

No. 662,610.

Patented Nov. 27, 1900.

J. O. E. TROTZ.

REHEATING FURNACE FOR STEEL INGOTS.

(Application filed Jan. 20, 1900.)

(No Model.)

3 Sheets—Sheet 1.

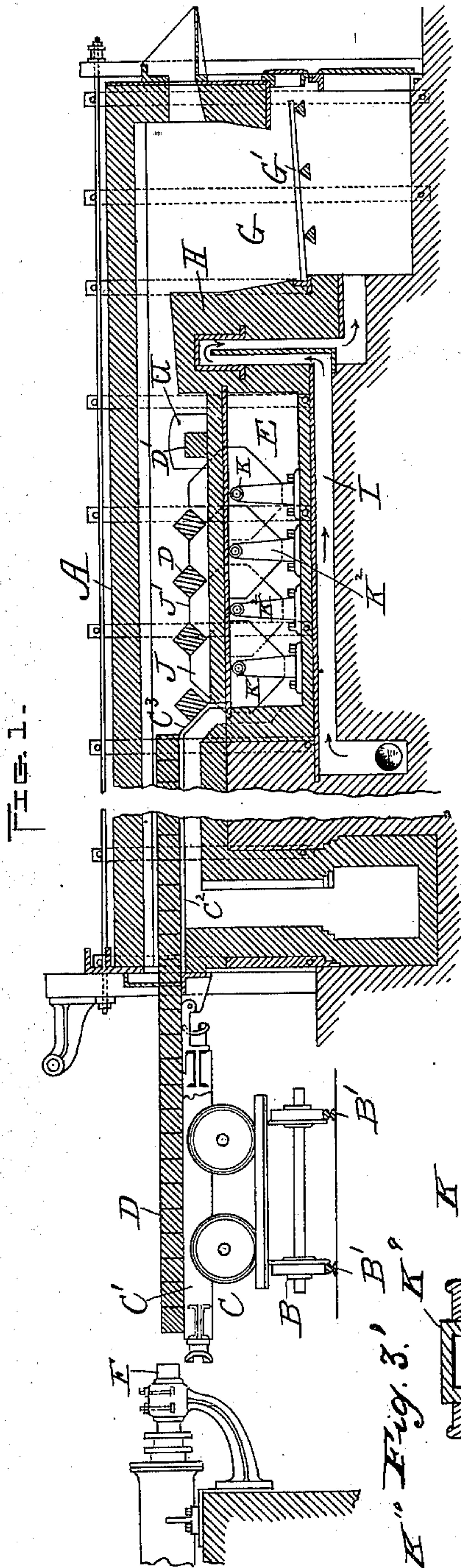


FIG. 1.

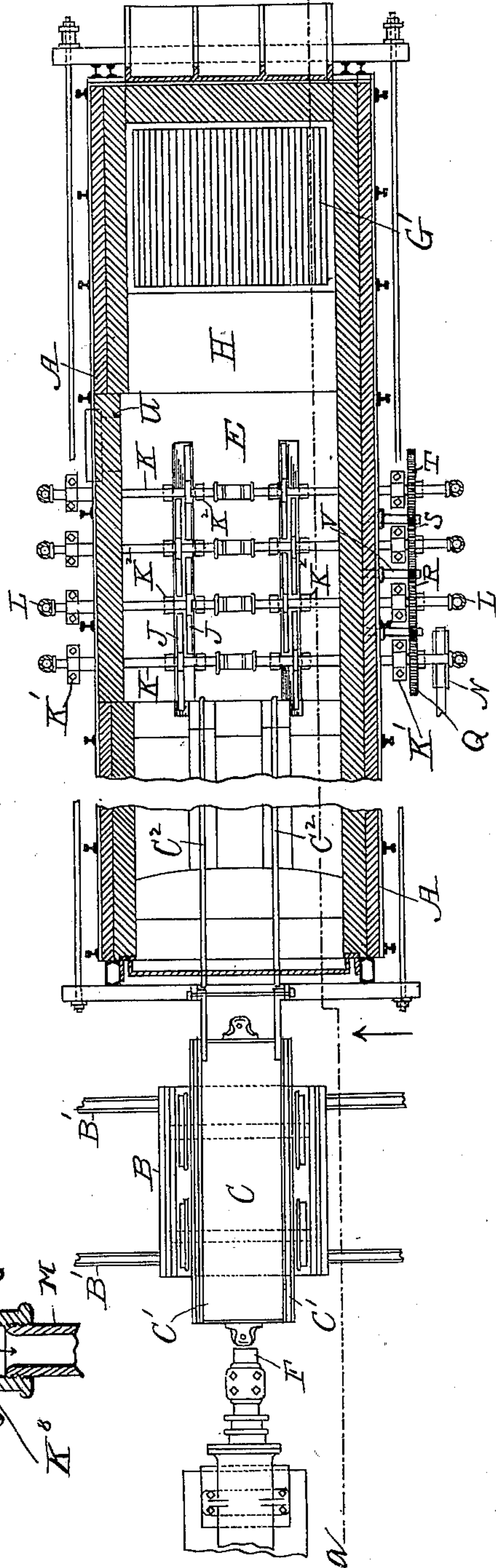


FIG. 2.

