

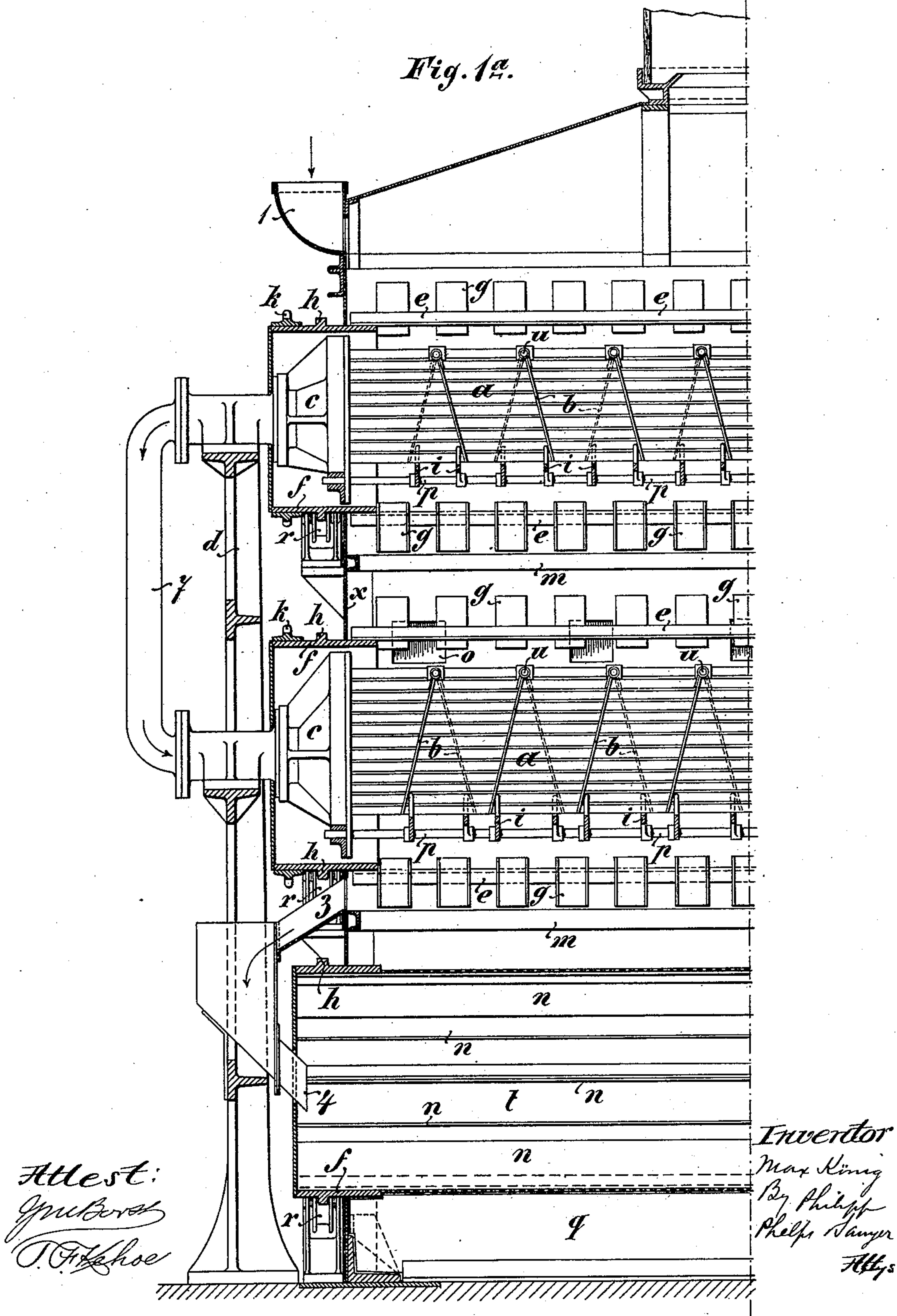
M. KÖNIG.  
APPARATUS FOR DRYING GRAIN, &c.

