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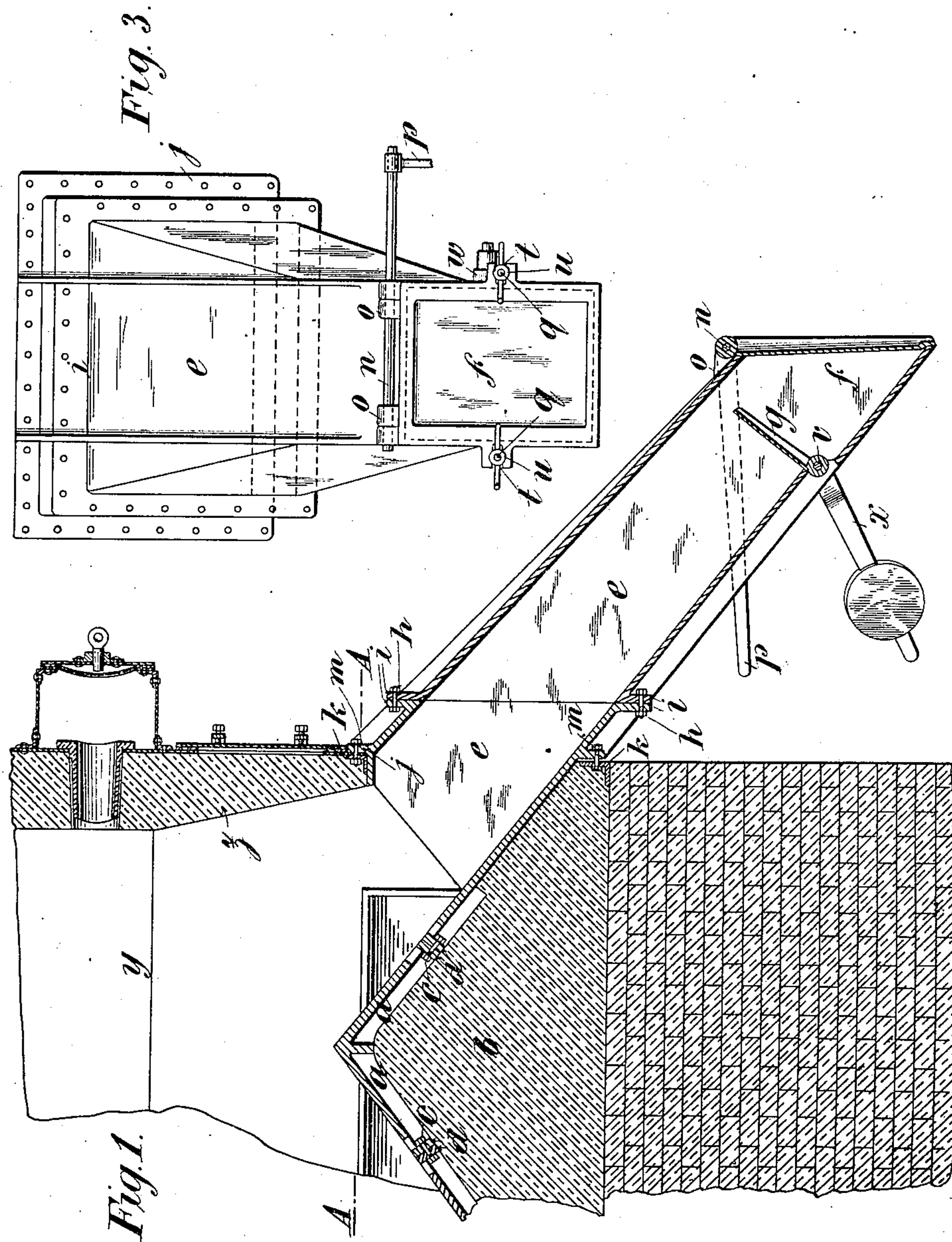
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KILN OR APPARATUS FOR CALCINING PURPOSES.

APPLICATION FILED JUNE 2, 1902.

