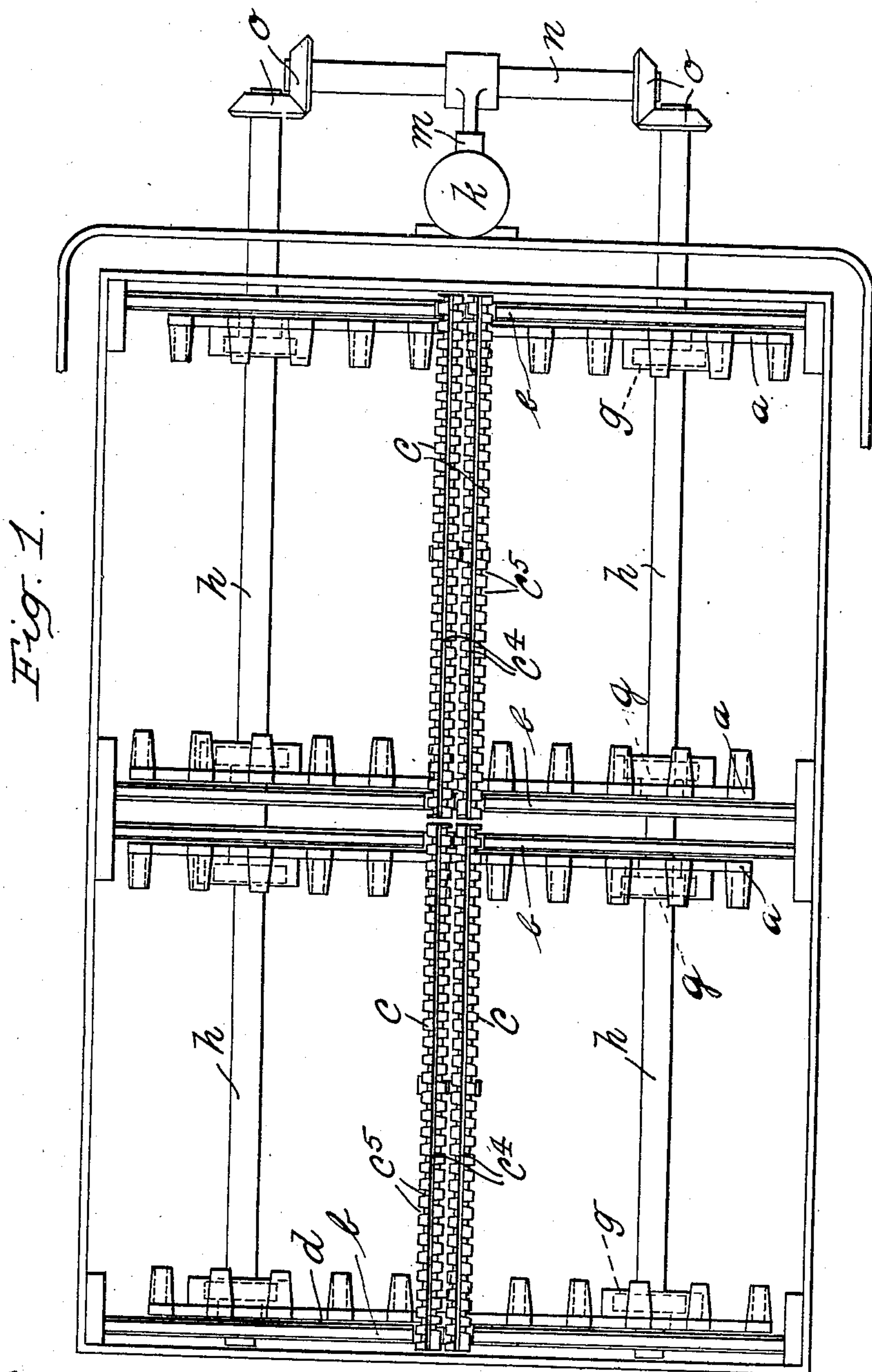


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R. ALLEN.
FURNACE GRATE.
APPLICATION FILED JULY 10, 1908.

Patented Jan. 26, 1909.
5 SHEETS—SHEET 1.