(Application filed Mar. 14, 1900.)

(No Model.)

4 Sheets—Sheet 1.

Fig. 1a.



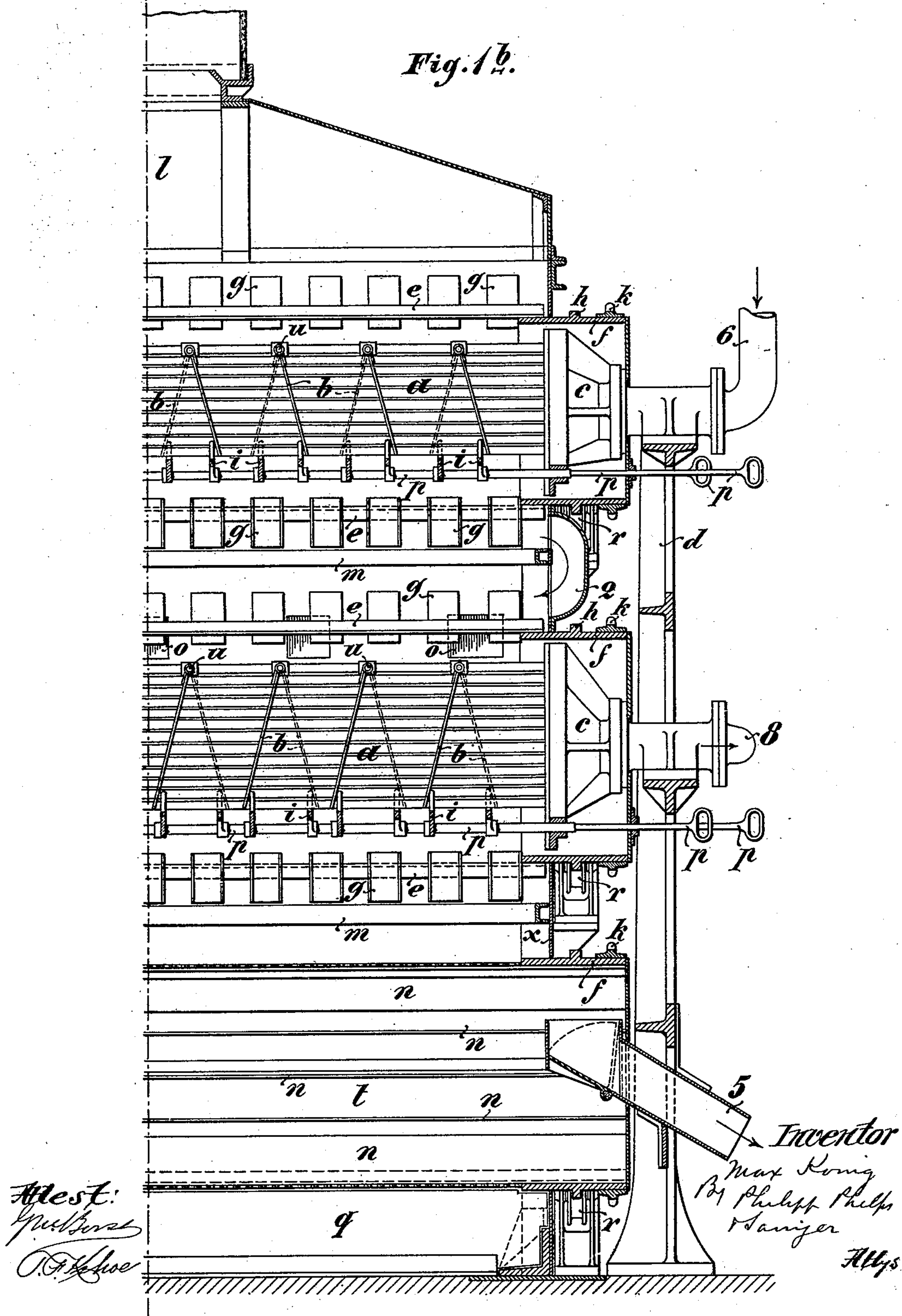
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Fig. 1b.



