

E. B. COLBY.

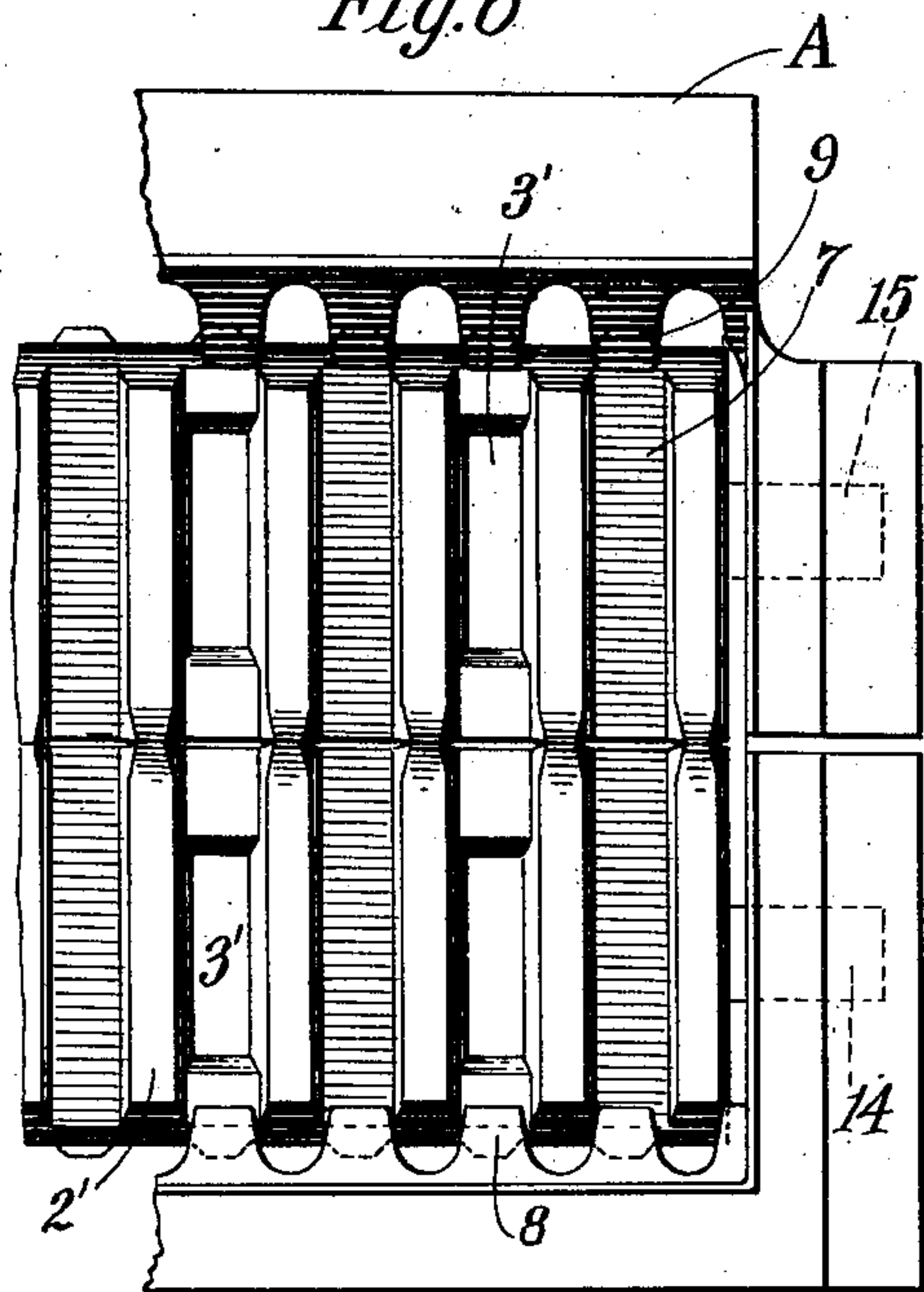
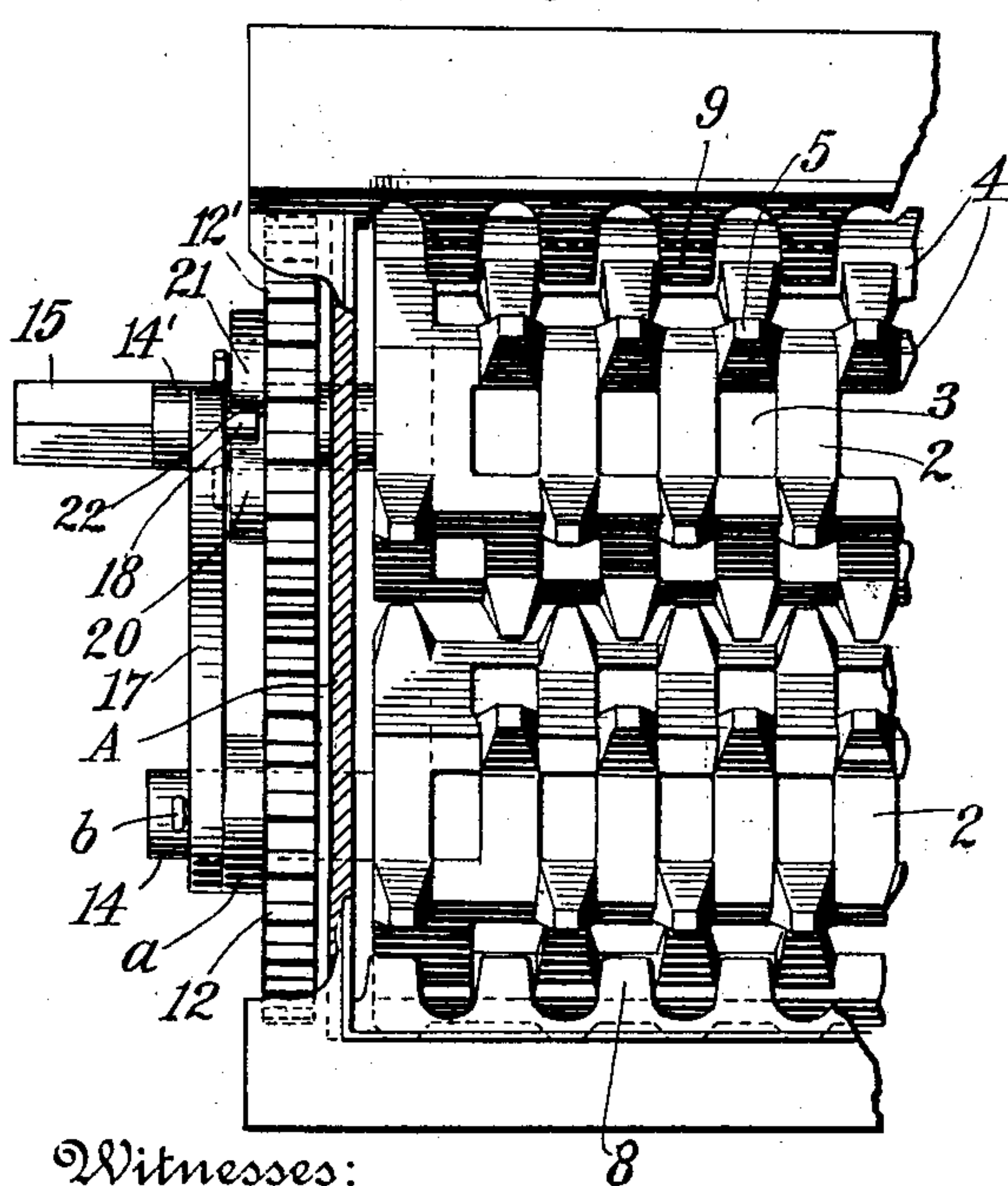