Witnesses.
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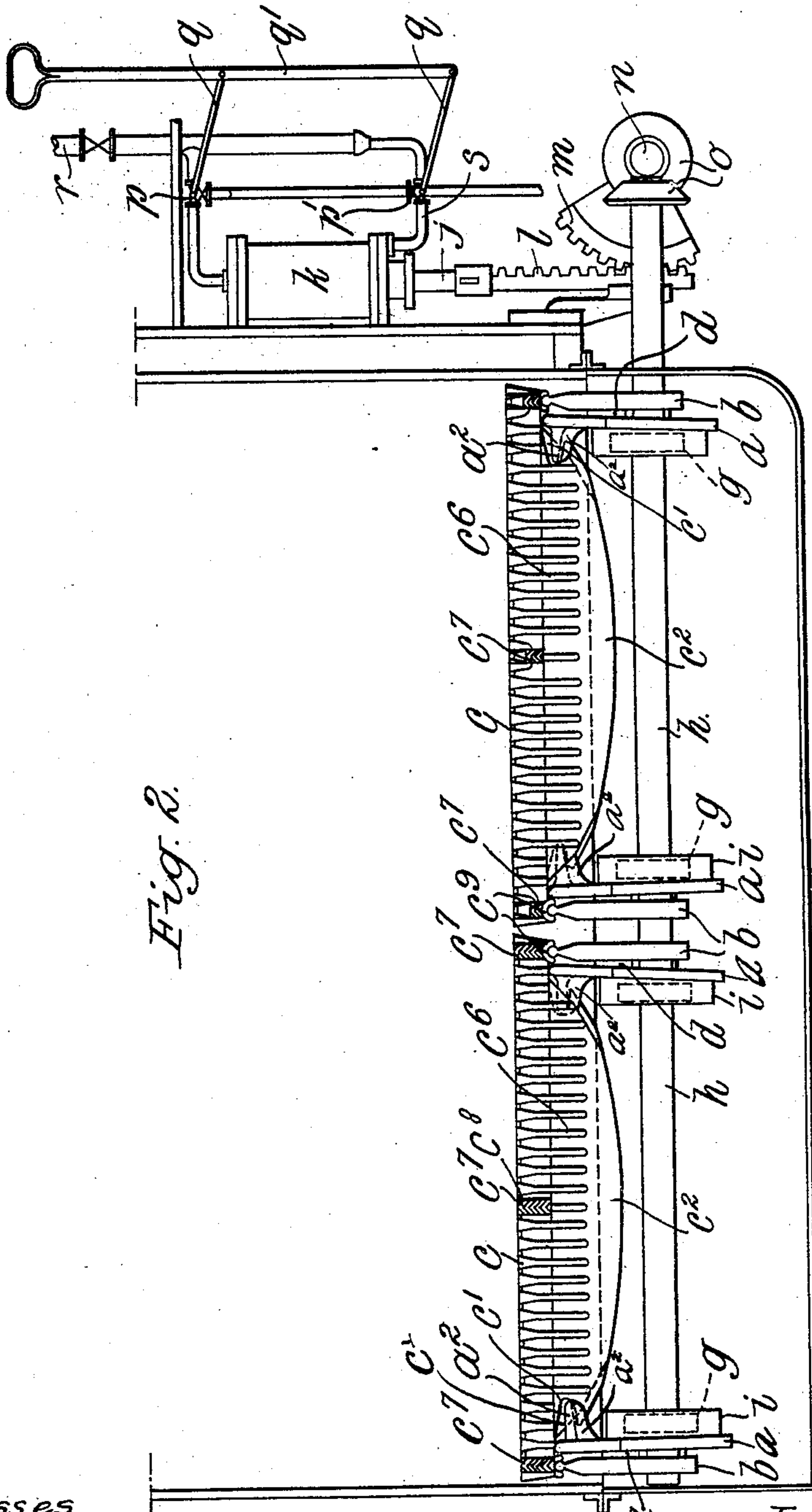


Fig. 2.