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No. 705,849.

Patented July 29, 1902.

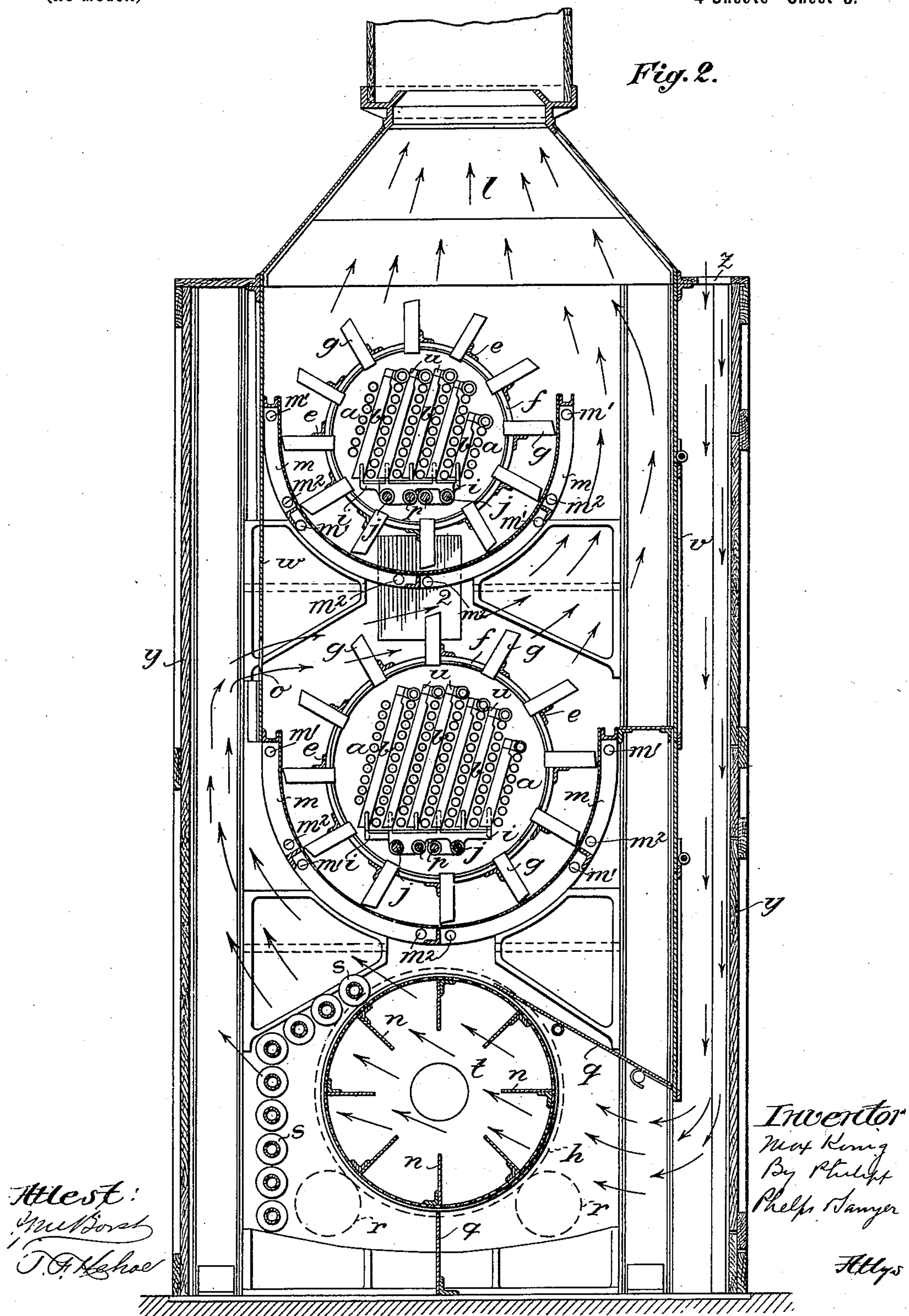
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Fig. 2.