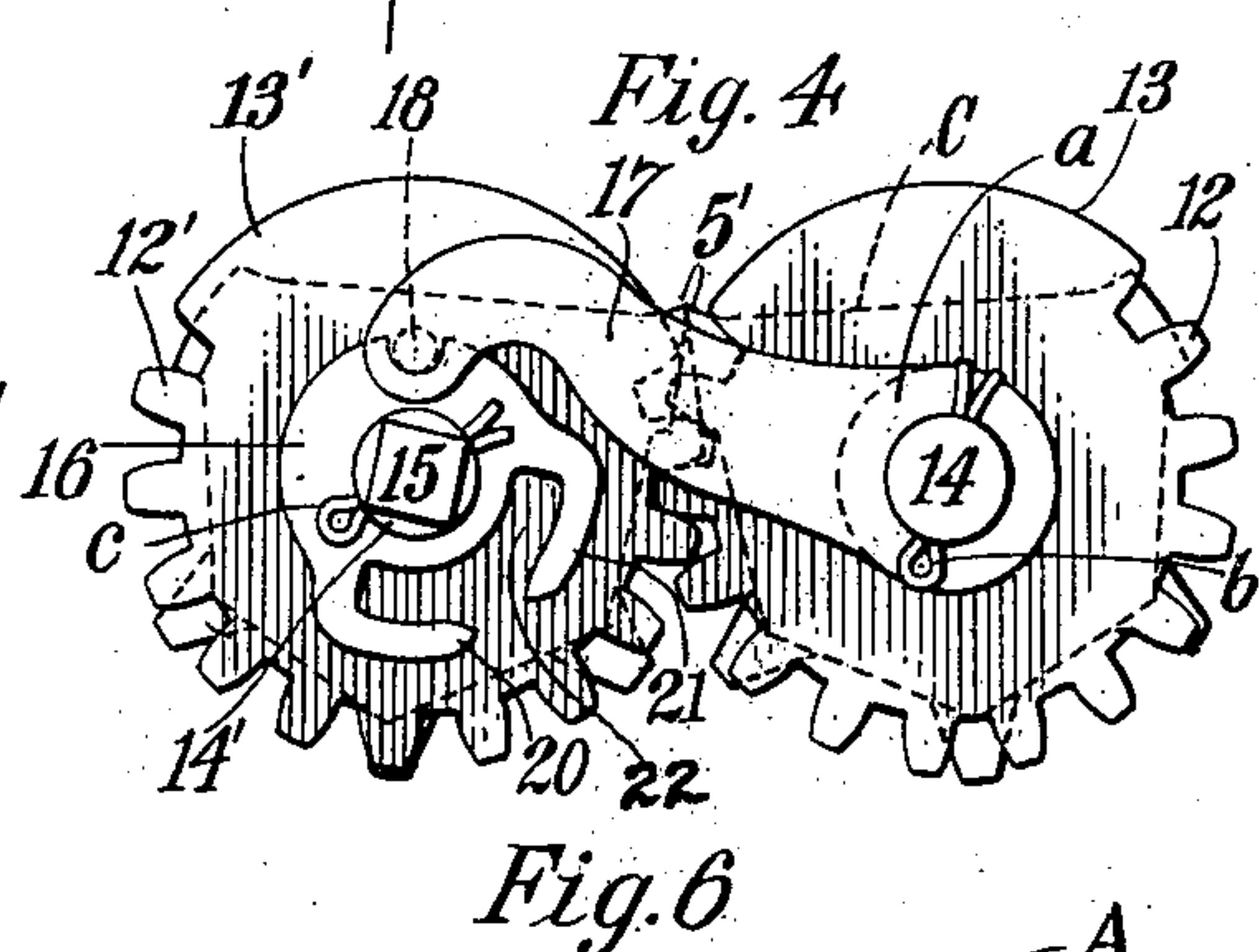
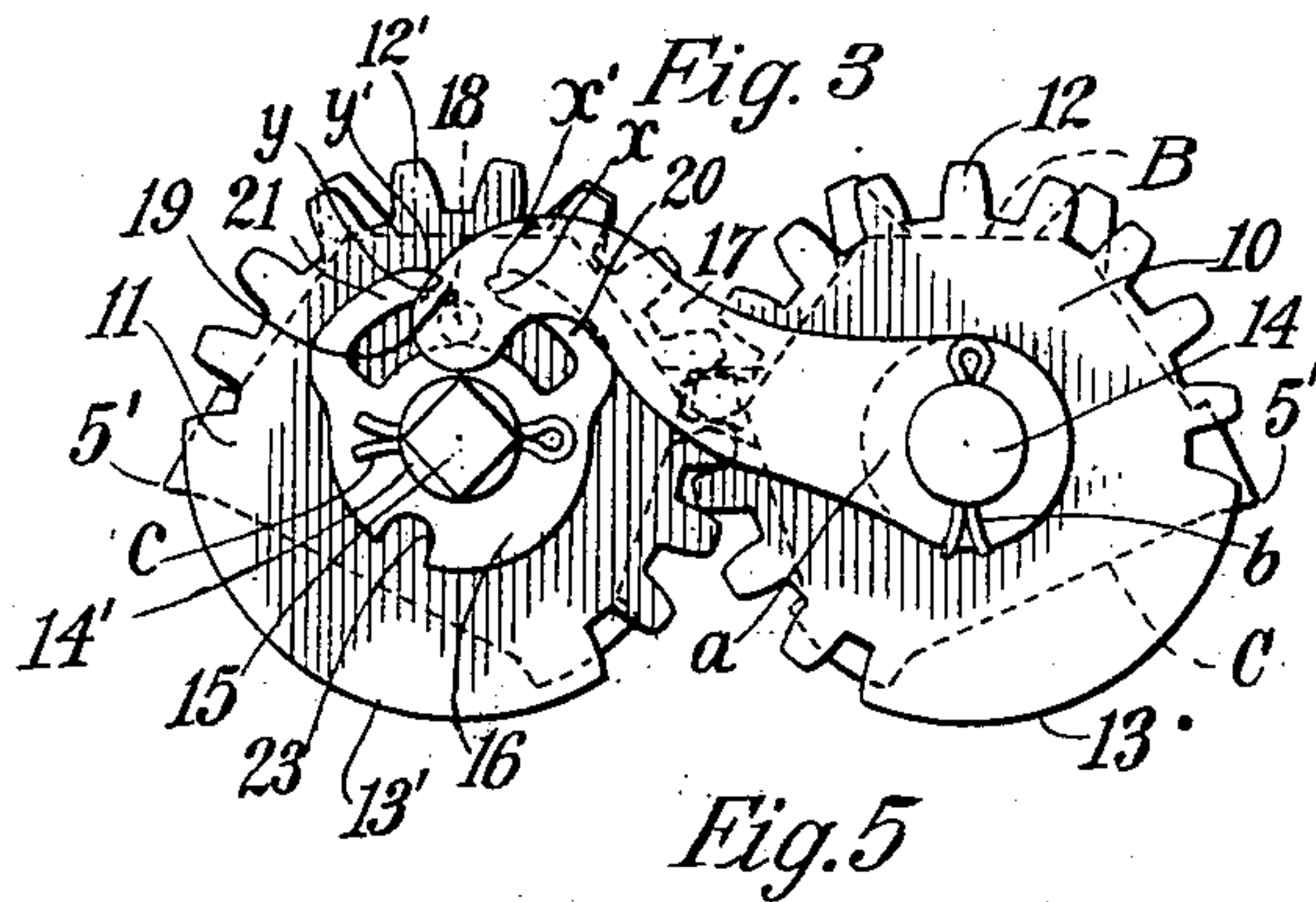