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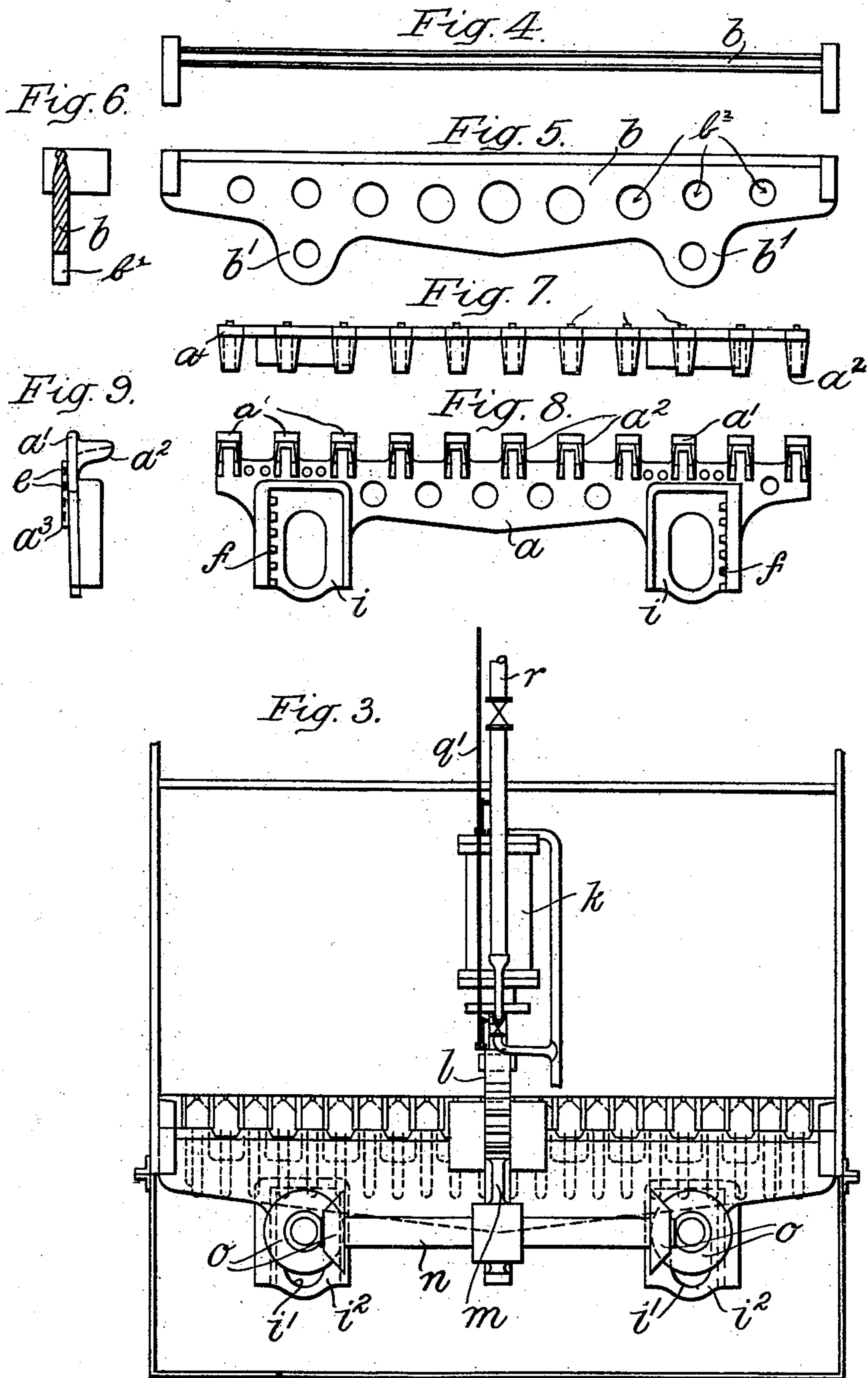
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5 SHEETS—SHEET 3.



Witnesses.