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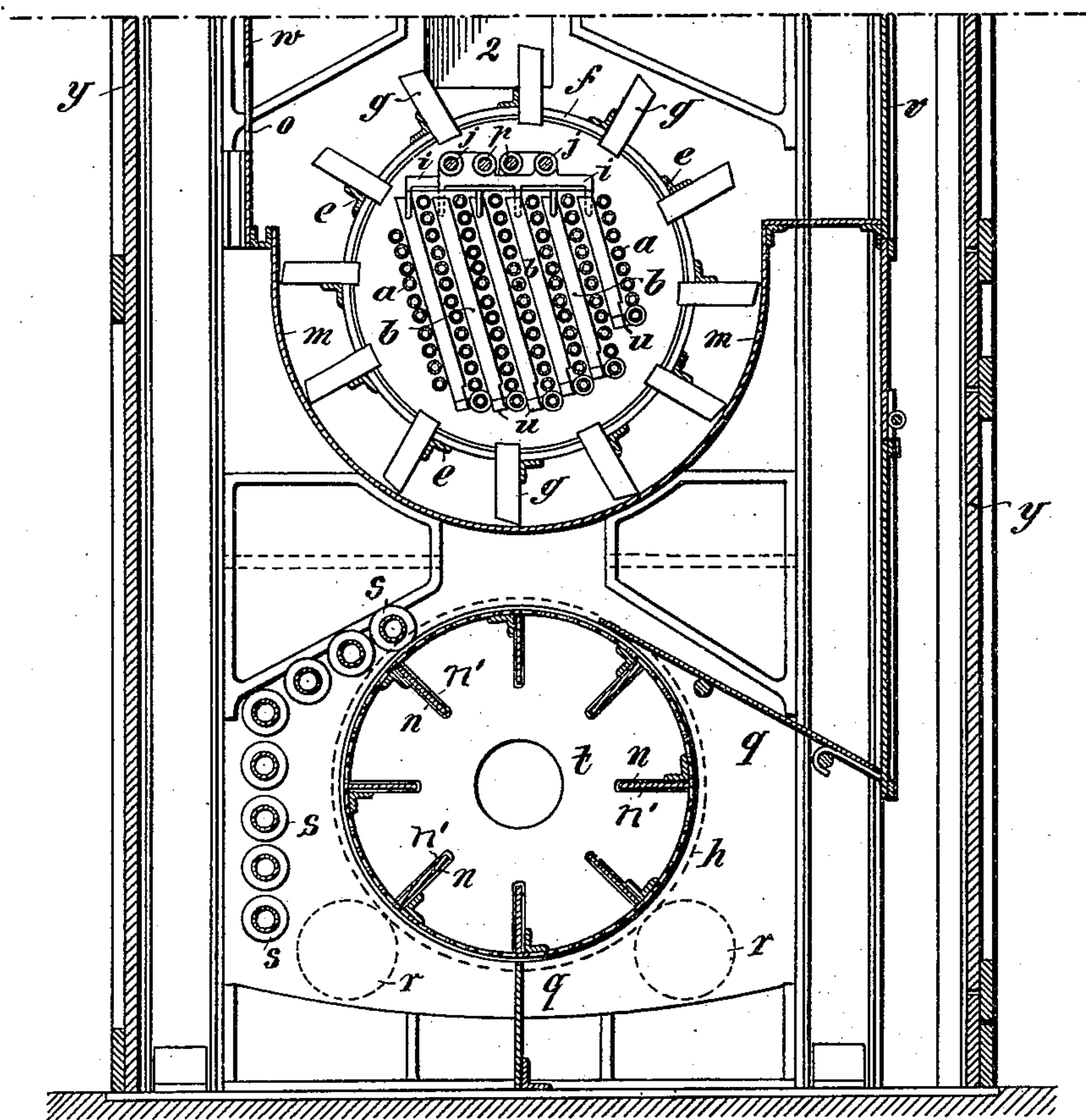
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Fig. 3.



