(No Model.) 3 Sheets—Sheet 1.

W. F. HOWE.

APPARATUS FOR MALTING.

No. 272,257. Patented Feb. 13, 1883.

Fig. 1.

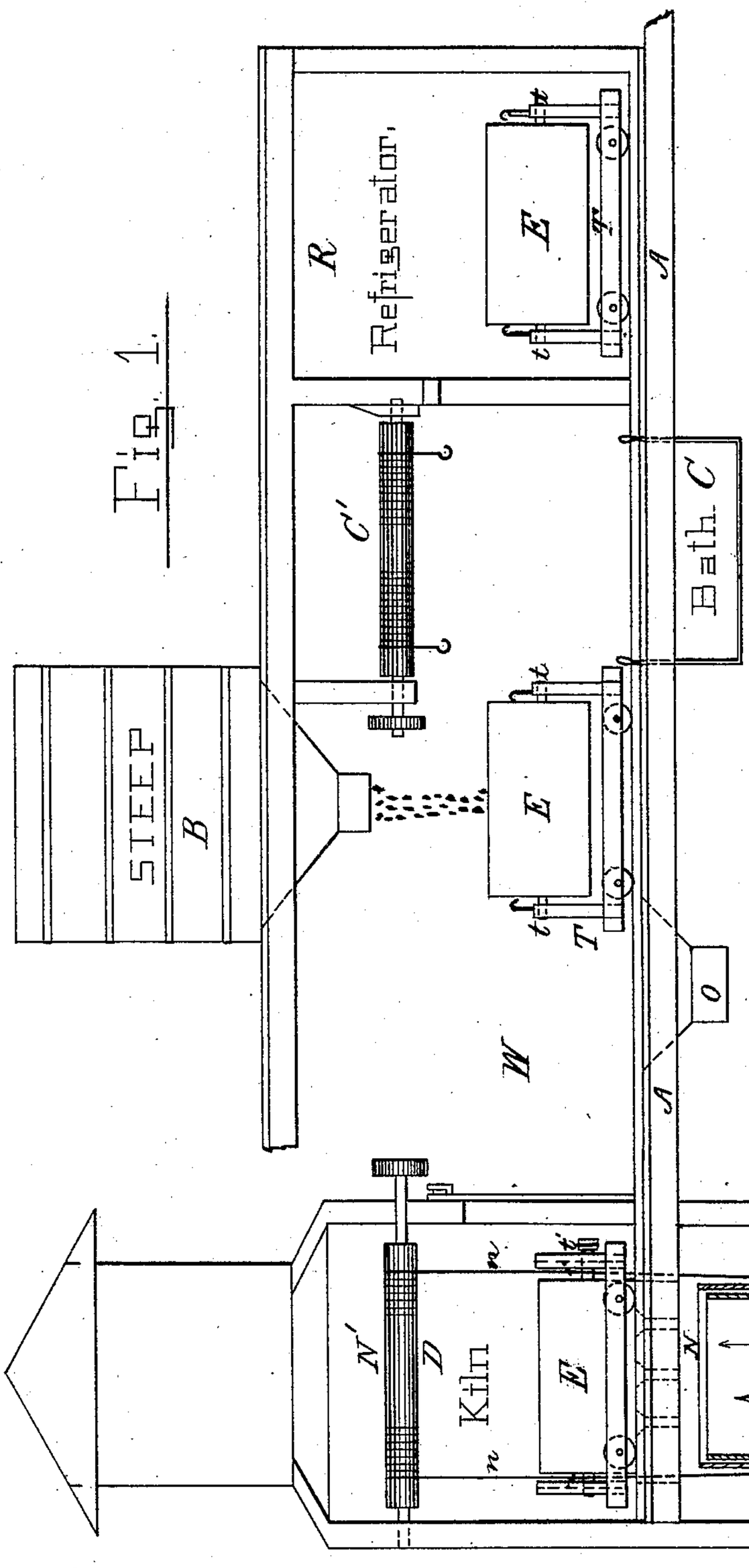
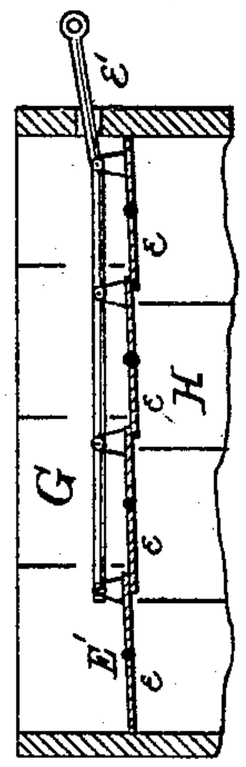


Fig. 7.