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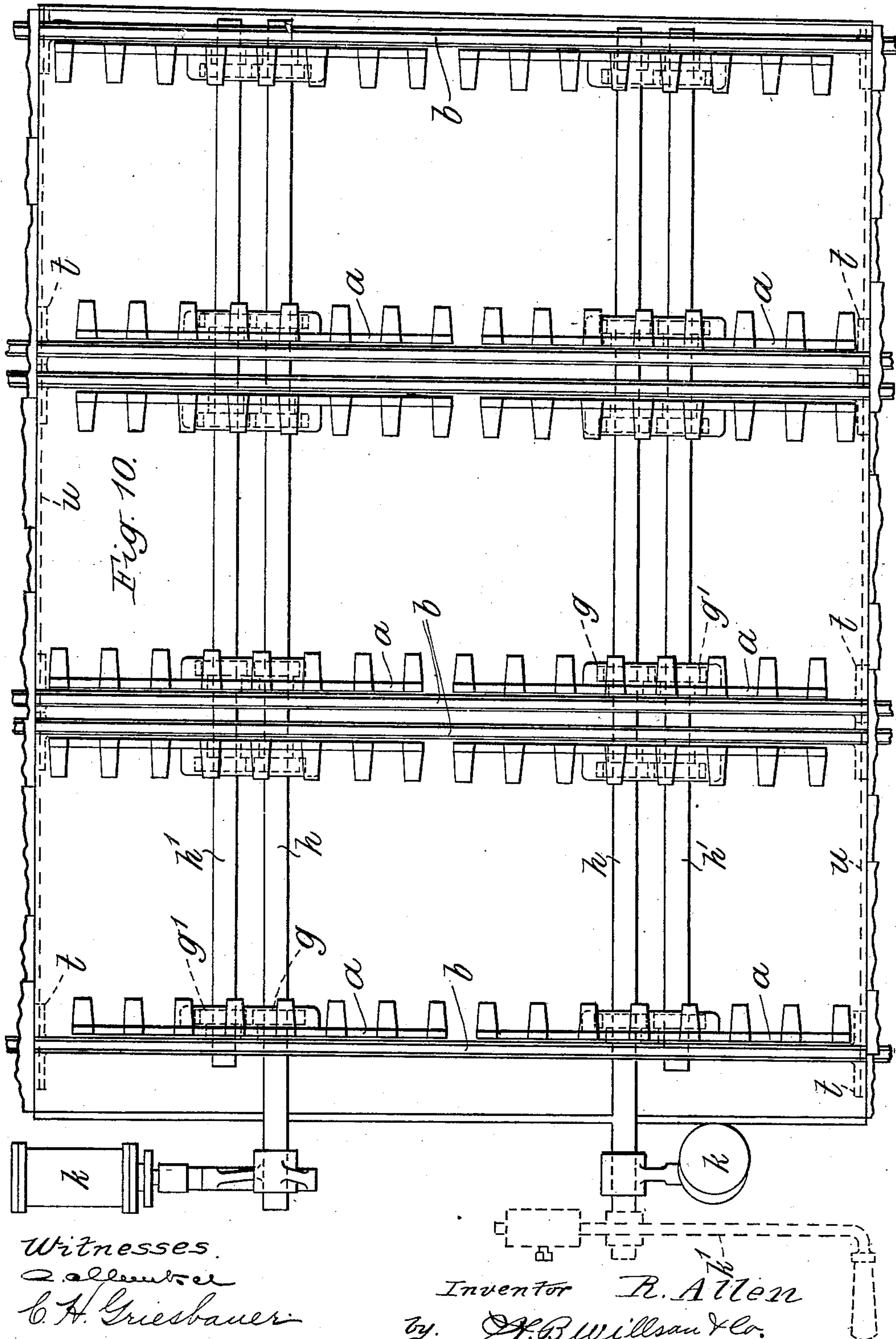
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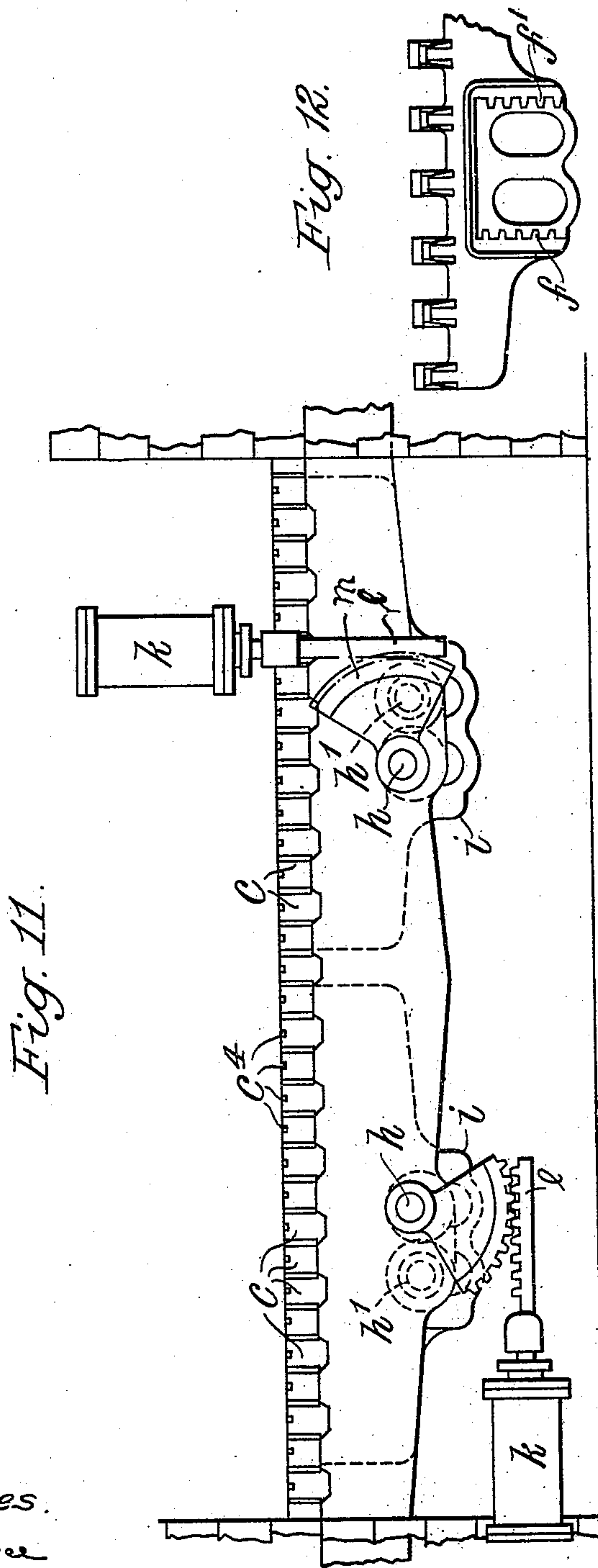
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5 SHEETS—SHEET 5.