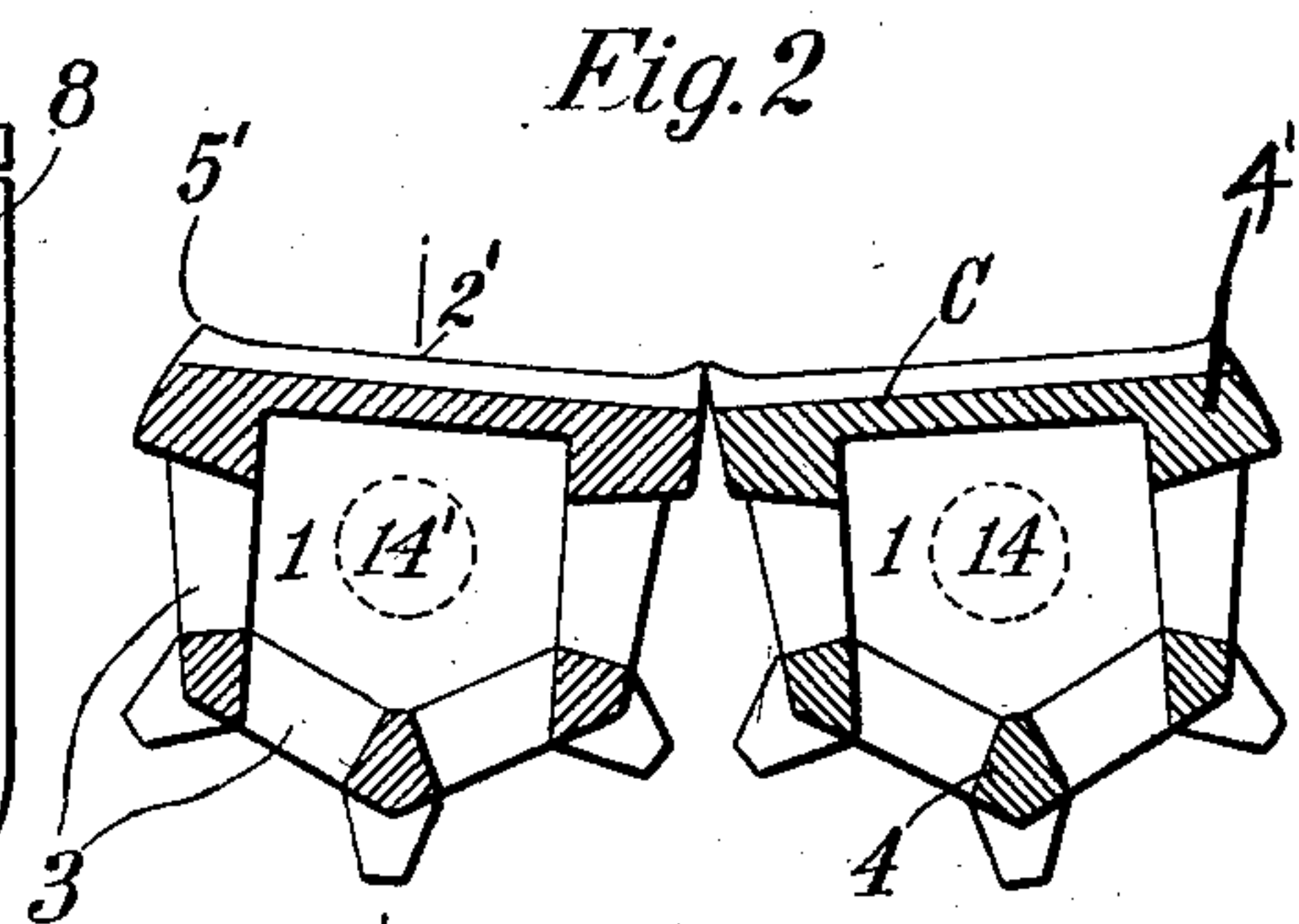
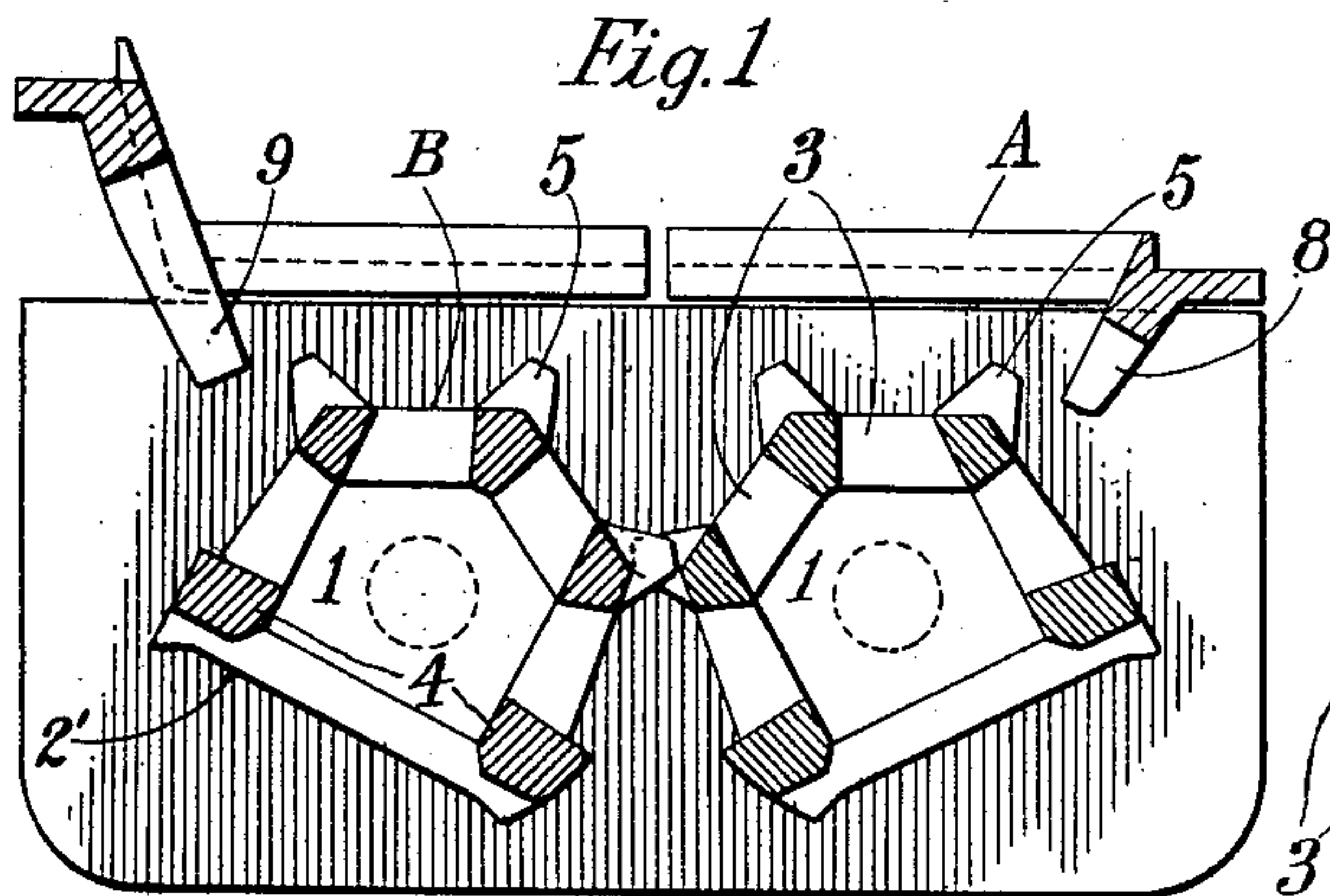
GRATE BAR.