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(No Model.)

3 Sheets—Sheet 2.

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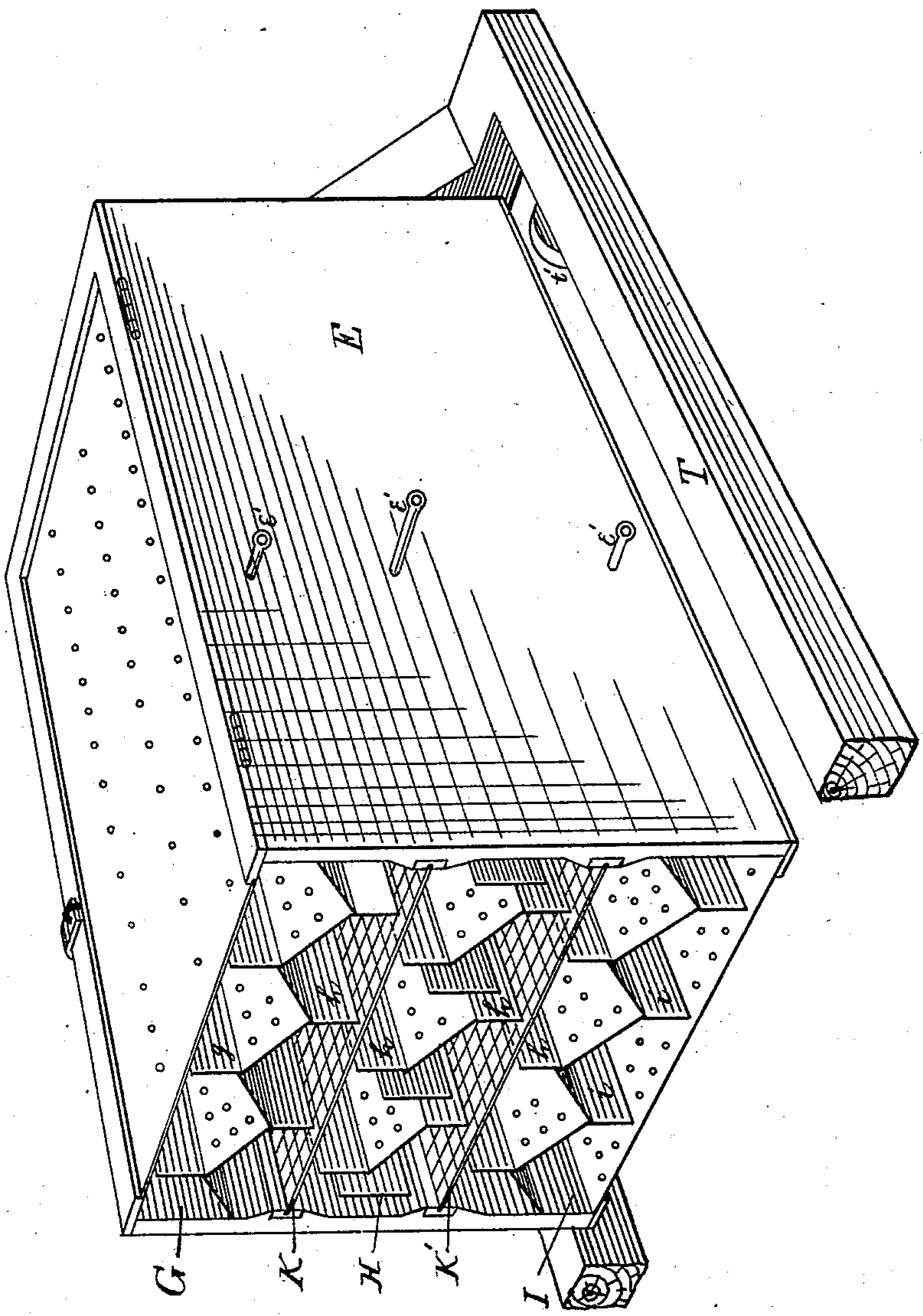
Fig 2



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(No Model.) 3 Sheets—Sheet 3.

W. F. HOWE.

APPARATUS FOR MALTING.