NO MODEL

3 SHEETS—SHEET 1.



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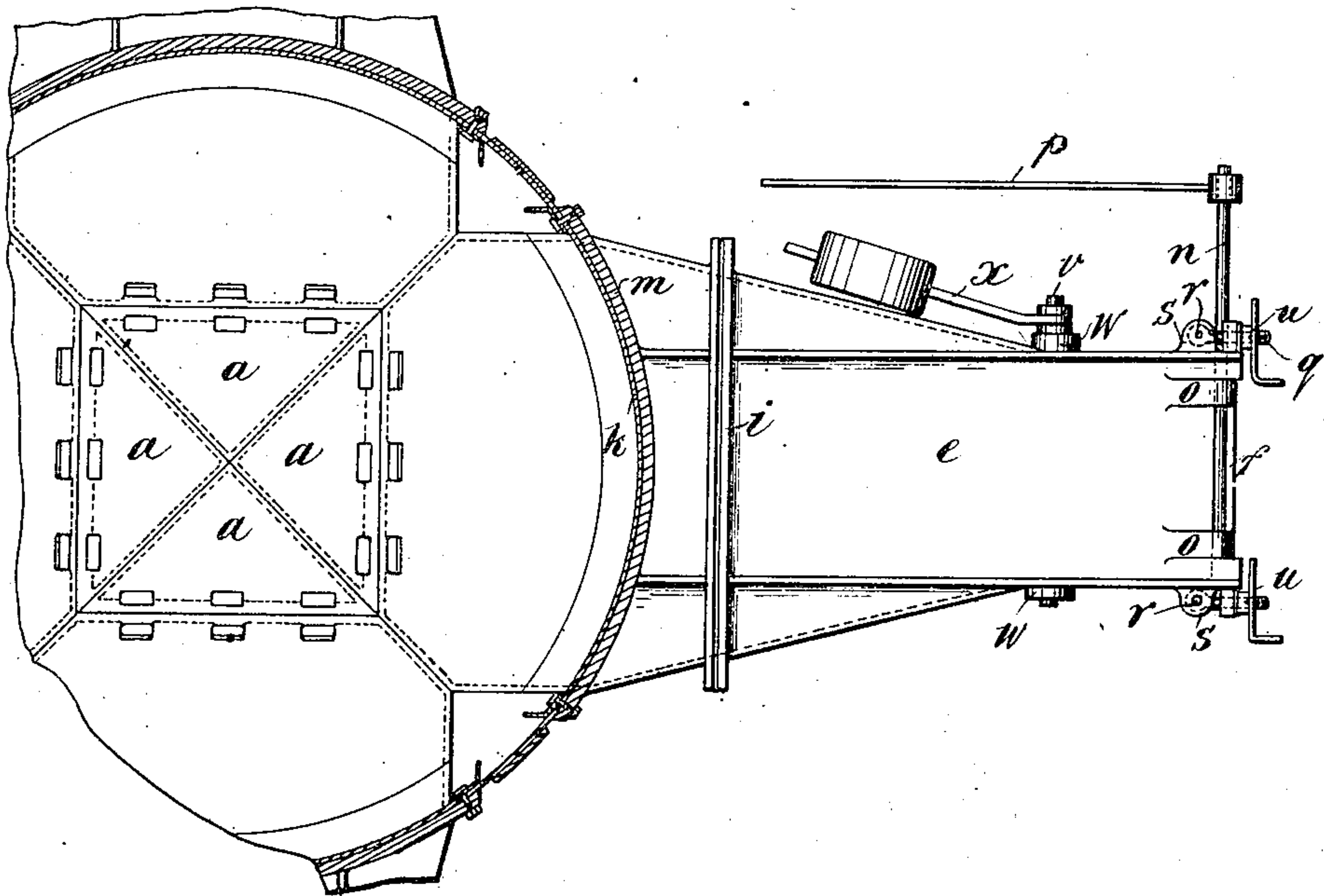
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APPLICATION FILED JUNE 4, 1902.

NO MODEL.

3 SHEETS—SHEET 2.

Fig. 2.