APPLICATION FILED MAR. 31, 1910.

997,904.

Patented July 11, 1911.

2 SHEETS—SHEET 1.



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2 SHEETS—SHEET 2.

Fig. 7

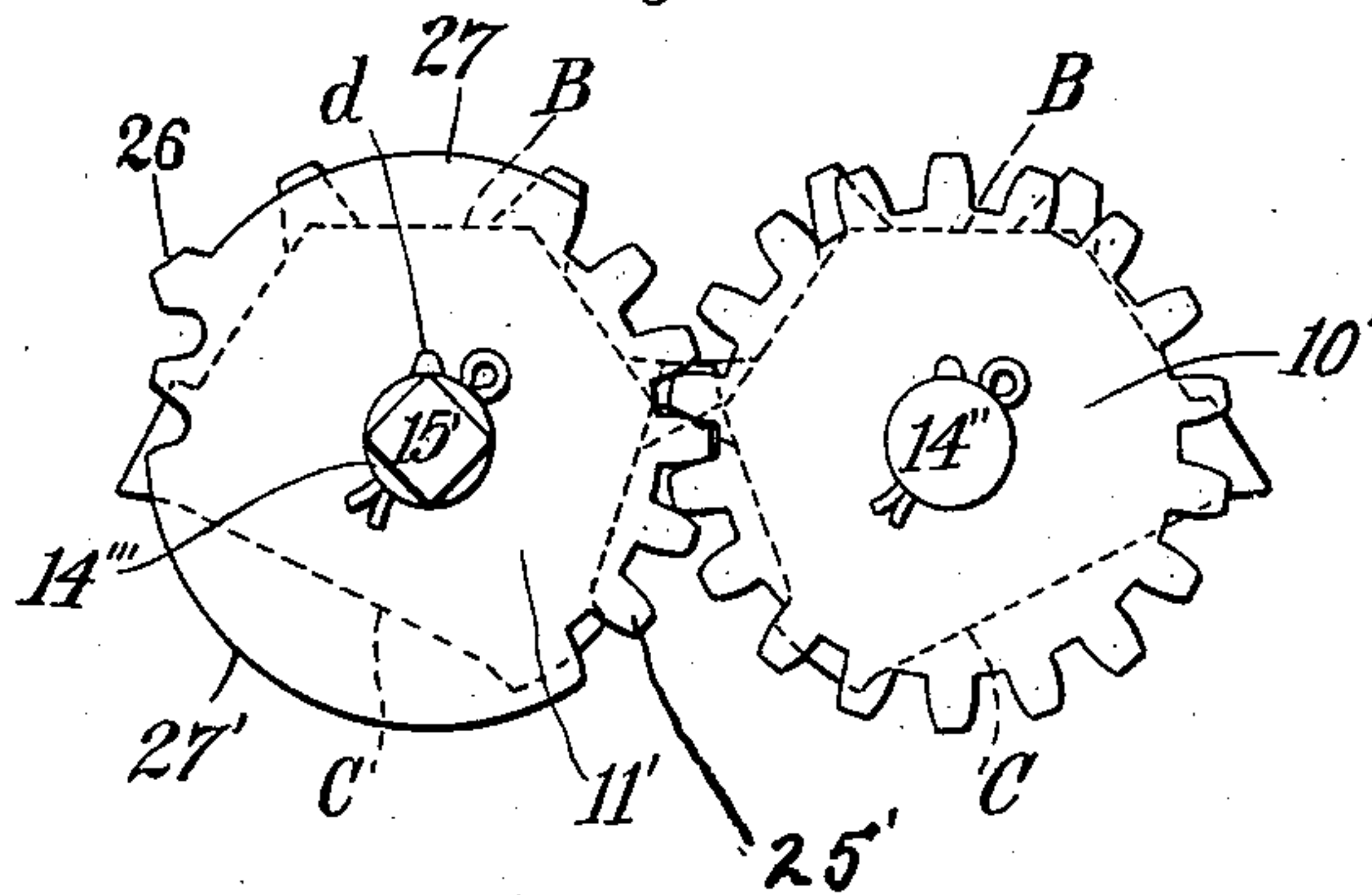


Fig. 9.

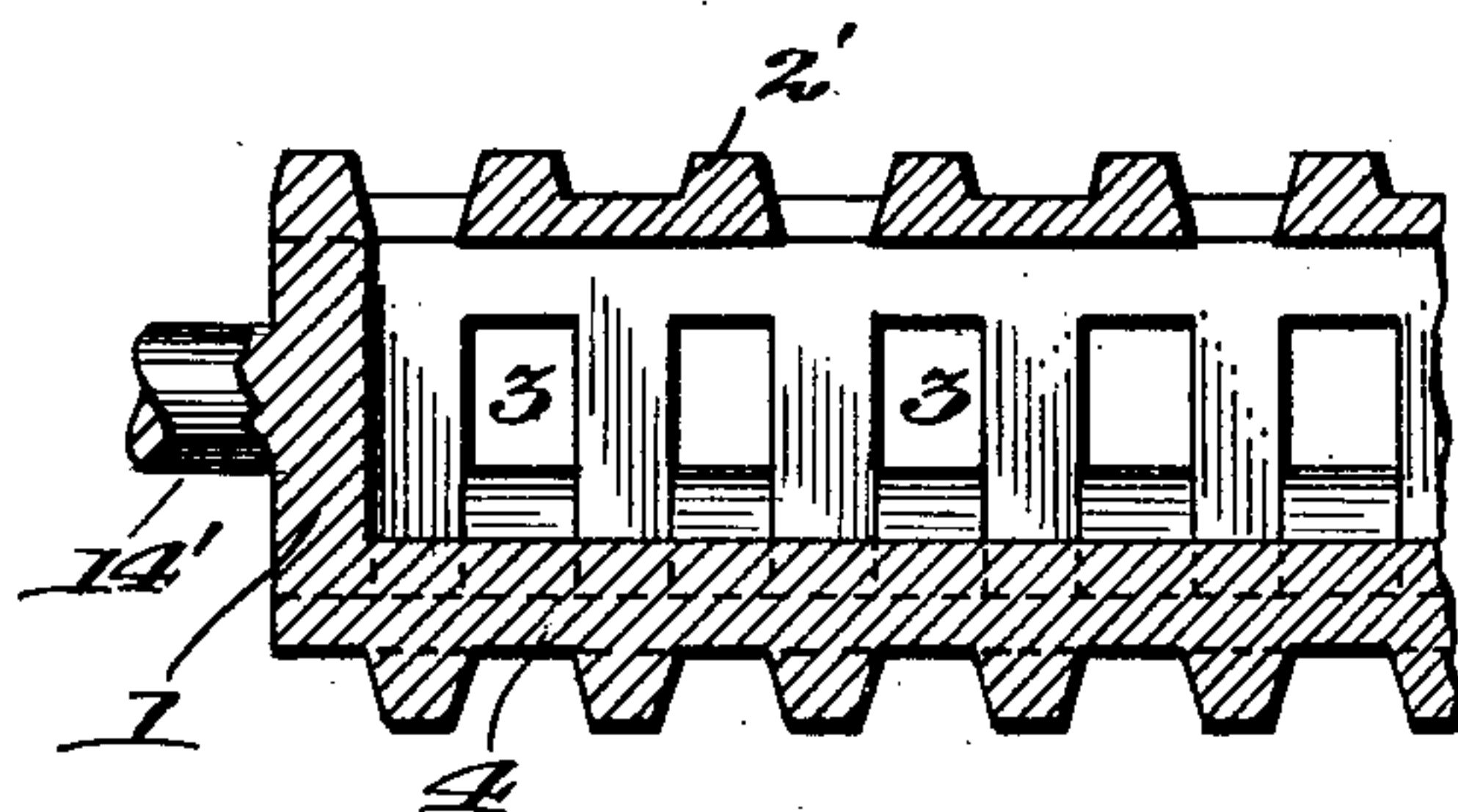
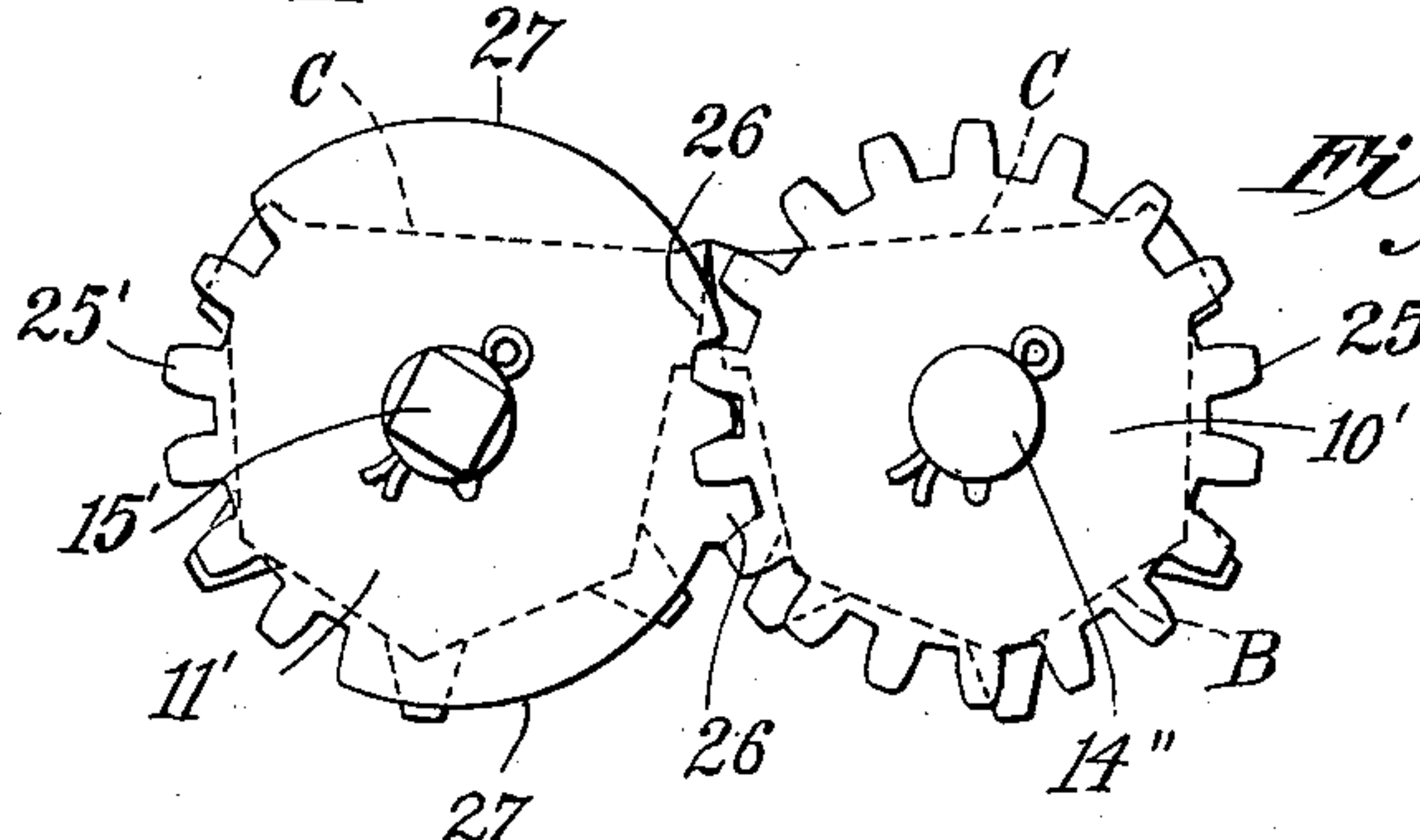