Witnesses.

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UNITED STATES PATENT OFFICE.

ROBERT ALLEN, OF CAVERSHAM, ENGLAND.

FURNACE-GRATE.

No. 910,766.

Specification of Letters Patent.

Patented Jan. 26, 1909.

Application filed July 10, 1908. Serial No. 442,910.

To all whom it may concern:

Be it known that I, ROBERT ALLEN, a subject of the King of Great Britain and Ireland, residing at Oakdene, Kidmore Road, Caversham, Oxfordshire, England, have invented certain new and useful Improvements in and Relating to Furnace-Grates, of which the following is a specification.

This invention relates to furnaces with shaking grates and more particularly to the type of grate in which one set of alternate grate bars is raised and lowered at one end and the other set raised and lowered at the opposite end and has for its object to provide such grates with actuating means that shall be more reliable in action than those employed heretofore, also to generally improve the construction of the grate with a view to preventing clogging of the bars or operating gear.

According to this invention the grate bars are supported at opposite ends on fixed bearer bars having an even supporting surface so that in the normal position the bars form a level grate, but are raised and lowered in the required order by notched or serrated lifting bars operated by rack and pinion and bevel gearing. All surfaces in contact between the grate bars are formed with a series of diagonal notches or grooves to convey away all ash getting between the said surfaces.

In the accompanying drawings Figure 1 is a plan of a furnace grate constructed according to this invention, comprising two packs of bars, two fire bars only being shown in each pack in order that the underlying lifting bars may be clearly seen. Fig. 2 is a side elevation of Fig. 1 partly in section; Fig. 3 is a front elevation of Fig. 1. Figs. 4 and 5 are plan and side elevation respectively of one of the fixed bearer bars. Fig. 6 is a transverse section of the same, Figs. 7 and 8 are similar views to Figs. 4 and 5 showing the notched or serrated lifting bars. Fig. 9 is an end elevation of the same. Fig. 10 is a plan of a large furnace grate divided into two sections with separate operating mechanism for each section. Fig. 11 is a front elevation of Fig. 10 with parts broken away, and, Fig. 12 is a fragmentary view in elevation of one of the lifting bars.

In the form of the invention illustrated in Figs. 1 to 9 the lifting bars *a* are mounted adjacent the inner sides of the fixed bearers *b* and are formed with suitably spaced teeth