No. 272,257. **Patented Feb. 13, 1883.**

Fig. 3

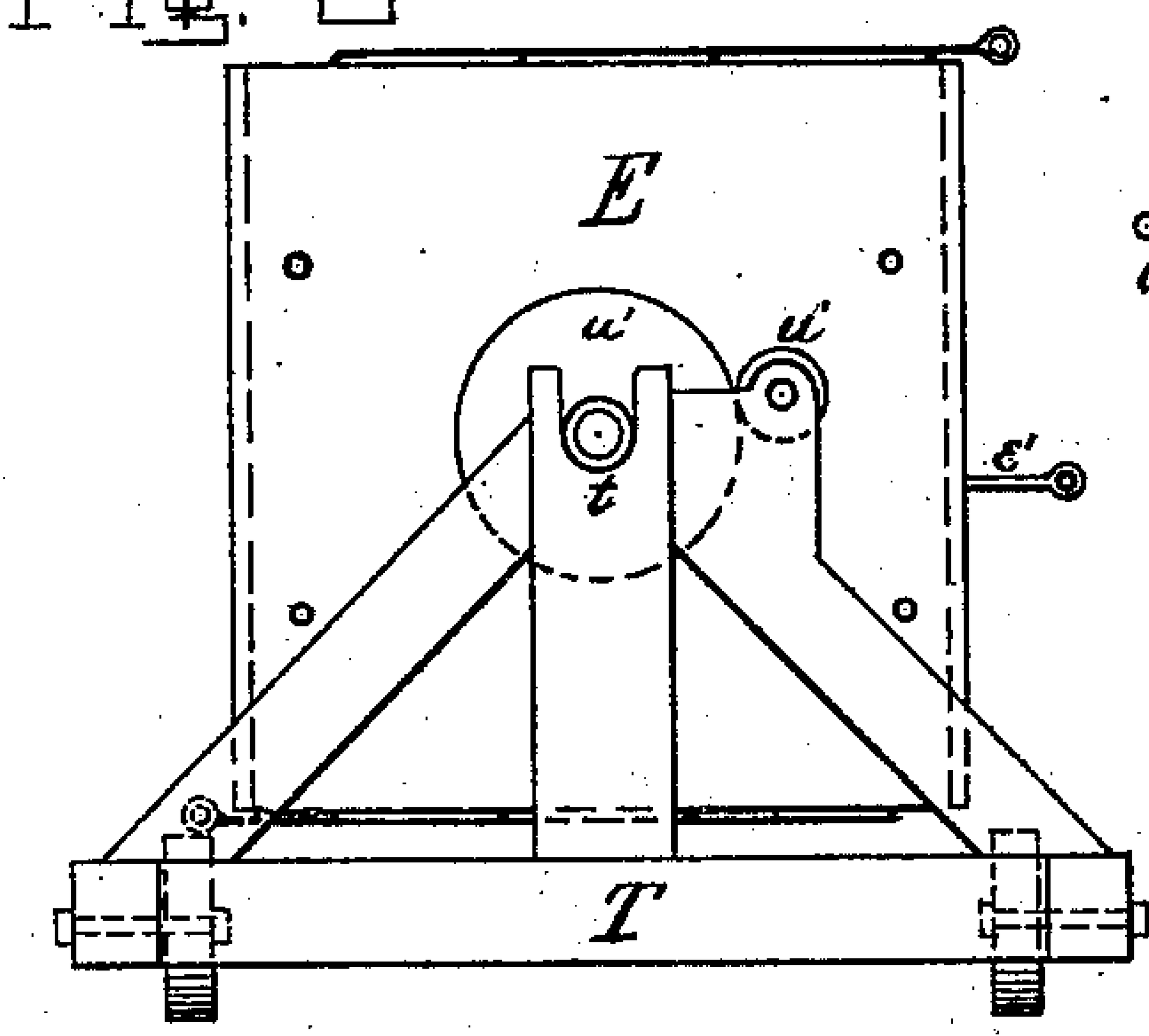


