

(No Model.)

2 Sheets—Sheet 1.

T. M. EDWARDS.
GRATE.

No. 567,083.

Patented Sept. 1, 1896.

Fig. 1.

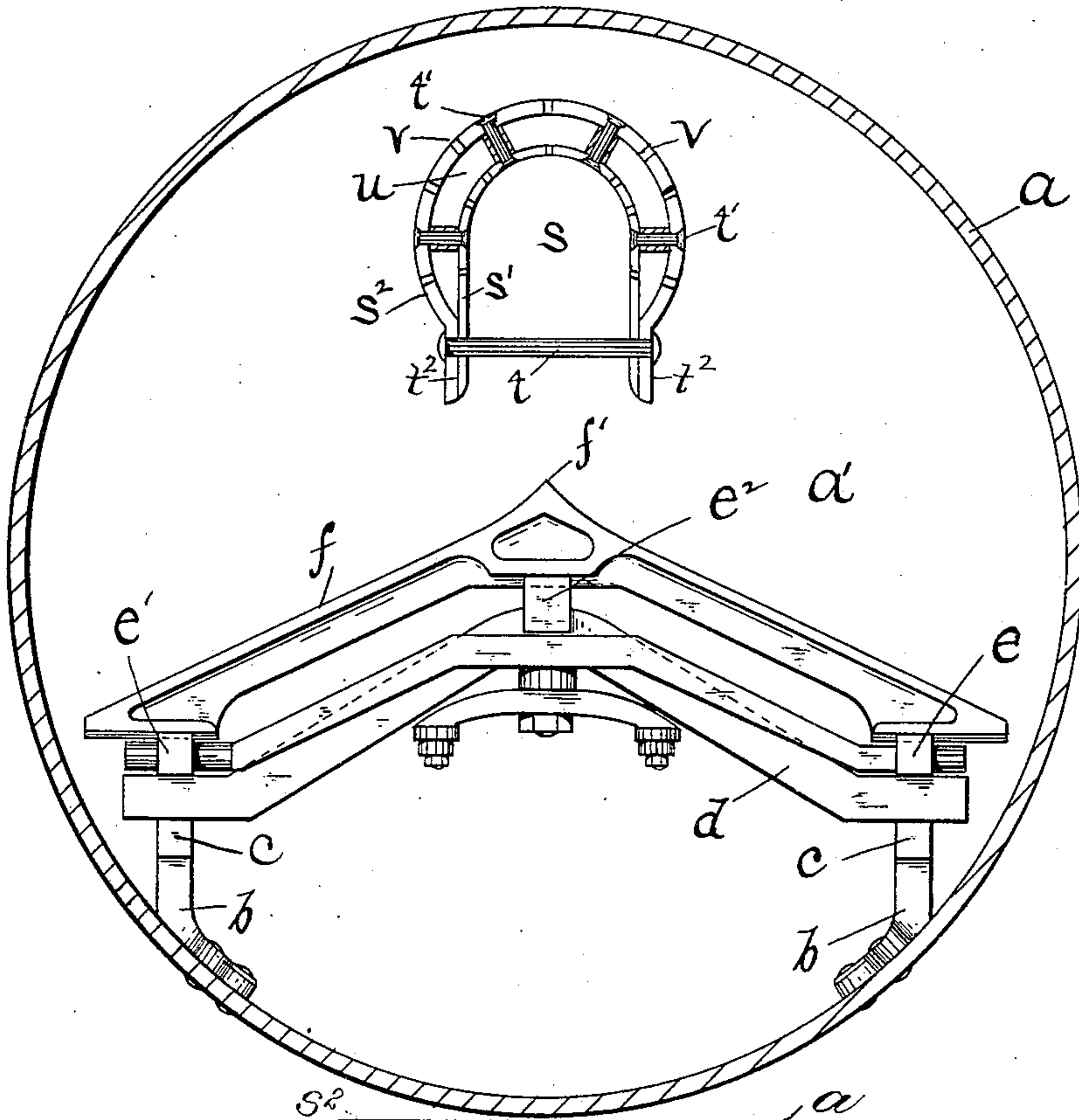
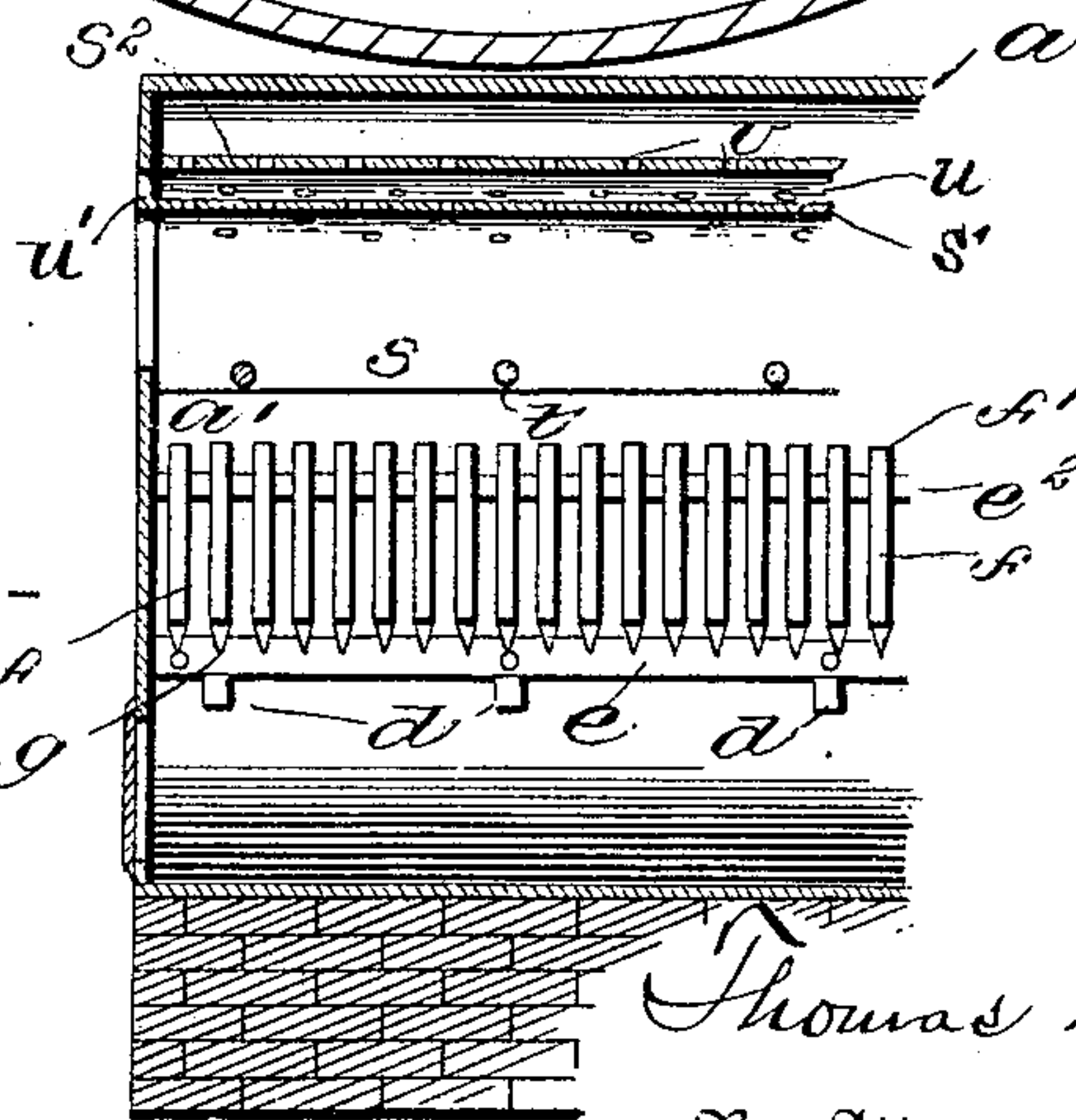