Fig. 8.



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UNITED STATES PATENT OFFICE.

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GRATE-BAR.

997,904.

Specification of Letters Patent.

Patented July 11, 1911.

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To all whom it may concern:

Be it known that I, EDWARD B. COLBY, a citizen of the United States, and resident of Montclair, in the county of Essex and State of New Jersey, have invented certain new and useful Improvements in Grate-Bars, of which the following is a specification.

This invention relates to improvements in grate-bars, and particularly to rotatable skeleton grate-bars suitable for optionally burning either coal, coke, wood or like fuel.

The principal objects of the invention include the provision of a plurality of polygonal grate-bars the same being preferably pentagonal and having four faces suitable for the reception of coal and at least one face for the reception of wood whereby efficient combustion of the said fuels is insured. The said grate-bars are pivotally mounted in the frame of a stove and preferably are so arranged as to permit the said grate-bars being maintained in two distinct positions herein termed "coal-burning" and "wood-burning" positions respectively.

When the grate-bars are maintained in the former position any one of certain faces herein termed "coal-faces" may be optionally thrown into an operative position for the retention and efficient combustion of coal fuel supplied thereto, it being merely necessary to rotate the grate-bars over a partial revolution in order to effect an interchange of said surfaces. The amount of rotation of said grate-bars is limited to a partial revolution in order to prevent a different surface, herein termed "wood-surface" from being accidentally thrown into commission during the period of shaking the grate-bars for the purpose of removing ashes and clinkers. Consequently these grate-bars may be employed in exactly the same manner as a simple grate-bar intended merely for the burning of one kind of fuel. When on the other hand, the grate-bars are maintained in an alternative position with the "wood-face" in an operative position suitable for the retention and efficient combustion of wood, then the accidental rotation of the grate-bars, sufficient to throw a coal face into commission is prevented. In fact preferably, when said "wood face" is in an operative position the grate bars are locked against all rotation whatsoever in order that the wood ashes may be permitted to accumulate, whereby the combustion of the wood-

fuel supported thereon will be materially enhanced.

In addition to the features set forth, this invention relates to the construction of the grate-bar *per se*, and comprises the provision of an extremely simple and durable grate bar which requires but a minimum amount of metal and in which all tendency to warp is eliminated, the same being so constructed that it permits of abundant circulation and efficient heating of the air supplied to the fuel.

The invention is set forth in detail in the following specification and accompanying drawings forming a part thereof, in which—

Figures 1 and 2 are vertical transverse sections; Figs. 3 and 4 are end elevations and Figs. 5 and 6 are plan views, showing the grate-bars in the alternative positions employed when burning coal and wood respectively; Figs. 7 and 8 are end views of the grate bars isolated showing a modified form of rotating mechanism also illustrating said grate bars in alternative positions employed when burning coal and wood respectively; and Fig. 9 is a fragmentary longitudinal sectional view of the grate-bars shown in Fig. 2 isolated, showing the construction of the wood-supporting side of the grate-bar.

Referring to the drawings and the construction shown therein, the reference letter A designates the frame of the stove in which are journaled rotary skeleton grate-bars of the combination type, having a central air space or chamber which serves as a hot air zone 1 and raises all of the air passing upwardly through the grate-bars to the requisite temperature to insure efficient combustion of the fuel supported above said grate-bars. Said grate-bars consist essentially of transverse ribs 2, which are placed apart in such a manner as to flank the slotted openings or air vents 3 and these transverse ribs are connected by longitudinal ribs 4, the latter being provided with integral teeth 5, which are staggered longitudinally of the said grate-bars, the whole forming four similar faces B which are intended for the reception and efficient combustion of coal. The said teeth are arranged so as to intermesh with the corresponding teeth of the adjoining grate bar and serve when the said grate bars are rotated for the purpose of shaking, in the manner well known, to