Inventor:

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# UNITED STATES PATENT OFFICE.

MAX KÖNIG, OF GROSSLICHTERFELDE, GERMANY.

## APPARATUS FOR DRYING GRAIN, &c.

SPECIFICATION forming part of Letters Patent No. 705,849, dated July 29, 1902.

Application filed March 14, 1900. Serial No. 8,625. (No model.)

*To all whom it may concern:*

Be it known that I, MAX KÖNIG, residing at 109<sup>b</sup> Chausseestrasse, Grosslichterfelde, near Berlin, Kingdom of Prussia, German Empire, have invented a new Apparatus for Drying Grain and other Materials, of which the following is a specification.

This invention relates to apparatus for drying grain and other materials. The said apparatus is fitted with troughs, which may or may not be heated and which are furnished with internally-arranged agitators or scoop mechanism provided with internal stationary heaters, around which the agitators are caused to revolve. The action of the mechanism is such that the material to be dried is lifted by the scoops and spread thereby over the heater, where it slides along adjustable sections of the latter and finally returns or falls into its trough. By altering the inclination of the said sections of the heater the material will be caused to slide more or less rapidly over the heating-surface—that is to say, the material will remain in contact with the heating-surface for a longer or shorter period. The passage of the material in the apparatus takes place at a uniform speed for each particular inclination of the heating-sections through the action of the scoops of the agitator.

One object of this invention is to enable the speed of material which is more or less moist to be altered independently of the agitator or scoop mechanism and also independently of the inclination given to the sections of the heater. To this end the various sections of the heaters disposed within the drums and scoop mechanism are arranged to receive between them pivotally-suspended iron strips adapted to be adjusted to various inclinations without the necessity of having to open the apparatus. These strips or baffle-plates, furthermore, are used for completely emptying the apparatus after drying one material when it is desired to dry a different kind of material.

A further improvement in connection with this apparatus is that the ventilating air-current produced by the action of the chimney may be utilized before entering the drying apparatus to cool or refrigerate the material, which is being discharged from the latter and to remove any moisture from such ma-

terial. In order to more speedily remove such moisture from the material, it is advantageous to cover the conveyer or baffle-plates of a drum disposed below the last drying-trough with sackcloth or similar material.

The invention will be readily understood by referring to the accompanying drawings, in which—

Figures 1<sup>a</sup> and 1<sup>b</sup> are the two halves of a vertical longitudinal section of the improved apparatus, and Fig. 2 is a cross-section of the same. Fig. 3 is a cross-section of a modification.

The apparatus comprises two superposed troughs *m*, adapted to be heated and fitted with agitators *e*, having scoops *g* and heaters *a*. The troughs *m*, which may be heated by admission of steam into the space between the inner and outer walls of the troughs, *m'* being the steam-inlets and *m''* the steam-outlets, are supported upon a strong frame, while the agitators *e* run on rollers *r*, arranged at the exterior of the troughs, their internal heaters being independently supported upon externally-arranged standards *d*. Within the spaces provided between the various sections of the heater are located iron strips or baffle-plates *b*, suspended upon pivots *u* and adapted to be adjusted in a forward or rearward direction. Below the heaters are situated the means for adjusting the position of the baffle-plates *b* to any desired inclination. The adjusting means consist of frame-plates *i*, formed with eyes or sockets which slide upon guide-bars *j*, and attached to these plates are draw-bars *p*, projecting through one end of the trough to allow of moving such plates from the exterior of the apparatus in such a manner as to cause finger-pieces provided on the plates to bear against the strips or plates *b*, and thus hold these latter at any desired inclination. This arrangement may be obviously modified in such a manner that the adjusting device will be arranged in the upper part of the drum and the pivots of the baffle-plates *b* at the bottom thereof. The scoops *g* of the agitators *e* for picking up the material in the troughs and distributing it over the surfaces formed by the sections of the heater *a* also serve in this case to convey the materials along the interior of the apparatus. This transmission of the material by