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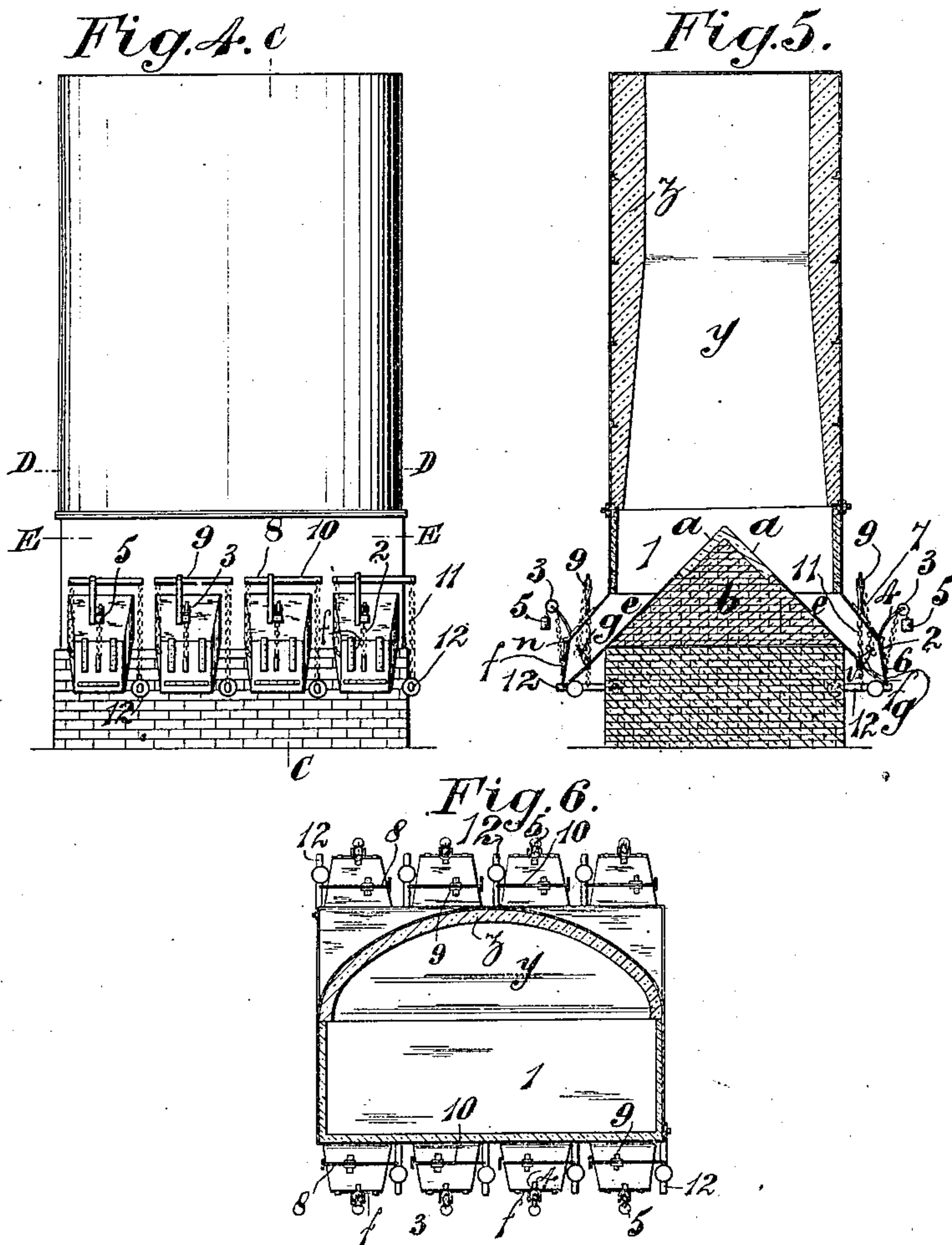
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NO MODEL.

3 SHEETS—SHEET 3.



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UNITED STATES PATENT OFFICE.

JOHN ROWLEY HORTON, OF WORKSOP, ENGLAND.

KILN OR APPARATUS FOR CALCINING PURPOSES.

SPECIFICATION forming part of Letters Patent No. 723,528, dated March 24, 1903.

Application filed June 2, 1902, Serial No. 109,942. (No model.)

To all whom it may concern:

Be it known that I, JOHN ROWLEY HORTON, a subject of the King of Great Britain and Ireland, residing at Worksop, in the county of Nottingham, England, have invented Improvements in Kilns or Apparatus for Calcining Purposes, of which the following is a specification.