Fig. 4.



Witnesses

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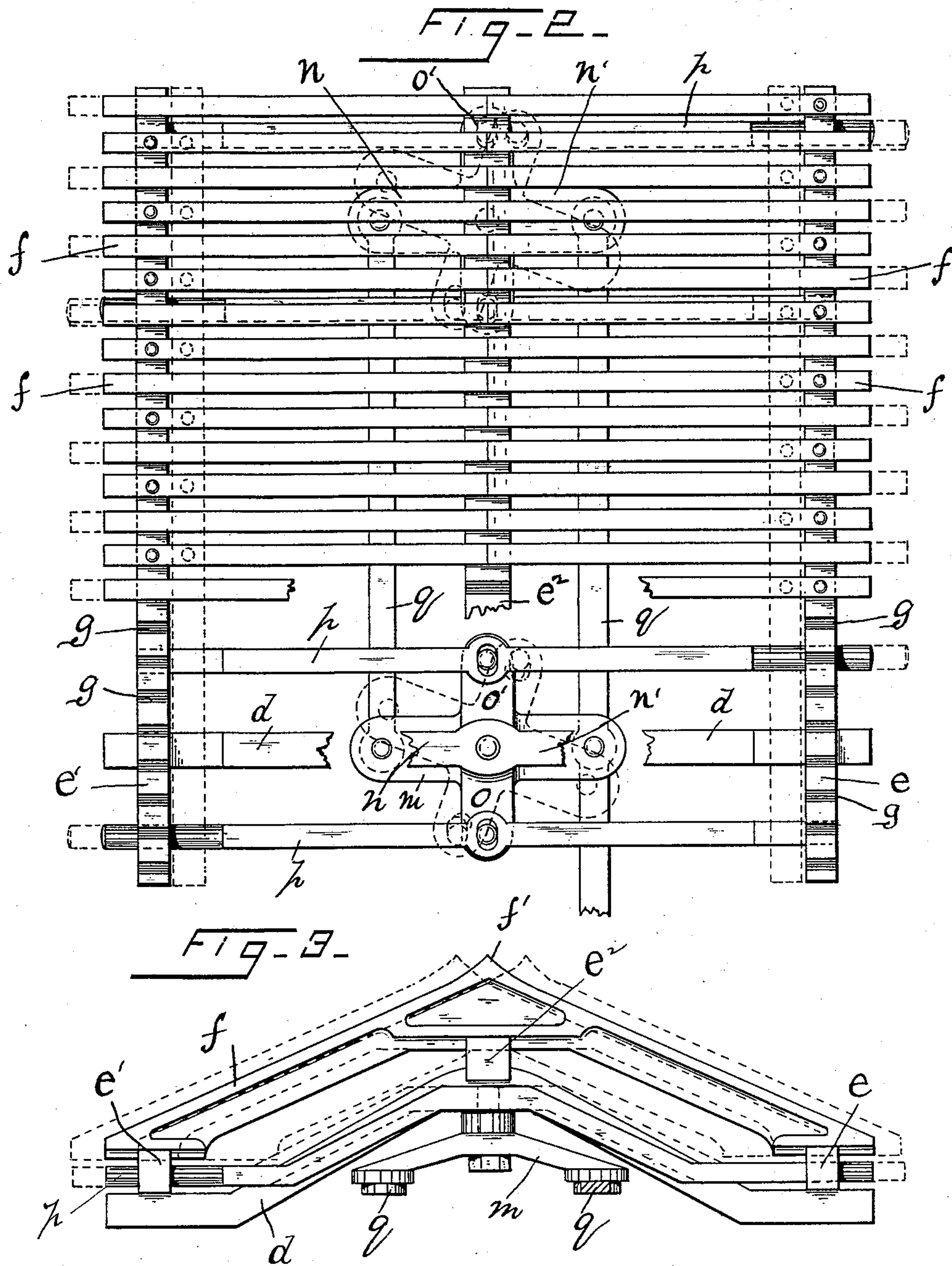
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2 Sheets—Sheet 2.

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Witnesses

Abigail M. Luther.
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UNITED STATES PATENT OFFICE.

THOMAS M. EDWARDS, OF NEW LONDON, CONNECTICUT.

GRATE.

SPECIFICATION forming part of Letters Patent No. 567,083, dated September 1, 1896.

Application filed January 8, 1894. Serial No. 496,111. (No model.)

To all whom it may concern:

Be it known that I, THOMAS M. EDWARDS, a citizen of the United States, residing in the city and county of New London and State of Connecticut, have invented certain new and useful Improvements in Grates, which improvements are fully set forth and described in the following specification, reference being had to the accompanying two sheets of drawings.

The object of my invention is to provide a furnace of simple construction in which coal of various grades may be economically used and in which better heating results may be attained in limited space than has been possible heretofore. I further provide a form of furnace that will act as a smoke-consumer, thus forestalling the disagreeable results, both in locomotive and stationary engines, now so common.