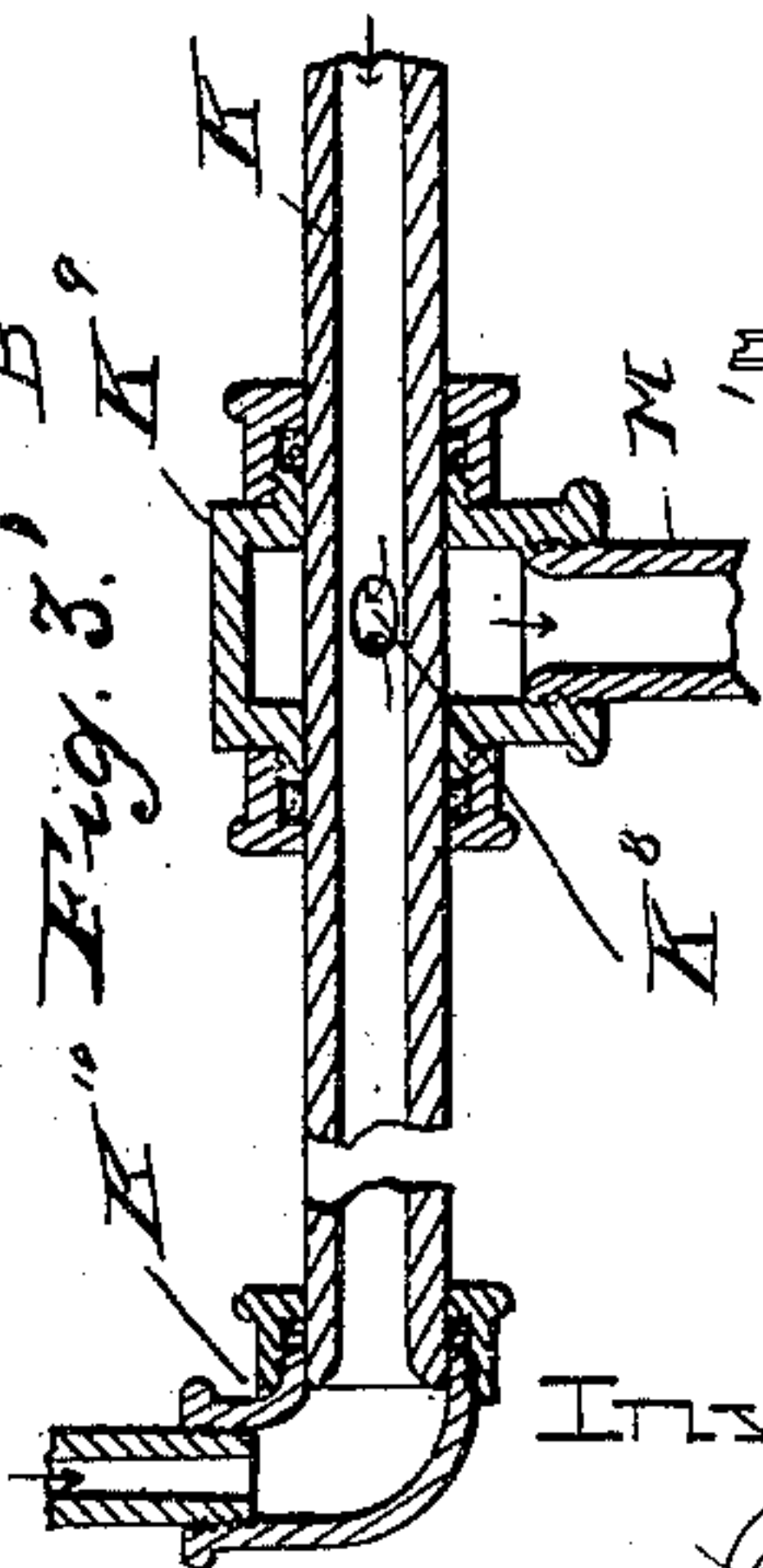


FIG. 3.

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FIG. 3.