This invention has reference to kilns or apparatus that are intended to operate after the manner of a running-kiln—that is to say, in a continuous or approximately continuous manner and can be advantageously employed for calcining lime, dolomite, or other substances.

The invention has for objects to effect saving in the time and labor of drawing material from such kilns; to enable the charge to be drawn equally and uniformly all over the kiln, which is not practicable with running-kilns with boshes as usually employed; to obtain greater uniformity in calcining, and to prevent loss of heat at the top of the kiln.

The bottom of the kiln is made with downwardly-inclined surfaces terminating in outlets each provided with an outer door, whereby the outlet can be completely closed, and with an inner door which can be independently operated and is adapted to arrest the discharge of treated material through the outlet when required and to hold up the contents of the kiln or furnace in such a way as to enable the outer door to be readily closed. The inner door is of less sectional area than the outlet-passage which it is intended to control or is of such a size that when moved into its position of closure (which may be inclined to the said passage) it will not completely close the outlet-passage, so that it may be moved into its attitude of closure in opposition to the downflow of material through the outlet-passage. By the easy manipulation of the inner door after opening the outer door the material can be allowed to run out under the action of gravity, and thus no shoveling is required, which in the case of ordinary kilns, so far as I am aware, entails a large amount of labor and time, a considerable portion of which is saved by this invention.

The invention consists in various novel features of construction and combinations of parts, as hereinafter fully described, and set forth in the claims.

Figure 1 of the accompanying illustrative drawings shows in central vertical section a portion of the lower part of one arrangement of apparatus, according to this invention, adapted to serve as a cupola for calcining and shrinking dolomite. Fig. 2 is a sectional plan corresponding to the line A A of Fig. 1, and Fig. 3 shows in front elevation one of the four inclined outlet-passages of the cupola with its outer door. Fig. 4 shows in front elevation a running kiln of large size according to this invention. Fig. 5 is a vertical section corresponding to the line C C of Fig. 4, and Fig. 6 is a sectional plan corresponding to the line D D of Fig. 4 as regards the upper half of the figure and corresponding to the line E E of Fig. 4 as regards the lower half of the figure. Figs 4 to 6, inclusive, are somewhat diagrammatic.

In the arrangement shown in Figs. 1, 2, and 3 the floor or bottom of the cupola is constructed of metal plates *a*, which rest upon a brick or concrete foundation *b* and are secured together by bolts *c*, that pass through holes in flanges *d* of the plates *a*, and is of a form representing a four-sided pyramid, the sides being at an inclination of slightly less than 45° (forty-five degrees) to the horizontal and each terminating in a correspondingly-inclined outlet-passage *e*, which is provided with an outer door *f*, whereby the outlet can be completely closed, and with an inner door *g*, which when in its position of closure, Fig. 1, forms a kind of shelf, support, or baffle which does not extend entirely to the upper wall of the corresponding part of the outlet-passage. Each outlet-passage *e* comprises two flanged metal castings, secured together by bolts *h*, which pass through holes in the flanges *i* of the castings. One of the said castings is formed with a flange *j*, adapted to fit against the corresponding side wall of the cupola and to be secured to the metal framework *k* thereof by bolts *m*. Each outer door *f* is secured at its upper side to a horizontal shaft or axle *n*, mounted so as to turn in lugs *o*, provided upon the upper side of the corresponding outlet-passage *e*, and a lever-arm *p* is fixed to one end of the shaft or axle *n*, whereby the door *f* can be moved about the axis of the said shaft. For securing the door in a closed position screw-bolts *q* are provided, which are hinged at *r* to lugs *s*, projecting from the side