To assist in explaining my invention, I have provided the annexed drawings, in which—

Figure 1 is a sectional view taken just inside the front plate of a furnace-casing, showing my new grate properly located within said furnace. Fig. 2 is a detached plan view of my grate, several of its bars being broken away to expose certain mechanism provided for shaking the same; and Fig. 3 is an elevation of the several parts illustrated in Fig. 2. Fig. 4 is a broken vertical sectional view through Fig. 1, with the grate in side elevation, showing the feeding mechanism, which is omitted in Fig. 1.

Referring to the drawings, the letter *a* indicates a furnace-casing of cylindrical or other suitable form, constructed in the usual manner, in which furnace is located my improved grate, which latter supports the fire and beneath which a suitable pit for ashes is provided. The construction of this grate and the manner of supporting and operating the same form the essential features of this invention, and I will therefore proceed to describe these several elements.

Rigidly supported inside the case *a* and extending longitudinally through said case are several arms *b*, which arms *b* are located on each side the furnace in the same horizontal plane and serve to support on each side of the furnace a bar *c*, said bars being parallel

with each other and reaching approximately from the front to the rear ends of the furnace. Supported on and secured to bars *c* and extending at right angles thereto are bars *d*, here shown as two in number, located, respectively, at the front and rear ends of the furnace. Bars *d* are also parallel to each other, reach approximately from side to side of the furnace, and are preferably of the form illustrated in Fig. 1, the central portion of the same being somewhat elevated.

By reference to Fig. 1 it will be seen that the ends of bars *d* are so shaped as to provide a short horizontal portion on which rests on one side of the furnace a bar *e* and on the opposite side a bar *e'*. On the central elevated portion of bars *d* is located and fixedly secured a similar bar *e²*, bars *e*, *e'*, and *e²* being parallel with each other. Bars *e*, *e'*, and *e²* serve to support the grate-bars proper of my device, indicated by reference-letter *f* and preferably of the form shown in Fig. 1, from which it will be seen that said grate-bars are angular in form, the apex *f'* of the several grate-bars being centrally located throughout the length of the furnace.

When assembling a grate of my construction, the bars *f* are set on edge in grooves *g*, provided in the bars *e e'*. Each grate-bar *f* is fixedly secured at one end to bar *e* or *e'*, as the case may be, as shown, with the free end of each bar lying in its groove in rod *e* or *e'*. It has already been stated that bar *e²* is securely fastened to the central elevated portion of bars *d*. The companion bars *e* and *e'*, however, are capable of a limited reciprocating movement on the horizontal portions of the bars *d*, as will be hereinafter explained. Should the grate-bars be placed in position and alternately secured to the bars *e e'*, as just explained, it will be readily understood by reference to Fig. 2 that should motion be imparted to either of the rods *e e'* said rod will carry with it all the grate-bars secured to the same, the free end of each grate-bar sliding in its groove in the companion bar. To thus impart motion to the grate-bars *f*, I have provided certain mechanism in connection with my grate proper which I will proceed to describe.

Located near the front and rear ends of the

furnace and pivotally secured to the under side of the bars *d* are cross-heads *m*, provided, respectively, with arms *n n'* and *o o'*.

By reference to Fig. 2 it will be seen that when the various parts are in the positions shown in said figure the arms *o o'* extend in a direction approximately parallel to that of the length of the furnace, while the arms *n n'* are approximately at right angles to its length. The extremities of the arms *o o'* of each cross-head are pivotally connected to certain rods *p*, that are the same in general shape as the bars *d*. Rod *p*, pivoted to the arm *o'* of each cross-head, is fixedly secured to bar *e'*, the free end of said rod *p* sliding in bearings provided therefor in the bar *e*. The companion rod *p*, pivoted to the arm *o* of each cross-head, is similarly secured to bar *e*, its free end likewise sliding in bearings in the bar *e'*. The cross-heads *m* are caused to rock in unison by means of rods *q*, pivotally secured to and connecting the arms *n* and *n'* of each cross-head. It will be readily seen by reference to Fig. 2 of the drawings that should the cross-head *m* be rocked, as shown in dotted lines in said figure, arms *o'*, through the connecting-rods *p*, will draw toward the center of the furnace the bar *e'*, and in a like manner the arms *o*, through their connecting-rods *p*, will also draw inward bar *e*, said bars *e e'* being thus moved toward each other. On the other hand, should the cross-heads *m* be rocked in the opposite direction the bars *e e'* will travel away from each other. Bars *e e'* will carry with them the grate-bars *f*, secured thereto, each grate-bar, when in motion, moving in a direction opposite to that taken by its immediate neighbor, or, in other words, each alternate bar will move in the same direction and thus produce a shaking or sifting motion to the entire grate, the central portion of bars *f* during such time being free to slide in the grooves provided for them in the bar *e²*. One of the rods *q* is somewhat longer than its companion and, if desired, may be extended through the front plate of the furnace, thus allowing it to be readily grasped when it is desired to shake the grate, or such extension may be suitably connected and actuated by power.