Fig. 4

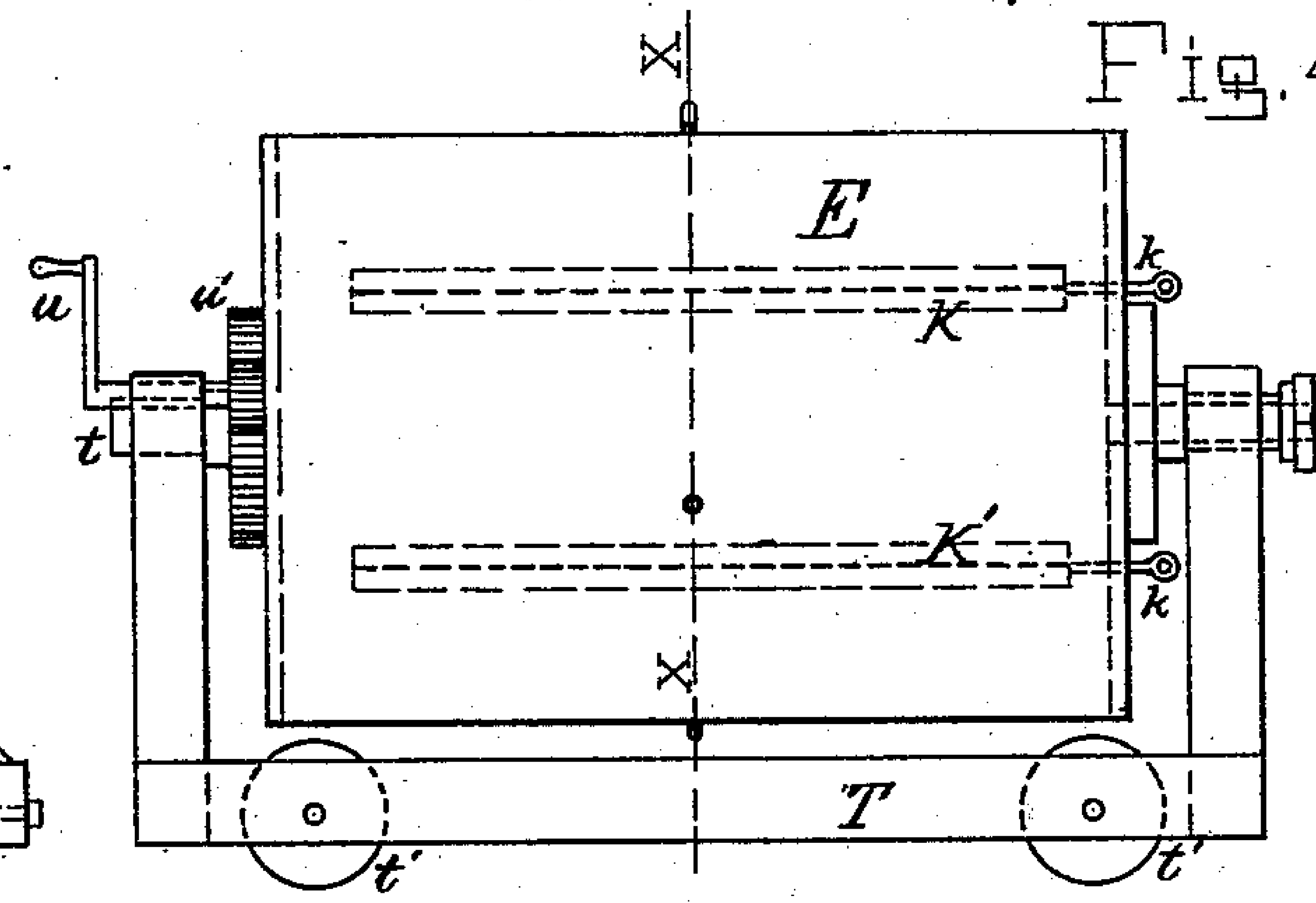


Fig. 5