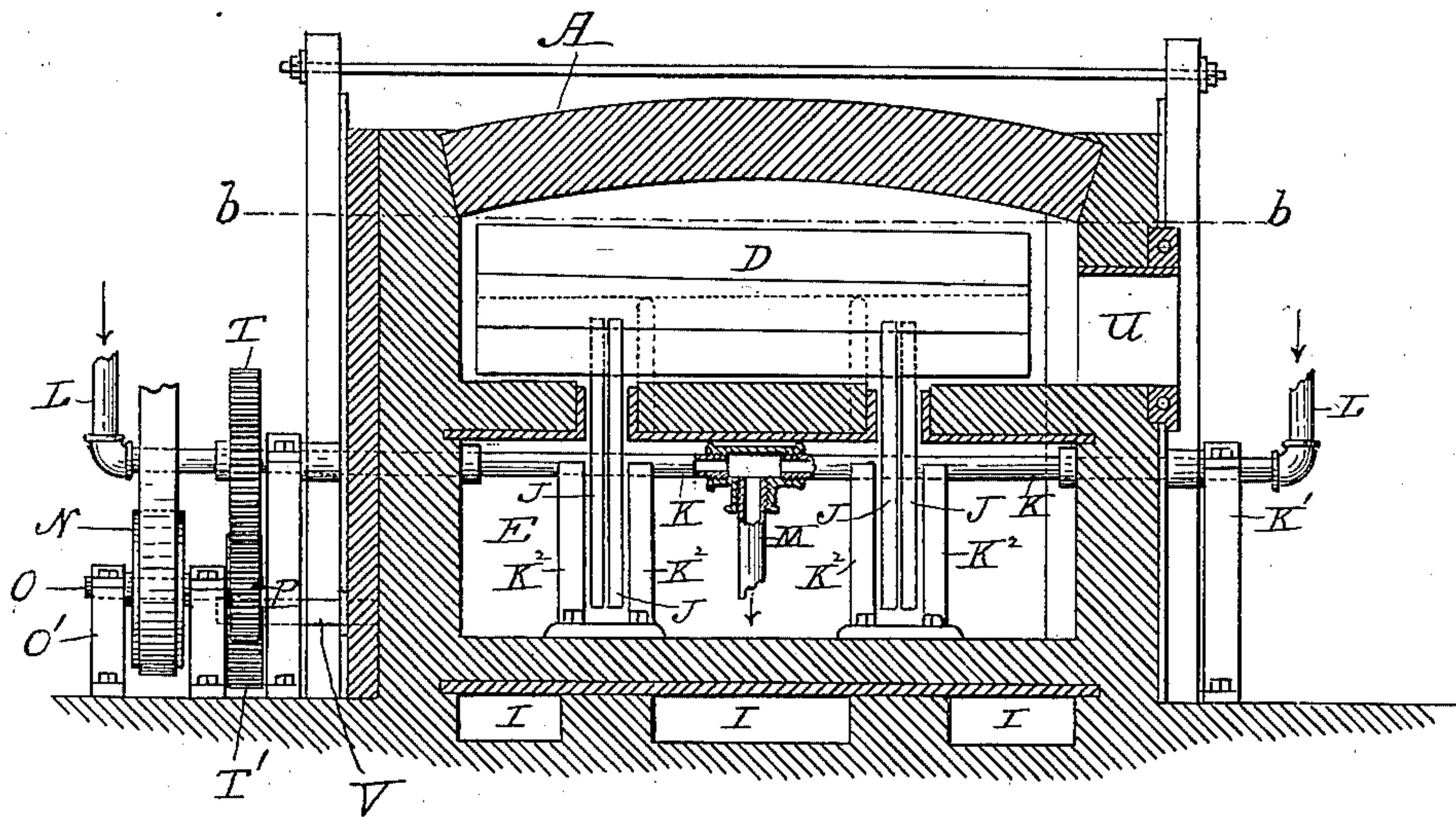
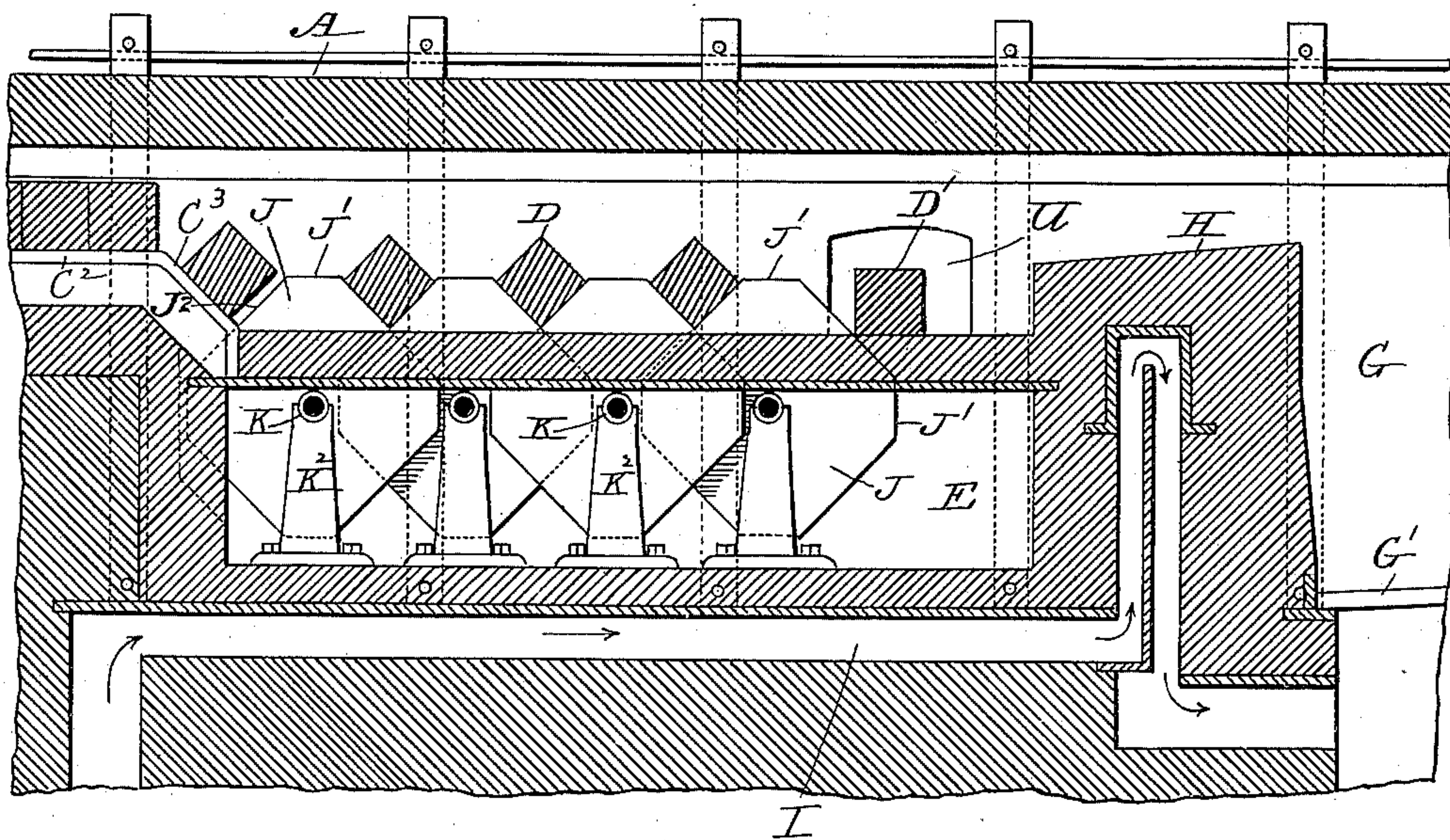