Assuming that we have a grate of the described construction, it will be seen that when the same is shaken the described sliding movement of the grate-bars will cause all ashes on the upper side of said grate to sift down into the ash-pit beneath, and it will also be noted that the construction of the grate is such that such shaking motion will cause all pieces of clinker and burned fuel too large to pass between the bars to travel down the inclined sides of the grate-bars and finally drop through the openings between the ends of the same produced when the grate is in motion, as shown in dotted lines in Fig. 2. This shaking motion will also cause the fuel in the process of consumption to spread itself on each side of the apex of the grate-bars, thereby

obtaining a more even distribution of the fuel and fire than it has been possible to obtain in grates of ordinary construction, in which case the major portion of the fire is at the center of the fire-pot instead of at the sides, thus heating a smaller area than my improved form.

Immediately over the apex of the grate-bars and extending from front to rear of the furnace is a coal-chamber *s*, in which a considerable supply of coal may be maintained. As fast as the burning coal supported by the grate-bars is consumed other coal will pass by gravity downward from the chamber *s*, and as often as the grate-bars are vibrated said coal will gradually be distributed evenly upon the grate-bars.

The coal-chamber *s* is preferably formed by an inverted-U-shaped shell *s'* and an outer shell *s²*, which are joined at suitable distances by bolts *t*, passing through the lower portions *t²* of said shells, and by shorter bolts *t'*, which are of such a length that an air-space *u* is formed between the aforesaid shells. The said air and gas mixing chamber *u* is at each of its ends in communication with the outer air by means of the openings *u'* in the casing *a*. (See Fig. 4.) Each of said shells is perforated with holes *v*. As the coal in chamber *s* becomes sufficiently heated to generate and throw off carbon, which, being forced outward through the perforations *v* of the inner shell, mingles with the air in the space *u* and passes outward through the perforations of the outer shell, and being ignited by the flames of the furnace provides a large number of gas-jets that aid materially in maintaining a high degree of temperature in the furnace. By locating the coal-reservoir within the fire-chamber the coal is thus raised to a high temperature before being fed downward to the grate-bars and is used with greater economy than when simply shoveled onto a flat grate, as most commonly practiced.

Having described my invention, I claim—

1. In a furnace, a casing, a grate having a raised center and sloping sides, said center extending longitudinally in the casing thereof in combination with an inverted-U-shaped trough located above said center and composed of perforated shells having an inclosed air-space, said air-space opening at its ends to atmosphere, substantially as described.
2. In a furnace-grate, the combination of a support having a raised horizontal central portion and horizontal side portions, laterally-movable bars mounted on the horizontal side portions thereof, means for moving said bars, and grate-bars, each connected at one end to one of the respective laterally-movable bars and slidingly mounted at the other end in the other bar, the central portion of each of said grate-bars being raised and adapted to slide on the horizontal raised central portion of the support, substantially as set forth.
3. In a furnace-grate, the combination of a support, laterally-movable bars mounted on opposite sides thereof, grate-bars, each con-

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4. In a furnace, the combination, with supports *c*, of bars *d* located thereon, each end of which is provided with a flat portion and the central portion is raised and provided with a flat portion, a longitudinal bar upon each of the flat portions of the first-mentioned bars, each of which is provided with grate-bar bearings, a series of inclined grate-bars each secured at one end to one of the second-mentioned bars, and having its opposite

end lying loosely in the opposite bar said grate-bars alternating with each other, and means for simultaneously moving the side bars toward and away from each other, substantially as set forth.

5. In a furnace, a casing the arms *b* secured to the inner sides thereof, the longitudinal bars *c* secured to said arms, the cross-bars *d* supported on said bars *c*, the side bars *e*, and *e'*, the longitudinal bar *e²* resting on a central and raised portion of the bars *d*, and the grate-bars *f*, resting on said bars *e*, *e'* and *e²*, said parts being combined substantially as described.

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Witnesses:

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