or projections *a'* along their upper edges adapted to engage under the ends of alternate grate bars *c* and lift them when the lifting bar *a* is raised without disturbing the intermediate grate bars. The grate bars *c* are each provided at one end with a socket *c'* which receives the upper rounded edge of the bearer bar *b* while the other end is flat on the underside so that this end can move freely on the tooth of the lifting bar. Laterally projecting tongues *a''* are cast or otherwise formed on the teeth of the lifting bars and engage in notches *c'* formed in the ends of the webs *c''* of the grate bars so that when the lifting bars *a* are lowered the grate bars *c* are positively pulled down on to the fixed bearer bars *b*. As shown the bearer bars *b* have bearing lugs *b'* formed thereon and are perforated to enable air to pass through freely. On the lifting bar *a* tapering spacing or guide ribs *a'''* are cast which are in contact with the fixed bearer *b* and insure a space *d* being left between the lifting bar *a* and bearer *b* which increases in width from the top downwards so that ash or the like is prevented from accumulating and air is admitted in the space aforesaid. In the outer faces of the spacing ribs inclined grooves *e* are formed to keep the faces clear of clinker or the like, while perforations are formed in the bars for the passage of air. The lifting bars *a* have depending racks *f* cast on them and are actuated by pinions *g* gearing with the racks *f* and keyed on shafts *h* mounted in the bearings *b'* in the fixed bearer bars *b*. In order to prevent ash or clinkers entering the gear the racks and pinions *f g* are inclosed in boxes or housings *i* cast on the lifter bars the shafts *h* passing through elongated holes or slots *i'* in the rack boxes. The rack boxes are each closed on one side by a removable plate *i''* of sheet metal also slotted to allow the shaft *h* to pass through. Steam or manual power is employed for rotating the shafts to operate the lifter bars. When steam power is used the piston *j* of a direct acting steam cylinder *k* is operatively connected by means of a rack *l* and quadrant or toothed arm *m* fixed on a cross shaft *n* as shown which is geared by bevel gear wheels *o* with the operating shafts *h* of the fire bars. Or the rack may be geared direct to one of the two operating shafts. The supply of steam to the cylinder *k* is controlled by three-way cocks or valves *p p'* which are coupled together by levers *q* and actuated by a single rod *q'* to put the steam

supply pipe *r* and exhaust pipe *s* in communication with opposite ends of the cylinder *k* alternately.

In applying the invention to large furnaces
5 the width of the grate is divided into two or more sections which may be raised either independently or together. As shown in Figs. 10 and 11 the width of the grate is divided into two sections. The grate bars *c*
10 of each section are actuated by separate lifting bars *a a* but rest on common fixed bearer bars *b* that extend across the furnace. A pair of operating shafts *h h'* mounted under each section pass through the same rack box
15 *i* and are geared together by the pinions *g g'* that mesh with racks *ff'*. By this means the shafts *h h'* are rotated in opposite directions to drive racks *ff'* arranged on opposite sides of the box *i*. The shafts *h* are operatively
20 connected with the pistons of steam cylinders *k* or may be operated by hand cranks *k'* as shown in dotted lines.

The fixed bearers *b* may be carried into the sides of the furnace and have flanges *t* cast on
25 them near the ends for the attachment thereto of spacing bars *u* which run the full length of the grate and maintain the bearers in position in a convenient and simple manner.

Suitable grate bars *c* for giving good re-
30 sults in a shaking grate of the type outlined are those in which slanting grooves *c⁴* are formed along the upper surfaces of the bars and communicate with lateral recesses or air spaces *c⁵* in the sides thereof which allow the
35 ashes to fall freely between the grate bars.

Vertical side webs or fins *c⁶* extend downwardly from the head to near the lower edge of the central web of each fire bar, and ribs *c⁷* at the ends and middle of the bars which
40 form contact surfaces for the contiguous bars are formed with deep angular notches *c⁸* or grooves in their contacting surfaces to render them self cleaning.

What I claim and desire to secure by Letters Patent is:—
45

1. In combination with grate bar sections, rigid supporting means for the ends of the sections, lifting bars near the ends of the sections, said bars provided at their upper edges with portions to engage alternate bars of the sections, racks formed upon the lifting bars, operating shafts extending through the lifting bars, pinions on said shafts to engage the rack teeth, housings formed on the lifting bars to provide a protection for said pinions and operating means for rocking said shafts alternately in reverse directions to positively raise and lower the lifting bars. 50 55

2. In combination with grate bar sections provided with depending longitudinal webs, rigid supporting bars at the ends of said sections, lifting bars provided with portions to engage alternate bars of the grate bar sections and portions to engage ends of the grate bar webs, racks formed upon the lifting bars, operating shafts extending through the lifting bars, pinions upon said shafts for engaging said racks and positive means for rocking said shafts alternately in reverse directions to alternately raise and lower the lifting bars and opposite ends of alternate grate bars. 60 65 70

3. In combination with grate bar sections, bearer bars provided with reduced rounded portions at their upper edges to seat in the ends of said sections, lifting bars arranged near said bearer bars and provided with means for engaging alternate grate bars, the outer faces of the lifting bars having vertical series of upwardly tapering spacing ribs to engage the inner faces of the bearer bars whereby spaces of downwardly increasing width are left between the bearer bars and lifting bars. 75 80

In testimony whereof I have affixed my signature, in presence of two witnesses. 85

ROBERT ALLEN.

Witnesses:

H. D. JAMESON,
A. NUTTING.