FIG. 4.



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FIG. 5.

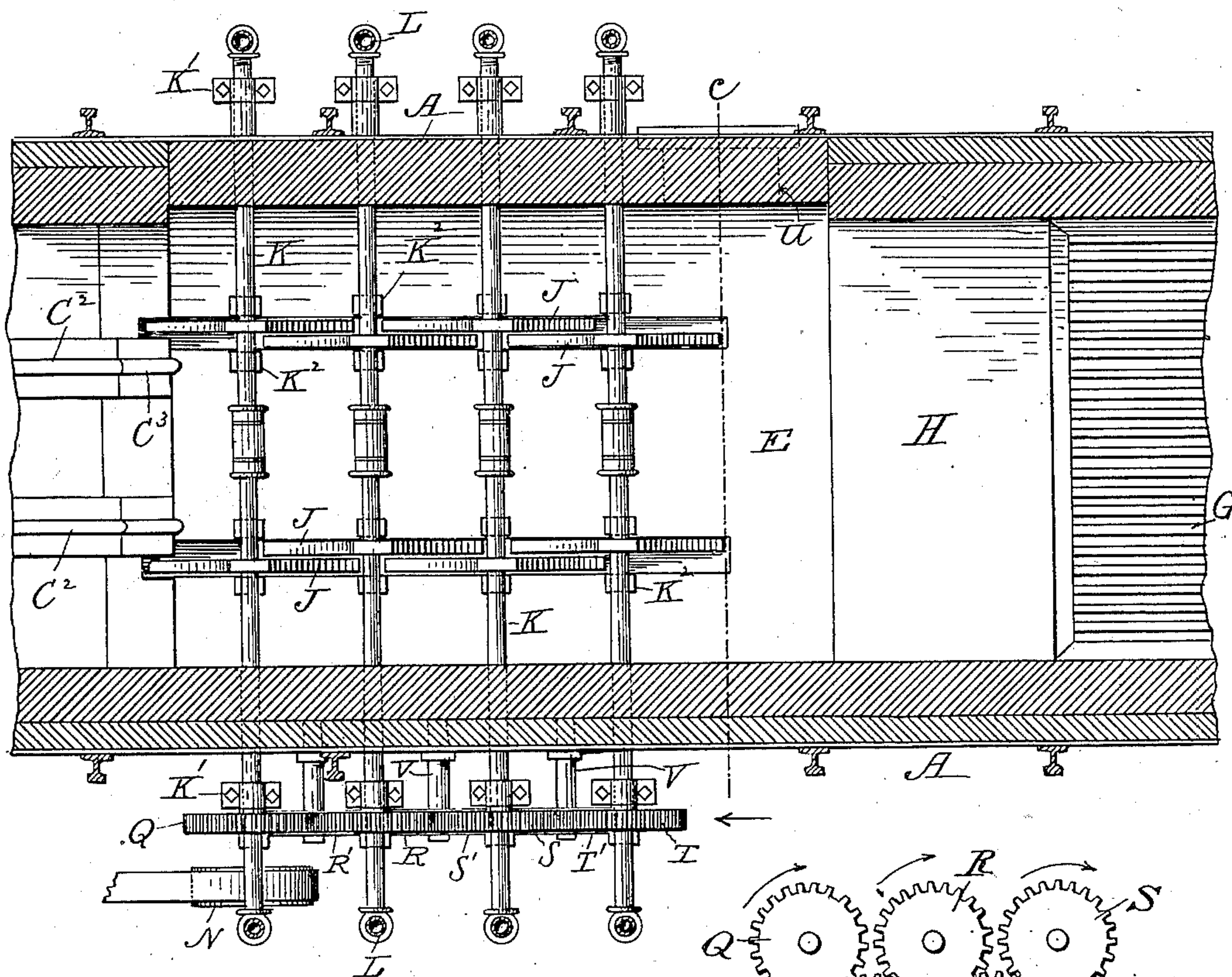
