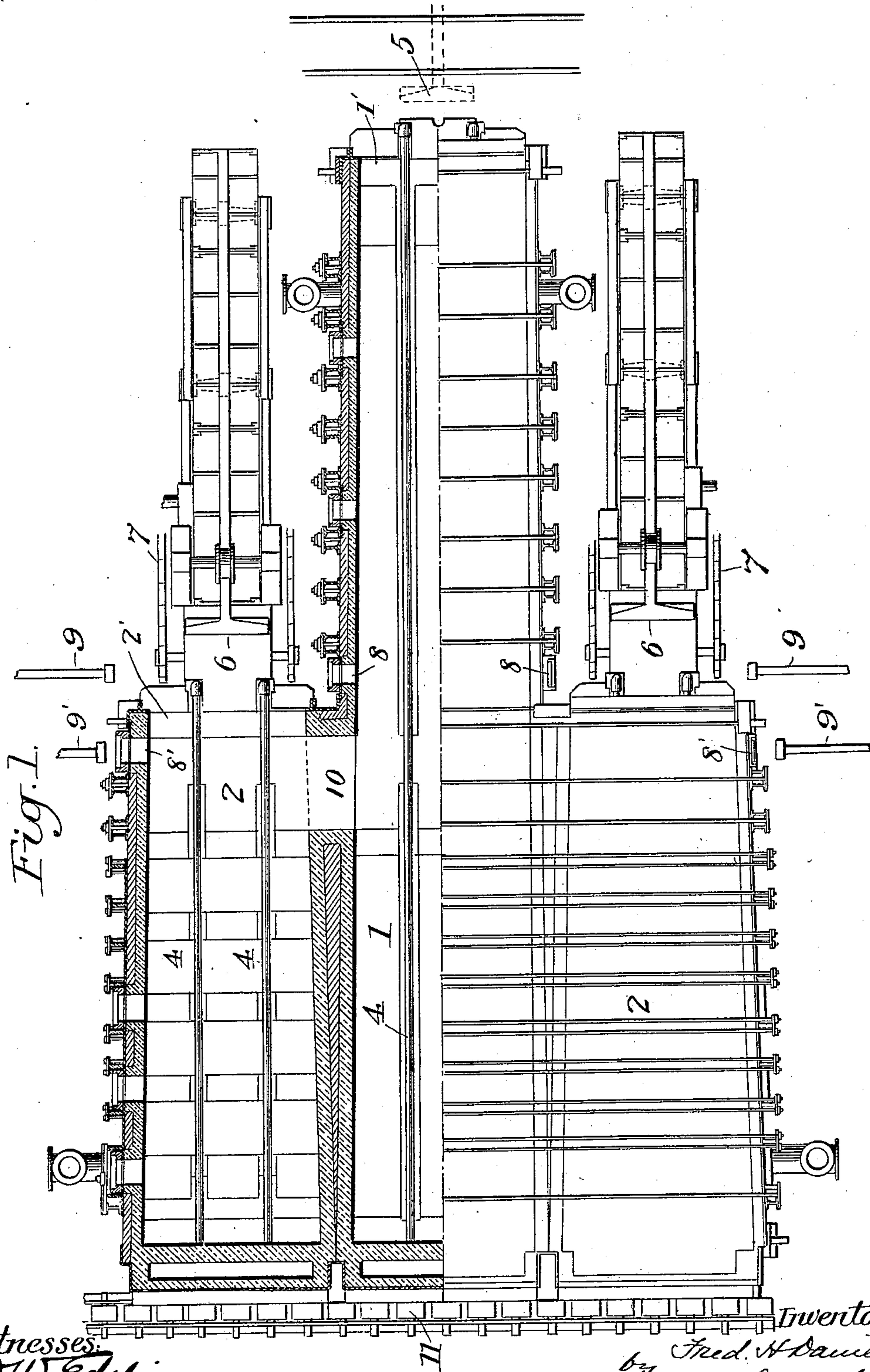
Patented Aug. 5, 1902.

F. H. DANIELS.
HEATING FURNACE.

(Application filed May 2, 1902.)

(No Model.)