walls of the corresponding outlet-passage *d*, and are so arranged as to be capable of entering slots or recesses *t t* at the edge of the door *f*, nut-wheels or nuts *u* being provided, so that when the bolts *q* are in the slots *t* the nuts can be tightened up in a manner to press the door *f* against its seating. When the pressure of the blast is not too great, a counterweight on the outer face of the door *f* may be employed to keep the latter closed, and the tightening device described may then be dispensed with. Each inner door *g* is at its lower edge secured to a horizontal shaft or axle *v*, carried in lugs *w*, provided on the lower side of the corresponding outlet-passage *e*, and a counterweighted lever *x* is rigidly secured to one end of the shaft *v*, the arrangement being such that normally the inner door will occupy its attitude of closure. The floor of the outlet-passage near its discharge end is lower than the remaining portion, and the outer end *g'* of the higher portion acts as a stop to arrest the movement of the door *g* under the action of its counterweight. The levers *x* and *p* of the inner and outer doors, respectively, are so arranged near to each other that both can be conveniently operated simultaneously when necessary by a single attendant, and in this way the contents of the cupola can be discharged with much less expenditure of time and labor than has, so far as I am aware, been hitherto practicable. *y* is the main chamber of the cupola, which is lined with fire-brick *z* up to the twyers. In a running-kiln of similar construction, suitable for calcining lime, the outer-door fastenings may be dispensed with.

Figs. 4, 5, and 6 show another construction especially suitable for running kilns of large size, according to which the main chamber *y* is from a point near the bottom thereof of oval or elliptical or approximately oval or elliptical form in horizontal section, Fig. 6, and the lower or collecting portion 1 of the chamber 7 is of rectangular form in horizontal section, Fig. 6, as is also the bottom or floor *a*, which is of inverted-V shape, constituting two inclines of, say, forty-five degrees (45°) to the horizontal, leading toward outlet-passages *e*, located at the corresponding sides of the kiln. The outlet-passages at each side are opposite to corresponding outlet-passages *e* at the opposite side. The outer doors *f* are, as before, flap-doors, each mounted to turn about a horizontal axis at its upper part and each having attached to it a chain 2, which passes over a pulley 3, carried by a bracket 4, fixed to the upper side of the corresponding outlet-passage *e*, and is provided with a counterweight 5. Each inner door *g* is of less depth than the interior of the outlet-passage *e* and is mounted to turn at its lower part about a horizontal axis, and on the shaft or spindle *v*, to which the inner door *g* is rigidly connected, there is an external arm 6, connected by a chain 7 to one arm 8 of a lever of the first order, which is mount-

ed in a bracket 9, secured to the upper side of the corresponding outlet-passage *e*, and by actuating whose other arm 10 the door *g* can, if open, be closed. The second arm 10 is provided with a bar or chain 11, attached to a lever 12, weighted so as normally to keep the inner door *g* closed. The arrangement described enables the upper portion of the chamber *y*, in which the calcination is actually effected, to be curved, so as to allow of the keying of the lining in the ordinary way, and the oval form of the upper portion and the rectangular form of the lower portion enables the A-shaped ridge of the floor to be kept well below the hottest portion of the kiln and lower than would be the case if a kiln of the same capacity were circular in horizontal section. The rectangular section of the lower portion also enables the material to be withdrawn satisfactorily, even at the narrow ends of the lower portion, by means of two sets of doors arranged in two parallel lines. This arrangement is particularly advantageous for use in conjunction with screens to deliver direct into railway-trucks on lines running on opposite sides of the kiln, whereby much labor can be saved.

In apparatus constructed with an inclined bottom or floor *a* and outlet-passages *e*, with inner and outer doors *g* and *f*, according to my invention, the interior of the chamber *y* should be of a form gradually decreasing in horizontal sectional area from the lower part for a certain portion of its height, as shown in Fig. 5, in order to reduce the friction of the material against the side, and thereby insure a more uniform working of the kiln.

In the case of a calcining apparatus other than a cupola the outer door of each outlet-passage may in some cases be omitted.

The details of the constructions hereinbefore described, both as regards the actuating and the controlling of the doors and otherwise, may be variously modified without departing from the essential features of my invention.

What I claim is—

1. In calcining apparatus of the kind referred to, an inclined outlet-passage, an outer door adapted to close said passage completely, and an inner door arranged in said passage and adapted not to close said passage completely when in its position of closure.

2. In calcining apparatus of the kind referred to, an inclined outlet-passage, an outer door adapted to close said passage completely, an inner door arranged in said passage and adapted not to close said passage completely when in its position of closure, and means for causing said inner door to assume its said position.

3. In calcining apparatus of the kind referred to, an inclined outlet-passage, an outer door adapted to close said passage completely, means for keeping said outer door closed, and an inner door arranged in said passage and adapted not to close said passage completely when in its position of closure.