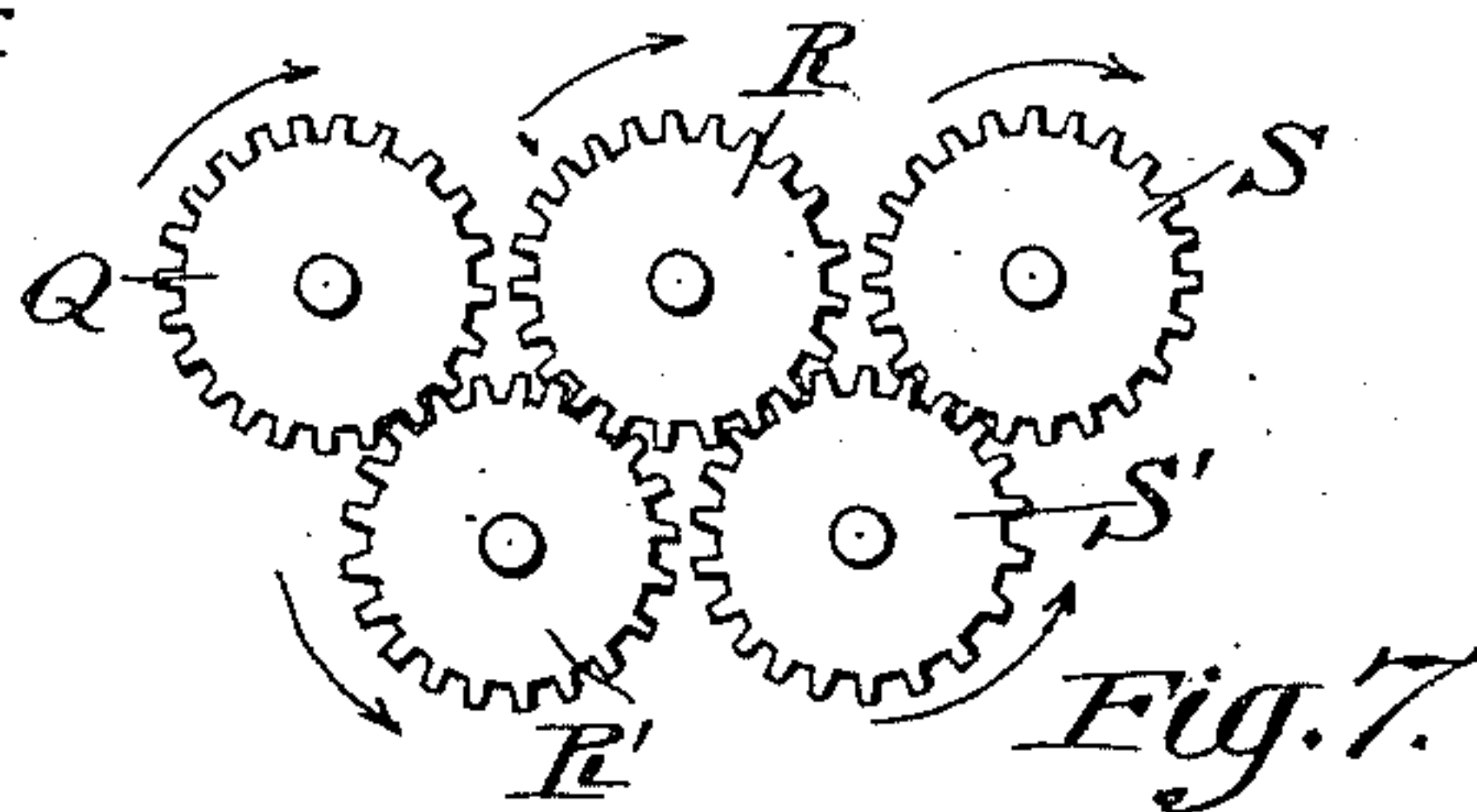
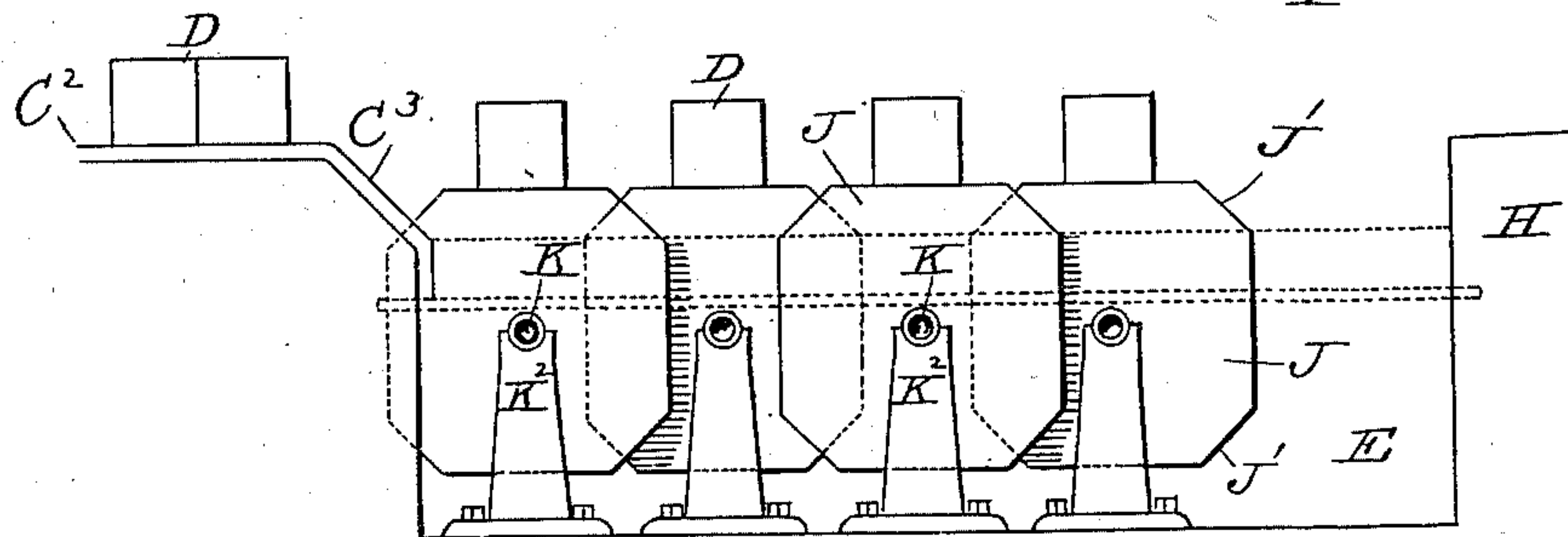