2 Sheets—Sheet 1.



Witnesses:
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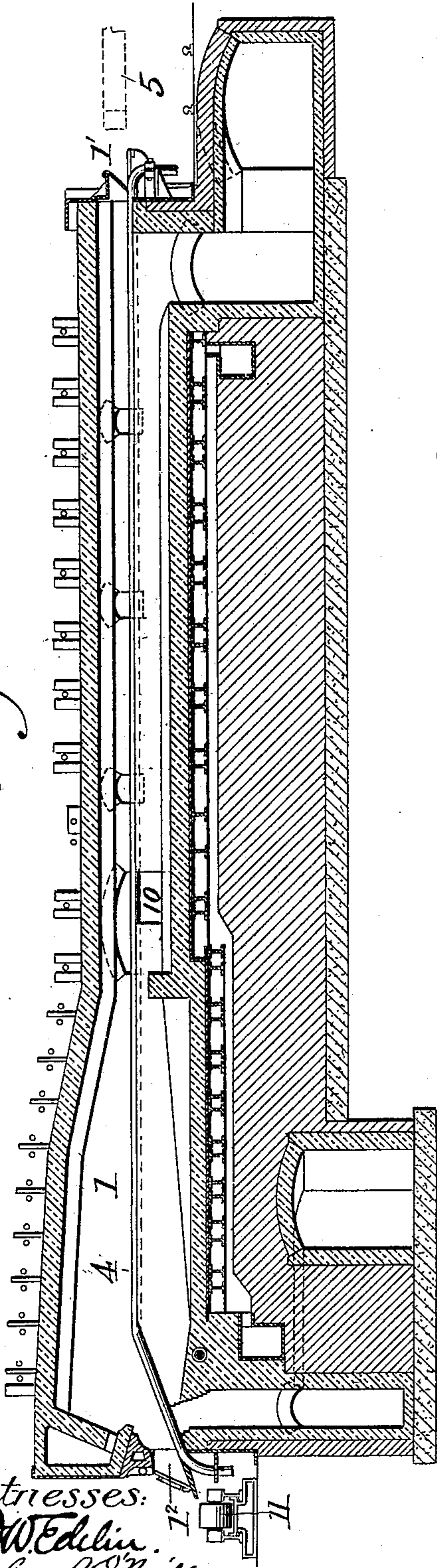
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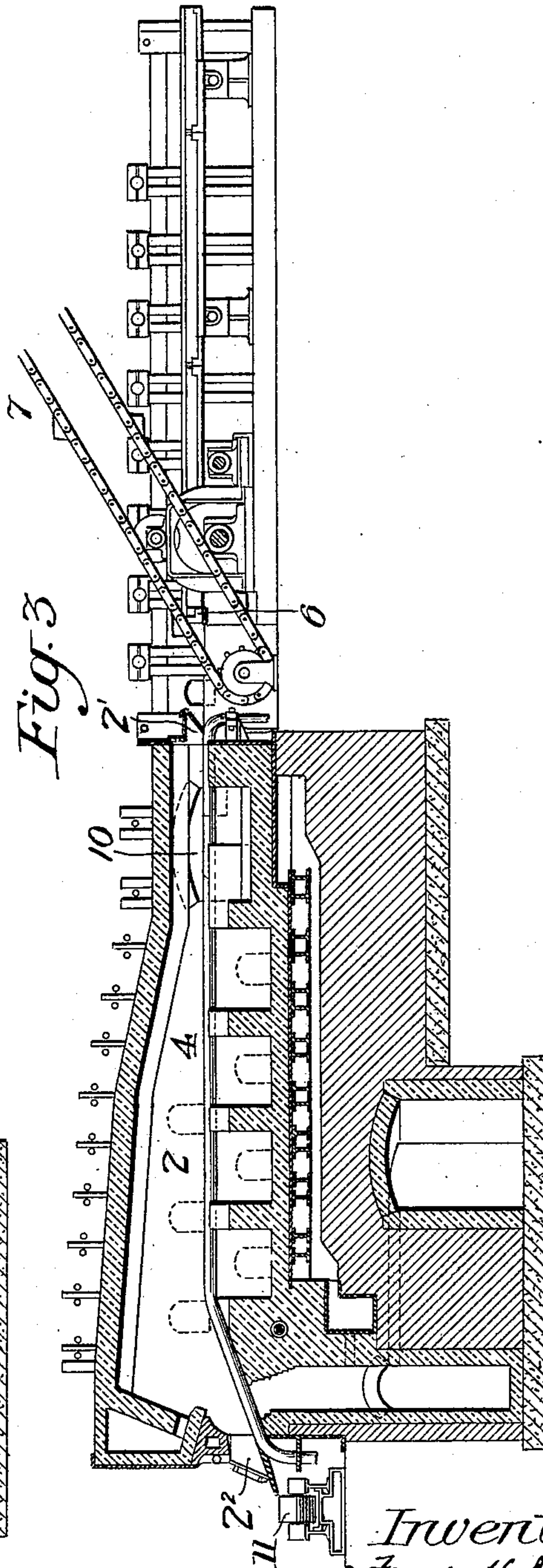
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Fig. 2.