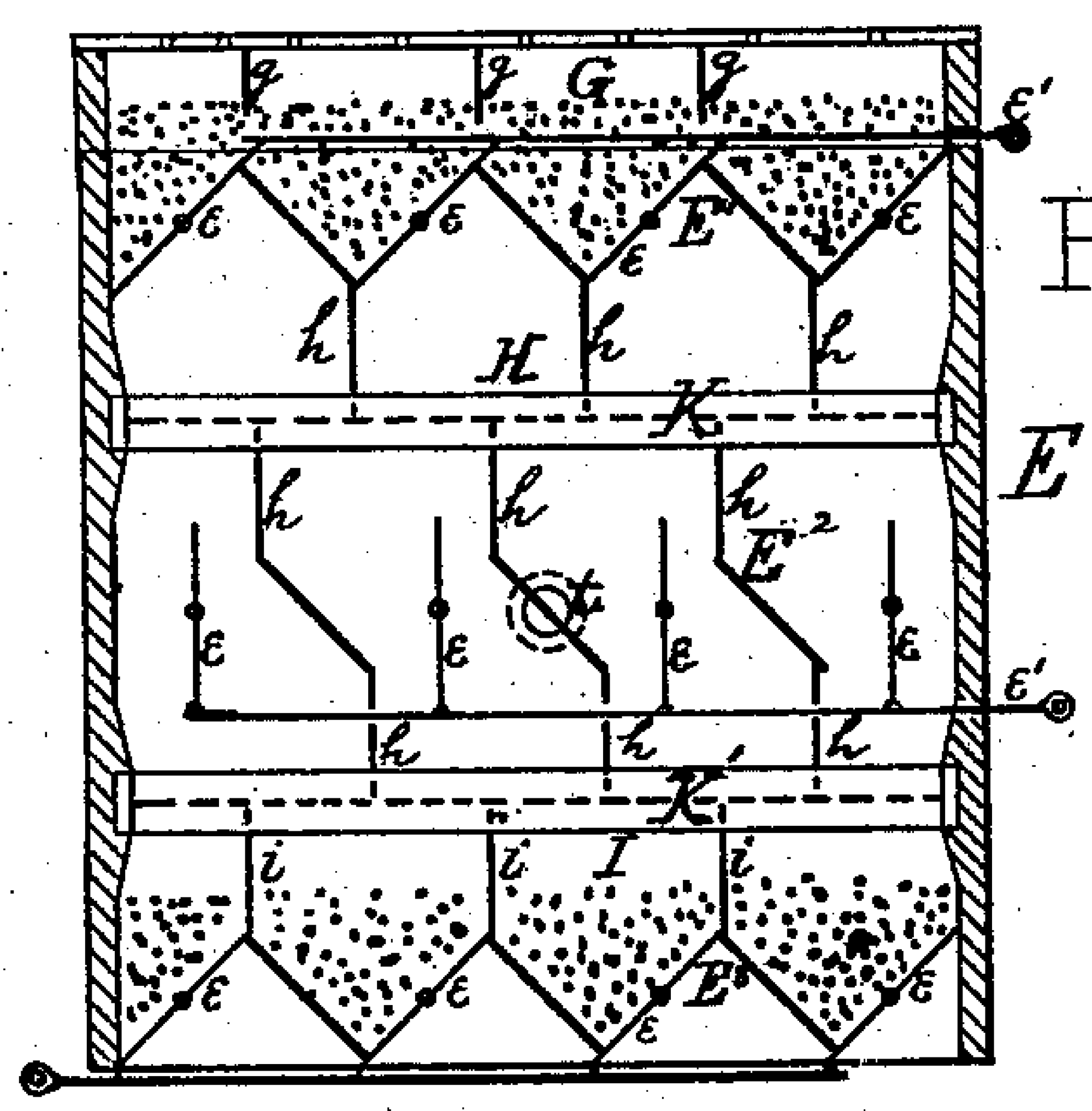
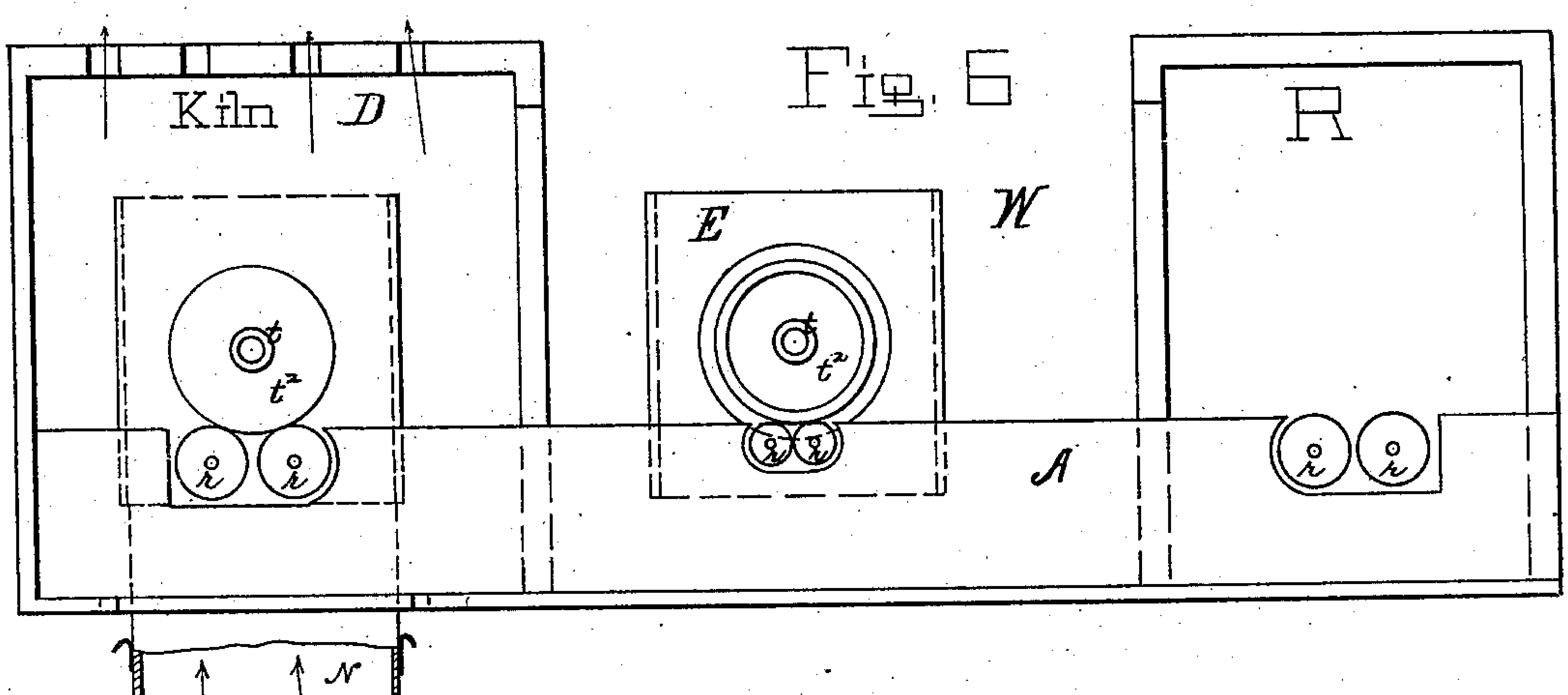