FIG. 6.



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UNITED STATES PATENT OFFICE.

JOHAN OTTO EMANUEL TROTZ, OF WORCESTER, MASSACHUSETTS.

REHEATING-FURNACE FOR STEEL INGOTS.

SPECIFICATION forming part of Letters Patent No. 662,610, dated November 27, 1900.

Application filed January 20, 1900. Serial No. 2,107. (No model.)

To all whom it may concern:

Be it known that I, JOHAN OTTO EMANUEL TROTZ, of the city and county of Worcester, in the State of Massachusetts, have invented certain new and useful Improvements in Reheating-Furnaces for Steel Ingots or Blooms; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, forming a part of this specification, and in which—

Figure 1 represents a vertical longitudinal section, partly in elevation, of so much of a reheating-furnace for steel ingots or blooms as is necessary to illustrate my improvements thereon, said section being taken at the point indicated by line *a* in Fig. 2. Fig. 2 is a horizontal section through the upper part of the furnace, taken at the point indicated by line *b b* in Fig. 3 and showing a plan of portions of the apparatus including my said improvements. Fig. 3 is a transverse vertical section through the apparatus, taken at the point indicated by line *c* in Fig. 5. Fig. 3' is a central vertical longitudinal section through the central portion and ends of one of the hollow shafts *K*, showing the central and end connections with the water supply and discharge pipes. Fig. 4 is an enlarged view of that portion of the illustration shown in Fig. 1 to which my invention relates. Fig. 5 is also an enlarged view of that portion of the illustration shown in Fig. 2 to which said invention relates. Fig. 6 represents a skeleton side view upon the same scale as the last two figures of the revolving ingot or bloom carriers for revolving the ingots or blooms and transferring them from one position to another, as will be hereinafter more fully described; and Fig. 7 is a skeleton side view of some of the gears for driving the shafts upon which the ingot-carriers are mounted.