4. In calcining apparatus of the kind referred to, an inclined outlet-passage, an outer door adapted to close said passage completely, and an inner door arranged near to said outer door in said passage and adapted not to close said passage completely when in its position of closure.

5. In calcining apparatus of the kind referred to, an inclined outlet-passage, an outer door adapted to close said passage completely, an inner door arranged near to said outer door in said passage and adapted not to close said passage completely when in its position of closure, and means for causing said inner door normally to assume its position of closure.

6. In calcining apparatus of the kind referred to, an inclined outlet-passage, an outer door adapted to close said passage completely, an inner door arranged near to said outer door in said passage and adapted not to close said passage completely when in its position of closure, and means for keeping said outer door closed.

7. In calcining apparatus of the kind referred to, an inclined outlet-passage, an outer door adapted to close said passage completely, an inner door arranged near to said outer door in said passage and adapted not to close said passage completely when in its position of closure, means for keeping said outer door closed, and means for causing said inner door normally to assume its position of closure.

8. In calcining apparatus of the kind referred to, an inclined outlet-passage, an outer door adapted to close said passage completely, and mounted at its upper side to turn about a horizontal axis, means for moving said door about that axis, and an inner door arranged in said passage and adapted not to close said passage completely when in its position of closure.

9. In calcining apparatus of the kind referred to, an inclined outlet-passage furnished with an outer door provided with slots, screw-bolts hinged to said passage and adapted to enter said slots, nuts fitting said screw-bolts, and an inner door arranged in said passage.

10. In calcining apparatus of the kind referred to, a main chamber which is of oval or elliptical or approximately oval or elliptical form in horizontal section at its upper portion and whose floor consists of inclined surfaces, outlet-passages corresponding thereto, outer doors adapted to close said outlet-passages, and inner doors arranged therein and adapted not to close said passages completely.

11. In calcining apparatus of the kind referred to, a main chamber which is of rectangular form in cross-section at its lower portion and whose floor consists of two inclined surfaces, outlet-passages corresponding thereto and located in parallel rows at opposite sides of the apparatus, outer doors adapted to close said outlet-passages, and inner doors adapted not to close said passages completely.

12. In calcining apparatus of the kind referred to, a main chamber which is of rectangular form in cross-section, at its lower portion and whose floor consists of two inclined surfaces, outlet-passages corresponding thereto and located in parallel rows at opposite sides of the apparatus, the passages on one side being opposite to those on the other side, outer doors adapted to close said outlet-passages, and inner doors adapted not to close said passages completely.

13. In calcining apparatus of the kind referred to, a main chamber which is of oval form in horizontal section at its upper portion wherein calcination will be effected and is of rectangular form in horizontal section at its lower or collecting portion and whose floor consists of two inclined surfaces, outlet-passages corresponding thereto located at opposite sides of the apparatus, outer doors adapted to close said outlet-passages, and inner doors arranged in said passages and adapted not to close said passages completely.

14. In calcining apparatus of the kind referred to, a main chamber whose floor consists of inclined surfaces diverging from the middle of said floor, outlet-passages at the termination of said inclined surfaces, for each such passage a door adapted not to close said passage completely when in its position of closure, and mounted to turn about a horizontal axis at its lower edge, and means for causing said door to assume its position of closure.

15. In calcining apparatus of the kind referred to, a main chamber which is of rectangular form in cross-section at its lower portion and whose floor consists of two inclined surfaces, outlet-passages corresponding thereto and located in parallel rows at opposite sides of the apparatus and for each passage a door adapted not to close said passage completely when in its position of closure, and mounted to turn about a horizontal axis at its lower edge, and means for causing said door to assume its position of closure.

16. In calcining apparatus of the kind referred to, a main chamber which is of rectangular form in cross-section at its lower portion and whose floor consists of two inclined surfaces, outlet-passages corresponding thereto and located in parallel rows at opposite sides of the apparatus, the passages on one side being opposite to those on the other side, for each such passage a door adapted not to close said passage completely when in its position of closure and mounted to turn about a horizontal axis at its lower edge, and means for causing said door to assume its position of closure.

Signed at Worksop, in the county of Nottingham, this 21st day of May, 1902.

JOHN ROWLEY HORTON.

Witnesses:

CHARLES A. WHALL,
ALFRED SLADE.