Fig. 6



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APPARATUS FOR MALTING.

SPECIFICATION forming part of Letters Patent No. 272,257, dated February 13, 1883.

Application filed April 18, 1882. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM F. HOWE, of Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Apparatus for Malting, of which the following is a description, reference being had to the accompanying drawings, in which—

Figure 1 is a side elevation of the improved mechanism, showing the furnace in section. Fig. 2 is a perspective view of the chest or car with one end removed and a portion of the supporting-frame broken away. Fig. 3 is an end elevation of the device represented in Fig. 2, and Fig. 4 is a side elevation of the same device. Fig. 5 is a vertical transverse section in line *x x* of Fig. 4. Fig. 6 is a side elevation, showing a modification of the apparatus represented in Fig. 1. Fig. 7 shows a modification of the construction of the car floors or partitions.

Similar letters of reference indicate like parts.

The object of the present invention is to avoid all the inconvenience, expense, and loss attendant upon the ordinary methods of malting, as the art is generally practiced with the malting-floor, the laborious and expensive method of shoveling the grain over and over, and the practice of removing it to a separate drying-room and again handling it over and over therein, by providing for a mechanical manipulation of the grain during the entire process in such a manner as to insure the even, uniform condition most favorable to proper germination for malting purposes, and to secure the necessary shifting and agitation of the grain when in the kiln with the least expenditure of manual labor, and which shall thus obviate the defects hitherto existing in this class of apparatus.

In carrying my invention into practice I construct a metallic portable or movable germinator capable of being rotated at will on or around its own horizontal axis. This vessel is divided by perforated longitudinal partitions into a series of compartments, in order to separate the charge of grain into layers of suitable thickness for properly germinating, with air-spaces between the layers, the said partitions forming horizontal floors to support the different layers of grain during germination. I further divide each of said compartments longitudinally by one or more partitions, which stand vertically when the vessel is in a position for germinating, and which divide each of said layers of grain into different longitudinal sections, in order to prevent the charge from shifting from one side of the compartments to the other during the rotation of the vessel on its axis. The "floors," as I shall term said horizontal partitions, are further provided with doors or valves, through which, when open, communication may be had from one compartment to another for the purpose of introducing or removing the grain. The walls of the vessel are perforated, so that air-currents can enter and pass through the vessel and the grain contained therein. I next provide a suitable drying-room and furnace, into which the portable germinator can be moved, with its contained charge, at the end of the germinating process, for the purpose of drying the malt in the vessel, and, after the drying and removal of the malt, for the further purpose of cleansing the vessel by the action of heat or fire from said furnace. A refrigerating-room is also provided, into which the vessel, with its contained grain, may be moved from time to time during the germinating process, for the purpose of regulating and controlling the temperature of the several compartments of the vessel; or the same result may be accomplished by blowers communicating with the interior of the vessel by means of air-pipes. If desired at any time to wash the vessels with water, a bath may be arranged, to which the vessels can be moved for the purpose. All these various rooms—namely, the germinating-room, in which the vessels stand during the process of germination, the refrigerating-room, the bath, and the drying-room—are connected by suitable floors or tracks, whereon the vessels can be moved back and forth from one to another, as required by the exigencies of the work.