The common way of manipulating the ingots or blooms in the process of reheating has been to push them forward laterally lengthwise of the furnace from a transfer car or truck by means of a hydraulic plunger or other suitable means into the reheating-furnace, and as the series of ingots or blooms lying side by side are intermittently fed forward over the usual longitudinal supporting-tracks and are deposited into the pit or welding-

room of the furnace they are turned over one after another by hand, the attendants performing said operation by inserting suitable tongs or bars through doors in the side of the furnace provided for the purpose. This method is objectionable for various reasons, the principal one of which is that considerable heat is wasted by opening the doors to turn over the ingots or blooms, as aforesaid, and being irregularly rotated are heated unevenly. Several attendants are also required to thus manipulate the ingots or blooms by hand, and said attendants are not only subjected to severe labor under intense heat, but are also liable to injury.

To obviate the foregoing objections is the main purpose of my invention, which consists in providing the usual reheating-furnace with a series of vertical rotary ingot or bloom carriers arranged in the pit or welding-chamber of the furnace about in a longitudinal line with the tracks over which the ingots are fed forward and adapted to receive the ingots thereon at the rear end of the series as they are intermittently pushed forward from the track and then automatically turned a quarter of a revolution at a time as they are gradually and intermittently carried forward and finally deposited one after another in front of the door preparatory to withdrawing them in their heated state from the furnace for further treatment, as will be hereinafter more fully set forth.

To enable those skilled in the art to which my invention appertains to better understand the nature and purpose thereof, I will now proceed to describe it more in detail.

Referring to the drawings, *A* represents part of a reheating-furnace for ingots or blooms the central portion of which is broken away in order to show the parts to which my invention relates upon as large a scale as possible.

B is a truck arranged to travel transversely to the furnace upon suitable tracks *B' B'* and upon which is mounted a supplementary truck *C*, whose wheels are arranged transversely to those of the main truck *B*. Said supplementary truck *C* is provided with horizontal longitudinal tracks *C' C'*, upon which are transversely laid side by side the ingots or blooms *D* to be reheated. Said tracks *C'*

C' are arranged upon a level with the usual longitudinal tracks C² C², extending from the outer left-hand end of the furnace to the pit or welding-chamber E thereof.

5 The ingots or blooms D are pushed forward laterally by means of a suitable plunger F, which may in practice be operated by steam, hydraulic, or any other suitable power. Said pushing apparatus not constituting a part of
10 my invention, only the front end thereof is shown in the drawings.

The reheating-furnace is provided with the usual fire-box G and grate G' in front, divided from the welding-chamber by the cross-
15 wall H. It is also provided with the usual fresh-air inlets I, opening into the ash-pit under grate G'.

The general construction and arrangement of the furnace are similar to those of others of
20 this class, with the exception of the application of my improved apparatus located in the welding-chamber for revolving the ingots or blooms in the reheating process automatically instead of by hand, and it will there-
25 fore be unnecessary to enter into a detailed description of said old parts of the furnace.

My said improved apparatus consists of a series of rotary carriers J, made in the form of flat, square-shaped disks or wheels having
30 flat sides J² and arranged vertically and longitudinally, and of the means employed for supporting and turning the same automatically, the ingots or blooms being laid transversely thereon, and intermittently rotated
35 laterally one-fourth of a revolution at a time, and thus intermittently rolled forward to the point of removal from the furnace by hand, as will be hereinafter more fully explained. The disks or wheels J are in practice arranged
40 about in line longitudinally with the longitudinal tracks C² C². They are each mounted and secured upon separate transverse horizontal shafts K. In this instance four of said disks or wheels are shown in each line; but I do not
45 limit myself to this number. They are arranged so that two of those in each line will come at one side of the other two, so as to permit each pair to overlap the other pair, and thereby admit of economizing in space, also to
50 form a transverse V-shaped rest at the top between one disk or wheel and the next one to it to receive the ingots or blooms, as is shown in Figs. 1 and 4. The shafts K rest and are fitted to turn in the bearings K' and K². The
55 inner bearings K² may be made without boxes, being simply provided with sockets in their upper ends for the shafts to rest in. Said shafts are in practice made hollow, so that a stream of cold water may be passed through
60 to keep the same properly cooled during the process of reheating. The disks or wheels J may also, if desired, be made hollow and connected with the openings in each shaft K, water being supplied through suitable sup-
65 ply-pipes L and discharged through the waste-pipes M at the center, the hollow shafts K being arranged to turn to rotate the disks or

wheels J and also serving as water-pipes, as aforesaid. Their connections with the wa-
ter-supply pipes L L and discharge-pipe M 70 are made, as is shown in Fig. 3', with the central connection K⁹ and end connections K¹⁰ K¹⁰, with stuffing-boxes to make the joints water-tight and also allow the shaft to turn
75 therein. The water discharges from shaft K through an opening K⁸ into the chamber K¹¹ of the connection K⁹ and thence into and through the discharge-pipe M.