the scoops *g* usually takes place at a uniform speed independent of the fact that the material may have different degrees of moisture and that naturally the most moist material should remain for a longer period in the apparatus to enable it to dry, while the less moist material should be caused to pass out more rapidly to prevent it being dried beyond the desired degree. By a suitable adjustment of the strips *b* between the sections of the heaters *a* more rapid or a slower transmission of the material in the apparatus may be secured independently of the agitator or scoop mechanism and in an easy and expeditious manner without the necessity of opening the apparatus. For somewhat dry materials the strips or baffle-plates *b* are set to an incline in the direction of travel, as indicated in full lines in Figs. 1<sup>a</sup> and 1<sup>b</sup> of the drawings, while for comparatively moist materials the inclination of the strips or baffle-plates *b* is reversed, so that they incline in the opposite direction to that of the travel of the material, as shown in dotted lines. In the first case the material, or rather a portion of it, moves quickly forward at intervals along the strips or baffle-plates *b* in the direction of its travel, thereby accelerating the transmission in the drying apparatus; but in the second case the material is moved rearward to some extent, and in this manner retards the transmission in the apparatus. The strips or baffle-plates *b* are, furthermore, of importance when it is required to discharge the whole of the grain or other material from the apparatus in order to treat another kind of grain or in general when it is desired to treat different materials in succession. The agitators or scoop mechanism alone cannot completely discharge the materials from the apparatus, owing to the decrease in the speed of travel after the feeding of the material is interrupted until finally the transmission of material entirely ceases directly the level of the accumulated material sinks to a certain point. After this the scoops continue to lift the material; but as no further feeding of material takes place there is no forward pressure, so that the material merely falls back into the same place in the apparatus without being conveyed forward. By setting the strips *b* at a suitable angle in the direction of travel of the material it will be possible for the strips *b* to convey and clear the very last part of material from the apparatus, as the said strips act independently of the scoop mechanism in conveying the said material. The arrangement composed of the parts already described is completed, so as to constitute the drying apparatus, by the provision of the side walls *v* and *w*, front and rear walls *x*, and cover *l*, such parts inclosing the space around and above the troughs *m* and the agitators and heaters. The cover *l* is provided with a chimney, which may, if desired, have a fan for drawing off the steam arising from the drying materials and for creating an air-current.

In the lower part of the apparatus below the troughs *m* is arranged a drum *t* for use in case the dried material, such as grain, after its discharge from the drying apparatus proper becomes moist by cooling. This drum *t*, which is constructed of perforated sheet-iron or narrow-mesh woven wire, and which, like the agitators *e*, is rotatably supported upon rollers *r*, is utilized for cooling the material and for removing moisture therefrom. This result is effected by means of baffle-plates *n*, arranged in the interior of the drum *t* and adapted to lift the material and allow it to fall again, while at the same time a ventilating-current of air created by the chimney above the cover *l* passes through the drum and through the grain or the like, thereby cooling the latter and removing the moisture therefrom. The baffle-plates *n* in the drum may with advantage be covered with sackcloth or similar material *n'*, (see Fig. 3,) which absorbs the moisture from the grain while resting upon or sliding over the said plates *n*, so that the grain is, so to speak, dried by the covering material. The moisture absorbed by the cloth evaporates and is carried off by the current of air. The said current is also utilized for ventilating the drying compartments in the following manner.

The apparatus has on both sides of the walls *v* and *w* wooden walls *y*, having spaces between them, the space outside the wall *w* being completely closed, while that outside the wall *v* is provided at the top with apertures *z*, which serve as air-inlets for the ventilating air-current, as indicated by the arrows in Fig. 2. The air-current passes downward through the space between the wooden wall *y* and wall *v*, thereby absorbing heat from the latter, and then into the perforated drum *t*. A deflecting-plate *q* is so arranged as to compel the air-current to pass through the drum *t* and cool and free the material therein from moisture. As the air by this means becomes partly or wholly saturated with moisture it will be necessary to heat the same in order to render it capable of absorbing more moisture in passing through the drying apparatus. For this purpose the apparatus is so arranged that the air after passing through the drum *t* impinges against the lower portion of the trough *m*, and, if desired, also against heating-tubes *s*, whereby it absorbs the radiated heat from such trough and tubes. The air then passes through holes *o* in the wall *w* into the drying-chamber above the lower trough. When the apparatus is provided with two troughs with agitators and heaters *a*, as shown, the air-current is caused to pass crosswise above the lower trough, thereby carrying off the moisture rising from the material therein. The air then passes upward along the upper trough and toward the cover *l*, carrying off the moisture arising from the material in the upper trough, and finally escaping as a mixture of air and moisture through the chimney. When the