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Fig. 3.



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UNITED STATES PATENT OFFICE.

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HEATING-FURNACE.

SPECIFICATION forming part of Letters Patent No. 706,032, dated August 5, 1902.

Application filed May 2, 1902. Serial No. 105,671. (No model.)

To all whom it may concern:

Be it known that I, FRED H. DANIELS, a citizen of the United States, residing at Worcester, county of Worcester, State of Massachusetts, have invented certain new and useful Improvements in Heating-Furnaces; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

My invention relates to furnaces of the continuous type, in which ingots or billets are charged into one end thereof, forced through the furnace, and delivered or discharged at the opposite end, said ingots or billets being heated during their progress through the furnace to a degree necessary for their proper working in rolling-mills.

The object of my invention is to provide a furnace of this type comprising a section adapted to receive hot billets and a second section, which is relatively longer than the former section, for heating the cold billets, together with means for diverting the waste gases from the hot section into the cold section to assist in heating the billets contained in the latter, and also to provide means whereby billets from the cold-billet section may be transferred into the hot-billet section.

In rod-mill practice it is very desirable to reduce the cost of heating by introducing the billets into the heating-furnace from the blooming-mill and as hot as possible. It is often, however, impossible to so regulate mill conditions as to bring this about, and cold billets must then be charged. The modern furnaces used for superheating before rolling the billet into a rod generally have this in common: that the billets are pushed on water-cooled pipes continuously from the cool end of the furnace to the hot and delivered to a conveyer, by which they are delivered to the rolling-mill. A furnace designed on this principle for cold billets is, however, unsuitable for hot, because the hot gases from the delivery end of the furnace become so cool before reaching the charging end that in the case of the charging of a hot billet heat is actually given up to the gases by this fresh stock, and for some little time an actual cooling of the billets takes place.

The object of my invention is, generically considered, to avoid this difficulty in a mill running both hot and cold billets in the heating-furnace by providing a furnace having both hot and cold billet sections, preferably heated from a common source, with means for diverting the waste gases from the hot into the cold billet section and for transferring billets from the cold section into the hot section when there is a scarcity of hot billets.

My invention is illustrated in the accompanying drawings, in which—

Figure 1 is a plan view, partly in section, of a furnace constructed according to my invention comprising a cold-billet section and a hot-billet section located on either side thereof. Fig. 2 is a vertical longitudinal section through the middle of the cold-billet section of the furnace, and Fig. 3 is a corresponding section through the hot-billet section at the bottom of Fig. 1.

In its simplest form my invention consists of a continuous heating-furnace comprising three heating sections or furnaces arranged side by side. One of these furnaces (designated by the reference-numeral 1 in the drawings) is approximately twice as long as the others, (designated by the numerals 2 2.) The said sections 1 and 2 2 are preferably included in a single integral structure possessing the features of construction common to furnaces of this type. The three furnace-sections are fired from the delivery end and preferably from the same source and are provided at their charging ends with suitably-operated pushers 5 and 6 6, respectively. These pushers deliver the billets upon the fore-plate and thence upon the water-cooled guides or supports formed by the pipes 4 4, passing through the furnaces. In charging the longer section 1 I preferably deliver the cold billets at a point adjacent the charging end upon suitable trucks running upon a track, from which trucks the several billets are forced by the mechanical pusher aforesaid into and through the furnace in a continuous line. The two hot-billet sections are preferably charged by pushers 6 6, which receive the hot billets delivered by conveyers 7 at points in line with the charging-openings. The billet guides or supports 4 4 extend through the respective sections and pass by

an incline to the delivery or discharge openings 1², which are closed by the usual fire-doors. Adjacent to and parallel with the several openings runs a conveyer 11 of the usual type for delivering the billets to the rolling-mill.