Driving power may be imparted by a belt connected with suitable driving mechanism 80 and passing over a pulley N on a short shaft O, fitted to turn in suitable stationary bearings O' O'. The driving power is transmitted from said shaft O to turn the aforesaid trans-
85 verse horizontal shafts K by means of a spur-gear P on shaft O, which engages with a spur-gear Q on one of the shafts K, and thence through the chain of gears R, S, and T on
90 the other three shafts upon which the ingot or bloom carriers J are mounted and the intermediate gears R', S', and T' on stationary studs V, as is shown in the drawings. The
95 disks or wheels constituting said carriers J are preferably clipped at the corners, as shown at J', to reduce their radial diameters across from corner to corner, so as to economize in
100 space, being cut off just sufficient to permit said disks or wheels to turn without striking the shafts K when the latter are placed at the distances apart shown in the drawings. The
105 first shaft K next to where the ingots or blooms are discharged from the longitudinal tracks C² C² into the welding-furnace E is arranged at the proper place to bring the first two disks or wheels mounted thereon in
110 the right position to catch the ingot or bloom thereon when it slides down the incline C³ of tracks C² C², as is shown in Figs. 1 and 4 of the drawings. At this point in the operation
115 of treating the ingots or blooms the disks or wheels occupy diagonal positions in relation to each other—that is, their opposite corners are in line vertically and horizontally when
120 viewed from the side, as is also shown in Figs. 1 and 4, and said disks or wheels are stationary and remain at rest in said positions until the ingot or bloom last pushed forward from
125 tracks C² C² has arrived against the inclined edge of the disks or wheels, when they are set slowly in motion, and as they rotate from the positions shown in Figs. 1 and 4 to those
130 shown in Fig. 6 the ingots or blooms are carried forward with them, being partially turned in the operation. As they continue to slowly rotate they are each independently
turned and moved forward from one set of
disks or wheels to the next preceding ones,
the one, D', at the front end being deposited
on the bottom of the furnace-pit or weld-
ing-chamber ready to be withdrawn by hand
lengthwise through the door U in the side
of the furnace, as usual. By thus automatic-
ally turning over the ingots or blooms as they
are fed forward through the welding-cham-

ber of the furnace it is apparent that said operation may be performed very uniformly, all of said ingots or blooms being intermittently moved together, and therefore they are all uniformly heated. Consequently a superior product is obtained at less cost than by the old method of manipulating the ingots or blooms by hand in the usual way. Not only is the expense lessened by dispensing with a number of attendants now necessary, but also those that are required to attend the furnace are subjected to less laborious work and are less liable to injury, as before stated, than by the old method.

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

1. In a reheating-furnace for ingots or blooms, having the usual working chamber just back of the fire-box, the combination of carriers located in said working chamber and consisting of a series of overlapping disks, having flat sides, and arranged vertically and in series, each about in line longitudinally with the tracks over which the ingots or blooms are fed forward through the furnace; said tracks, the same extending back longitudinally through the apparatus from the inner end of the working chamber; the transverse shafts upon which said carriers are mounted, and means for supporting and turning said shafts, substantially as and for the purpose set forth.

2. In a reheating-furnace for ingots or blooms having the usual working chamber just back of the fire-box, the combination of rotary, hollow carriers located in said work-

ing chamber and consisting of a series of overlapping disks, having flat sides, and arranged vertically and in series, each about in line longitudinally with the tracks over which the ingots or blooms are fed forward through the furnace; said tracks, the same extending back longitudinally through the apparatus from the inner end of the working chamber; the transverse shafts upon which said carriers are mounted, having means for maintaining a stream of water or other cooling medium through the same and said carriers, and means for supporting and turning said shafts, substantially as and for the purpose set forth.

3. In a reheating-furnace for ingots or blooms, having the usual working chamber back of the fire-box, the combination of the tracks, for supporting the ingots or blooms in place, the same extending back through the apparatus from the inner end of the working chamber, and the plunger for pushing said ingots or blooms through the furnace with rotary carriers located in the working chamber and consisting of a series of overlapping disks, having flat sides, and arranged vertically and in series, each about in line longitudinally with the tracks over which the ingots or blooms are fed forward through the furnace; the transverse shafts upon which said ingots or blooms are mounted, and means for supporting and turning said shafts, substantially as and for the purpose set forth.

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