The following is a description in detail of my improved apparatus, and of the manner in which it should be employed to secure the best results:

In the drawings, A A are rails or a track of

any suitable construction and form, adapted to support the movable vehicles and enable them to be run back and forth from one point to another during the manufacture of the malt. They may be provided with cross-tracks or branches and turn-tables or other track-shifting devices to enable the cars to be run onto side tracks or shifted from the main track. A plain solid floor might be substituted for the track; but a guide-track is greatly preferable. The main track may be straight, curved, or circular, according to the conditions of space, &c., in the building in which the apparatus is used. The main portions of the track are in a germinating-room, W, the temperature of which is kept at the proper condition for the work. This track or way runs under the steep B, from which the moist grain is received for germination, and it also runs into the refrigerating-room R, the kiln or drying-room D, and the bath C, so that the germinating-car E can be run upon it from any one of said places to another. The body of the car E is capable of being rotated upon its horizontal axis as well as moved forward and back on the track.

The germinating-vessel is made in the form preferably of a square box, mounted either on trunnions *t*, in a frame, T, which runs on wheels *t'*, as shown in Figs. 1, 2, 3, 4, or mounted directly on large wheels or rollers t^2, as shown in Fig. 6. When mounted on trunnions in a car-frame it should be provided with a crank, *u*, and a gearing, *u'*, as represented in Fig. 4, for easily rotating it on its axis. When mounted directly upon wheels or rollers fixed to its ends, as represented in Fig. 6, it will rotate on its axis as it moves along on the track. When the grain is germinating or cooling or drying it will be necessary to rotate the vessel in a standing position, and to this end sets of friction-rollers *r r* may be provided at the proper points along the track, on which the vessel E will simply rotate on its axis without changing position and without the application of much power. The relative size of the wheels t^2 and vessel E (shown in Fig. 6) is not material and may be varied at pleasure, and the vessel may be held above the level of the track or may project down between the rails at the pleasure of the constructer.

The internal construction and arrangement of the germinating-vessel E are substantially as follows: It is divided by partitions or floors E' E^2 E^3 into a series of compartments, G H I. These floors are made in pivoted sections *e e e*, which can be tilted by means of rods *e'*, extending through the walls of the vessel, so that the workmen can tilt them without opening the car. Suitable stops or locking devices on the outside of the car may be applied to the rods to prevent the floors from accidentally tilting during the rotation of the vessel. The floors can be made of flat sections, as shown in Fig. 7, or in zigzag form, as shown in Figs. 2, 5, in which latter case alternate sections *e* need not tilt, but may be fixed rigidly in position, as shown. In the interior compartments, H and I, sieves K K' are arranged in guides running lengthwise of the walls of the vessel, and are severally provided with rods *k*, by which they may be shaken without opening the car. The top and bottom of the car are to be perforated, as shown in Fig. 2, for the passage of air. The floors E' E^2 E^3 are also to be perforated for the same purpose. The top of the car is provided with a door for the admission of the grain, and the bottom may have a door for discharging the grain; or the top may be used for both purposes. Any suitable device may be employed for fastening these doors, so that they will not accidentally open; and any suitable device may also be used to hold the vessel E in an upright position and prevent it from turning under an unequal weight of grain when it is not desirable to rotate it. The vessel E may contain as many floors as the constructer may deem best for his purposes.

In practicing the process herein described the car is run under the steep and charged with the grain. The charging may be effected by first closing the bottom door and all the floors and opening the top door, then about half-filling the compartment G, then tilting the floors so as to let that portion of the charge fall into the lower floor, then closing the floors and half-filling the compartment G again, then dropping that part of the charge into the middle floor, then closing the upper floor and half-filling the compartment G again, and finally closing the top door. This leaves the vessel charged to about half its full capacity with grain, which is distributed in three or more different layers, each layer only partially filling the compartment in which it rests, thus leaving abundant space over each layer for air, and making room for the proper shaking up and overturning of the grain during the rotation of the vessel. The compartments G H I are further subdivided by partitions *g g h h i i*, running longitudinally of the vessel and attached directly to the same, which divide each layer of grain into separate sections, preventing it from falling too heavily from one side of the car to the other during the rotation of the car, and insuring a more equal distribution of it over each floor. The sieves K K' break the wet grain apart as it falls through them, and thus prevent it from growing together or caking during its treatment. The vessel thus charged and closed is moved from under the steep to any suitable point on the track, or onto a side track, and allowed to stand for the process of germination to go on. From time to time, as often as necessary, it is turned over on its axis as a center as many times as experience may show will best shake it up to equalize the temperature of the various parts of the charge and bring those portions to the surface which were not at the surface before. The screens or sieves allow the grains to pass