very effectively crush all clinkers and to gouge or bite out from beneath the bed of the fuel all of the ashes and consumed fuel, while allowing the unconsumed fuel to remain substantially undisturbed. The fifth face or "wood face" C, intended for the reception and efficient combustion of wood, is of considerably greater area than either of the "coal faces" of the grate-bar and, as indicated in Figs. 2, 4, and 6, has a reduced number of relatively large slotted openings or air vents therein. The said "wood-faces" C consist essentially, as shown, of relatively long transverse ribs 2' which are spaced apart and flank alternately either slotted openings or air vents 3' and troughs or channels 7, and said transverse ribs are connected by longitudinal ribs 4'. These channels, as it is apparent, serve to induce the accumulation of wood ashes and, owing to the slight inclination of the respective "wood faces" of each bar when juxtaposed to each other (see Fig. 2) any ashes will be gradually impelled, and will tend to accumulate, adjacent the center of the fuel burning area, namely, adjacent the divisional lines separating the respective wood faces of the individual grate bars. The respective ends of each transverse rib 2' are slightly offset and form teeth or pointed shoulders 5', and the teeth formed on the respective inner ends of said ribs, are as shown in Figs. 2, 4, and 6, adapted to abut against each other and thereby prevent the escape of the wood ashes intermediate the said grate bars. The said frame A is provided with downwardly extending inclined lugs or teeth 8 and 9 which are so arranged as to intermesh with the teeth of the "coal faces," and on the other hand to either abut against or project into close proximity to the teeth of the "wood faces" as indicated in Figs. 5 and 6. In order to actuate, as well as define, the movement of said grate-bars, whereby the same are optionally maintained in suitable positions either for the reception and combustion of coal or the reception and combustion of wood, the gear-plates 10 and 11 having interrupted gears 12 and 12' respectively thereon are cast integral with journals 14 and 14' of the respective grate bars, the latter journal having a polygonal end 15 adapted to receive a suitable shaker for the purpose of effecting rotation of the said grate-bars. A stop-plate 16 is cast preferably integral with the gear-plate 11 and a traveler or regulating arm 17, preferably of a curved configuration to permit of rotation of said stop-plate, without impact or interference therewith, is pivotally mounted upon the journal 14 of the other grate-bar, and a suitable washer *a*, corresponding in thickness to said stop-plate, is inserted between the traveler arm and the gear-plate 10 in order

to insure the requisite alinement between the traveler arm and the said stop-plate. The free end of the arm 17 is provided with a pin or pawl 18 which is adapted to optionally project through an opening 19 between the jaws 20, 21 of said stop-plate, the width of said opening being substantially equal to the diameter of said pawl, thereby permitting of the snug reception of said tooth therein. The said jaws 20, 21 form a guide-slot 22, which is adapted to snugly receive the pin or pawl 18 whereby the amount of rotation of the respective grate bars will be definitely fixed throughout the period that said pin remains within said slot. Each of the jaws 20, 21 is as shown, provided with beveled faces *x*, *x'* and *y*, *y'* respectively in order to facilitate the manual insertion of the pin 18 intermediate the said jaws and also to prevent the accidental displacement of the said pin from the guide-slot during the shaking or rotation of the grate-bars, as it is evident that if the pin should be accidentally thrust upwardly it would strike against said inclined or beveled faces and be prevented from escaping between the said jaws except at a particular moment when the pin was in the exact position shown in Fig. 3 *i. e.* directly beneath said opening. When it is desired to change the said grate bars from the "coal burning" position to the alternative or wood burning position, it is merely necessary to remove the pin 18 from the slot 22. This is accomplished by the manual elevation of the traveler arm 17 when the grate bars are in the position shown in Fig. 3 with the consequent passage of the pin 18 through the opening 19 formed intermediate the jaws 20, 21. The grate bars are then rotated into the position shown in Figs. 2 and 4, whereupon the traveler arm is permitted to drop in the position shown in Fig. 4 with the result that the pin 18 will enter the niche 23, and since said niche is of a size sufficient to snugly receive the said pin, the grate bars will be locked against all rotation whatsoever and the accidental rotation of the said grate-bars by an ignorant or careless person, with the subsequent displacement of the accumulated wood ashes, which are desirable for the purpose of enhancing the combustion of wood fuel, will be prevented.

In Figs. 7 and 8, the modified forms of rotating mechanism employed consist of a cog wheel 10' cast integral with the journal 14', and a removable gear-plate 11', having two interrupted gears thereon, the said plate 11' being keyed in any suitable manner preferably by being fitted over the rib or ear *d* on said journal in the manner well known. These grate bars will then be free to rotate over the arc of a circle corresponding to the toothed periphery 25' of the gear-plate 11', and this as is evident also corre-

sponds to the amount of rotation necessary to permit of any one of the "coal faces" being presented into an operative position during the shaking, while preventing the "wood surface" from being accidentally thrown into commission during the shaking of the grate bars. When, on the other hand, it is desired to burn wood, the gear-plate 11' is manually removed from the journal, or loosened, so as to permit of the rotation of the grate bars into the position shown in Fig. 8 and thereupon the gear-plate is replaced in a reversed position, so that the teeth 26 are locked in engagement with the teeth of the cog-wheel 10'. In this position it is evident that owing to the fact that the tooth 26 is enlarged and of a wedge-shaped configuration, the said grate bars will be rigidly locked against accidental movement for the purposes heretofore specified.

The fragmentary view shown in Fig. 9 serves to illustrate the character of the wood-faces, and the manner in which the transverse ribs 2' project above the level thereof and serve to retain ashes thereon.

In order to prevent the displacement of any of the elements of the rotating mechanism the grate bars may be mounted within the frame of a stove in such a manner that the frame itself, or integral lugs thereon bear against the traveler arm and the plate 16 of the mechanism shown in Fig. 3, or preferably the journals 14 and 15 are drilled to permit of the insertion of the well known cotter-pins, as indicated by the reference letters *b* and *c*. In a similar manner the elements shown in Figs. 7 and 8 may be secured together without requiring the employment of cotter-pins or necessitating the drilling of the journals 14' and 15', by fitting the same snugly within the frame of a stove in such a manner that either the frame or integral lugs thereon bear against the plates 10' and 11', and prevent the displacement thereof while permitting of their rotation when in the position shown in Fig. 7.

Since the configuration of the respective grate bars is substantially pentagonal in that it has four "coal faces," or faces for the combustion of high carbon content fuel, which are of an approximate equal size and a fifth face, which is somewhat larger than the others and being as previously stated a "wood-face," or a face for the combustion of low carbon content fuel, it is evident that the marginal edge at the intersection of any two of said "coal-faces" will, when the grate bars are in the coal-burning position, be in closest proximity to a corresponding edge of the opposing grate-bar, at that moment during the rotation thereof, when it lies approximately in the plane including and defined by the journals of the respective grate bars as indicated by the position

of the grate-bars as shown in Fig. 1. When on the other hand said grate bars are in the wood-burning position, (see Fig. 2) the marginal edge formed by the intersection of a "coal-face" with a "wood-face" will be in closest proximity to the corresponding marginal edge of the opposing grate-bar when the said edges lie approximately in the plane containing said "wood-faces." But it is apparent that if each grate-bar was of true pentagonal configuration with all of the faces of equal size, (and when a grate-bar to be exclusively used for the consumption of coal is desired, such a true pentagonal grate-bar is employed), that a marginal edge between any two faces would be in closest proximity to a corresponding edge of the opposing grate-bar at that moment during the rotation thereof when said edges lie approximately in the plane including and defined by the respective journals of the grate-bars.