drying apparatus has only a single trough with agitator and heater, then the air-current on issuing through the holes *o* passes crosswise above the trough directly into the cover

5 *l*. In order to obviate the necessity of having heating-tubes *s*, the air-current may be supplied to the drum *t* at such a temperature as to be capable of absorbing the moisture from the material to be cooled, as well as ab-

10 sorbing the moisture in the drying apparatus. In order to insure a uniform passage of the air-current through the drum *t* and the drying-chambers, it is advantageous to make the holes *o* in the wall *w* of different sizes. The

15 farther these holes are from the chimney the larger should be the size thereof. This enables the various separate air-currents which pass through the holes *o* to be rendered entirely uniform. Thus the ventilation of the

20 drum *t* and of the apparatus is really perfect, as the removal of the moisture from the material to be dried is effected uniformly throughout and in the shortest way.

The material is fed into the hopper *l*, Figs. 1<sup>a</sup> and 1<sup>b</sup>, and passes into the upper trough *m*, from which it escapes through a channel 2 into the lower trough, which it leaves at 3. The dried material then passes through the chute 4 into the drum *t* and is finally dis-

30 charged through the discharge-chute 5. The heating agent passes through the pipe 6 into the heating apparatus in the upper trough, thence through the connecting-pipe 7 into the lower trough, which it leaves at 8.

35 The agitators and scoop mechanism may be driven by chain and chain-wheels *k*.

What I declare to be new, and desire to secure by Letters Patent, is—

1. In a drying apparatus for drying grain and other materials, the combination of a trough for receiving the materials, an agitator provided with an internal stationary heater, consisting of separate inclined sections, and adjustable baffle-plates or strips

45 located between the heater-sections, essentially as and for the purpose described.

2. In a drying apparatus for drying grain and other materials, the combination of a trough for receiving the materials, an agitator provided with an internal stationary

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heater consisting of separate inclined sections, baffle-plates located between the heater-sections, and means for adjusting the baffle-plates into forwardly and rearwardly inclined positions, essentially as and for the purpose 55 described.

3. In a drying apparatus for drying grain and other materials, the combination of a trough for receiving the materials, an agitator provided with an internal stationary 60 heater consisting of separate inclined sections, and pivotally-suspended baffle-plates, finger-pieces bearing against the said baffle-plates, and means for moving said finger-pieces in forward or rearward direction for adjust-

65 ing the baffle-plates into forwardly and rearwardly inclined positions, essentially as and for the purpose described.

4. In a drying apparatus for drying grain and other materials the combination of a trough for receiving the materials, an agitator provided with an internal stationary heater consisting of separate inclined sections, pivotally-suspended baffle-plates located between the heater-sections, finger- 75 pieces bearing against said baffle-plates for adjusting the baffle-plates into forwardly and rearwardly inclined positions, and draw-bars projecting through the end of the trough for moving said finger-pieces from the outside of 80 the apparatus, essentially as and for the purpose described.

5. In a drying apparatus for drying grain and other materials, the combination of a trough for receiving the materials an agitator provided with a heater, adjustable baffle- 85 plates, a perforated drum having internal scoops and located underneath the trough, air-passages, and guide-plates for conducting a ventilating air-current through the drum 90 and farther on through the heating portion of the apparatus into the chimney, essentially as and for the purpose described.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses. 95

MAX KÖNIG.

Witnesses:

HENRY HASPER,  
WOLDEMAR HAUPT.