Preferably all of the furnace-sections are fired from the same source, which is located at the delivery end, and in the case of the cold-billet section gas is passed directly backward toward the discharge end and thence to the stack. In the shorter or hot-billet section, however, on reaching the charging end 2 the waste gases are deflected sidewise through openings 10 in the dividing-walls between the respective sections into the cold-billet section and pass thence in common with the gases in said cold-billet section to the stack. In practice the hot billets are charged into these short sections and at once enter a zone of high heat. The hot gases in these short sections, which if led directly to the chimney would be wasted, are utilized by being deflected, as before mentioned, into the long section of the furnace, where they give up much of their heat to the cold billets being constantly introduced. If it should happen that a scarcity of hot billets occurred and it was not found possible to keep the short sections filled with hot billets, an arrangement is provided for shifting a number of billets from the long section sidewise into the hot section, where the heating can be completed, thus giving a chance for introducing more cold billets at once into the long section and keeping up the output of the furnace. In practicing this latter operation I provide the long or cold billet section of the furnace at points adjacent to the charging-openings of the hot-billet sections with lateral openings 8, through which pushers 9 are adapted to pass in order to engage and transfer billets from the long section to a position in front of the pushers 6 of the hot-billet sections. These pushers 9, which are shown conventionally, may be of any preferred type, and where the three sections are used, as indicated in Fig. 1, one of said pushers is placed upon either side of the short furnace-sections in such position as to pass entirely across the long furnace-section through the registering openings 8, and thereby transfer a billet from said long section to a position in front of the pusher of the short section. It is to be observed that in this case the billets will pass directly from the long section 1 to the fore-plate or charging-bed outside of the short sections 2, from whence they will be pushed into the furnace. However, I prefer in some cases to effect the transfer from the long section 1 directly into either of the short sections 2 2, and this is effected by providing lateral openings 8' 8' in the short sections 2 2 in line with the connecting-openings 10 10 between the respective short sections and the long section, so that the billets in the long section may be engaged by

the pushers 9' and transferred through the openings 10 into one or the other of the short sections 2. This latter arrangement is preferable where but one short section 2 is employed in connection with a long section; but it may also be employed where two short sections are used, as in Fig. 1.

While I have illustrated the preferred form of my invention as embodying three continuous furnace-sections arranged side by side with connecting-openings between the several sections, it is to be understood that I am not limited to this particular form, as obviously the sections might be arranged in various other relations to effect the same objects.

Having thus described my invention, what I claim, and desire to secure by Letters Patent, is—

1. A furnace of the continuous type, comprising a hot-billet section, and a relatively long cold-billet section continuing beyond the hot-billet section, said hot-billet section opening into the continuation of the cold-billet section, whereby the waste gases of the hot-billet section are diverted into said continuation of the cold-billet section, and means for charging each section.

2. A furnace of the continuous type, comprising a hot-billet section and a relatively long cold-billet section, means for charging each section, and means for transferring billets from the cold-billet section into the hot-billet section.

3. A furnace of the continuous type, comprising a hot-billet section and a relatively long cold-billet section, said hot-billet section opening into the cold-billet section, whereby the waste gases of the hot-billet section are diverted into the cold-billet section, and means for transferring billets from the cold-billet section into the hot-billet section.

4. A furnace of the continuous type, comprising a hot-billet section, and a relatively long cold-billet section continuing beyond the hot-billet section, said sections being separated by a wall having an opening near the charging end of the hot-billet section through which the waste gases of the hot-billet section are diverted into the continuation of cold-billet section.

5. A furnace of the continuous type, comprising a cold-billet section and relatively short hot-billet sections located on each side of said cold-billet section, said hot-billet sections communicating with the cold-billet section at points intermediate the ends of the latter, and means for transferring billets from the cold-billet section into the hot-billet section.

6. A furnace of the continuous type, comprising a hot-billet section, and a relatively long cold-billet section, said sections being formed as component parts of an integral structure having a division-wall between said sections, said wall having an opening connecting said sections near the charging end

of the hot-billet section, and means for transferring billets from the cold-billet section to the hot-billet section.

5 7. A furnace of the continuous type, comprising a cold-billet section, a relatively short hot-billet section on each side of said cold-billet section, a lateral opening from each hot-billet section near the charging end thereof into the cold-billet section, lateral openings
10 into the cold-billet section adjacent to the

charging ends of said hot-billet sections, and pushers adapted to pass through said openings to transfer billets from the cold-billet section into the respective hot-billet sections.

In testimony whereof I affix my signature 15
in presence of two witnesses.

FRED H. DANIELS.

Witnesses:

PHILIP W. MOEN,
H. G. STODDARD.