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

1. In a grate bar, the combination comprising a plurality of oscillatory, substantially pentagonal grate-bars, each grate-bar having four similar faces adapted for the effective combustion of high carbon content fuel and one face for the effective combustion of low carbon content fuel, said faces surrounding a central heating chamber and being provided with apertures adapted to afford communication with said chamber, a marginal ridge disposed on each side of the mouth of an aperture in said "wood-face" and a series of channels adapted to retain wood ashes formed between successive ridges along said "wood-face," terminal teeth projecting from the marginal edge of each grate bar at the intersection of any two coal-faces with each other, the teeth of one grate-bar being adapted to mesh with the teeth projecting from a corresponding marginal edge of the opposing grate-bar, and thereby form a clinker-crushing mechanism, and oscillation mechanism connected with said grate-bars and adapted to permit of oscillation of said grate-bars when in a coal-burning position while preventing complete rotation thereof and to admit of the locking of said grate-bars against oscillation when in the wood-burning position, said oscillation mechanism including a plurality of gear-plates rigidly secured respectively to each grate-bar, each gear-plate being provided with gears, the said gears being arranged to intermesh with each other, a connecting bar loosely mounted upon the axis of one of said grate-bars and having a stop-pin at its free end, opposing jaws secured to the gear-plate of the other grate-bar, said jaws forming an elongated guide-slot adapted to receive said

stop-pin and to define the movement thereof, the said jaws being spaced sufficiently far apart to admit of the insertion therebetween of said stop-pin, the ends of each jaw
5 being beveled in such a manner as to impel said pin to return into said slot when the said pin is caused to forcibly contact therewith, and said gear-plate being provided with a recess on its periphery at a point
10 substantially diametrically opposite the free ends of said jaws, said recess being adapted to snugly receive the said stop-pin and thereby lock both the said grate-bars
15 maintain the said grate-bars in the wood-burning position.

2. In a grate, the sub-combination comprising a plurality of oscillatory substantially polygonal grate-bars, the said grate-
20 bars being so arranged as to permit of oscillation through more than half of the arc of a circle and permit of the presentation of a plurality of the faces of said grate bar in an operative position for the reception
25 and efficient combustion of high carbon-content fuel, while preventing one of said faces from being accidentally thrown into an operative position during said oscillation.

3. A grate-bar provided with a plurality of faces suitable for the reception and efficient combustion of coal having a relatively large number of apertures for the admission of air through said faces to the fuel
35 supported thereon and having at least one face provided with ash-retaining means thereon and a relatively reduced number of apertures for the admission of air through said face to the fuel supported thereon, and
40 means permitting of oscillation of said grate-bar when said coal-faces are in an operative position and for automatically preventing said face having the ash-retaining means from being thrown into an operative
45 position during said oscillation of the grate-bar.

4. In a grate, the sub-combination comprising a plurality of polygonal grate-bars of the combination type having separate
50 faces for the reception and efficient combustion of coal and wood respectively, and means for admitting of oscillation of each of said grate-bars when either of the afore-said coal-faces is in an operative position
55 for the efficient combustion of fuel, while preventing complete rotation thereof, whereby one of said faces may be maintained in an inoperative position while the oscillation of the said grate-bars is permitted within defined limits.
60

5. In a grate, a plurality of oscillatory grate-bars arranged to permit of the same being thrown into two distinct positions, and means for oscillating said grate-bars respectively through the arc of a circle while pre-

venting complete rotation thereof, when in one of said positions.

6. The combination comprising a grate, a plurality of grate-bars of the combination type rotatably journaled therein, each grate-
70 bar being provided with a plurality of coal-faces for the reception and efficient combustion of coal and also a wood-face for the reception and efficient combustion of wood, the said grate-bar being so arranged that the
75 marginal edge at the intersection of any two of said coal-faces will be in closest proximity to the corresponding edge of the other grate-bar at that moment during the rotation thereof when it lies approximately in the
80 plane including both journals of the grate-bars, and means permitting of oscillation of said grate-bars when either one of said four coal-burning faces is in an operative position
85 for the reception and efficient combustion of fuel while automatically preventing the interchange of positions between the different types of faces.

7. The sub-combination, comprising a grate, a plurality of grate-bars having jour-
90 nals, rotatably mounted in said grate, each grate-bar having at least five faces, a plurality of said faces being suitable for the reception and efficient combustion of coal, the said grate-bar being so arranged that the
95 marginal edge of the intersection of any two of said coal faces will be in closest proximity to the corresponding edge of the other grate-bar at that moment during the oscillation thereof when it lies approximately in the
100 plane including both journals of the grate-bars, and means permitting of oscillation of said grate-bar while in a coal-burning position while automatically preventing an interchange of positions during such oscillation of the grate-bar.
105

8. The sub-combination, comprising a grate, a polygonal grate-bar, mounted in suitable bearings in said grate, means for oscillating the same through an arc of a
110 circle while preventing complete rotation thereof, whereby at least one face is maintained in an inoperative position throughout said period of oscillation and rendered incapable of supporting fuel for combustion
115 purposes, means for releasing said face and permitting the same to be thrown into an operative position, and means for locking said face in an operative position to prevent accidental oscillation of said grate-bar.
120

9. The combination comprising a plurality of oscillatory grate-bars provided with two distinct types of faces adapted respectively for the reception and efficient combustion of coal and wood, and means for preventing complete rotation of the respective grate-bars while permitting oscillation thereof when the coal-faces are in an operative position.

10. The combination comprising a grate, 130

a plurality of polygonal grate-bars provided with journals and rotatably mounted in suitable bearings, gears on each grate-bar adapted to intermesh with each other, a connecting-bar loosely mounted on one of said journals, means for co-acting with the free end of said bar adapted to confine to oscillation of said grate-bars within predetermined limits, said loosely mounted bar being arranged to permit of its being thrown out of

commission and thereby permit of complete rotation of said grate-bar.

Signed at Jersey City in the county of Hudson and State of New Jersey this 29th day of March A. D. 1910.

EDWARD B. COLBY.

Witnesses:

K. L. REILLY,

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Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