separately, but not in cakes. If the grain shows signs of germinating too fast or becomes too much heated, the vessel is moved off to the refrigerating-room and allowed to stand there until the evil is counteracted; and to facilitate and equalize the cooling while there it may be again rotated upon its axis in the refrigerating-room as often as may be judged expedient.

When the germination is completed the car is moved to the kiln, as represented at the left-hand end of Figs. 1, 6, and allowed to remain there until the drying or baking is completed. While this part of the process is going on the vessel should be again rotated on its axis from time to time, as often as may be desirable, for the purpose of preventing any part of the charge from being unduly heated, and of rendering the drying or baking uniform throughout the entire charge from the commencement to the end of the drying process. The vapors evolved from the drying grain will partially or entirely escape through the perforations in the top of the vessel and pass off through the flue of the kiln. To insure a full and free escape of such vapors one or both of the trunnions on the end of the car may be provided with a tubular passage, in or through which the air and moisture in the vessel may be drawn off by a pipe and any exhaust mechanism, or may be permitted simply to flow off. The trunnion or tube should have a suitable coupling for attaching the exhaust-pipe.

To more effectually concentrate the hot air of the furnace upon the car the hood N of the furnace may be raised, lowered, and adjusted in position by a windlass, N′, and chains *n n*. When the malt is completely dried in all or any one of the compartments of the car the car is run out of the kiln to a point over a discharge-chute, O, and the charge is delivered through the chute to the floor below; or a suitable chute may be arranged in the drying-room itself. The car may then, if fully discharged, be taken to the bath and cleansed. To expedite this operation the bath-tub C may be made large enough to receive the lower end of the vessel E and allow it to rotate therein, and may be made to hoist up and lower down by a windlass and chains, C′. Then by simply raising up the tub till the lower part of the vessel E is submerged and rotating the latter the washing can be easily done, after which the bath is lowered and the car moved away to dry.

The highest heat ordinarily used in drying malt—to wit, the furnishing heat of about 180° Fahrenheit—will of itself kill all fermentation and all ordinary insects and animal germs; but to insure the thorough destruction of bacteria and other more refractory animalculæ the car, after being emptied of its contents, may be subjected, without inconvenience or delay, to a heat of several hundred degrees, which no known vegetable or animal life can withstand. The cleaning of the malting-surfaces is thus effectually secured as an incident of the system, and its importance will be readily appreciated by all who have had any practical experience in the art.

When the rolling car, as shown in Fig. 6, is employed it may be provided with any suitable guide or guide-frame to keep it from veering and wedging on the track or running off the track; and to this end two or more rolling cars may be connected to each other by any suitable frame, in which case they will guide each other. When several rolling cars are thus united they will necessarily rotate simultaneously and alike while moving along the track, and the grain in one will tend to counterbalance that in the other, rendering it easier to roll them along than if they were not connected.

It will be understood that with this system any desired number of germinating-cars may be employed, and one or more kilns or refrigerating-rooms may be used. Some cars may be charging, others discharging, others drying, others cooling, and others germinating, all at the same time. The various steps of the work will thus go on harmoniously with the utmost economy of time, labor, and expense, and a few workmen, in a comparatively small building, can easily perform the work which has heretofore required a large force of laborers and an extensive malting-floor to accomplish. This process, moreover, is not restricted to the cooler seasons of the year, like the old process in general use, but can be carried on successfully at all seasons, as my provision for regulating the temperature of the grain and cleansing the floors by heat renders me independent of climate or weather.

It will of course be seen that in lieu of conveying the germinating-vessel itself, with its contained grain, into the kiln or refrigerator a second car might be employed to receive the grain from the germinator and transport it to the kiln or refrigerator. Such awkward and inconvenient plan would have no advantage over the better plan above described.

It may be further explained that the openings and collars for attaching the exhaust-pipe need not necessarily be limited to the tubular trunnions, but may be arranged at any point or points in the sides or ends of the car, provision being made for closing them and holding them closed when necessary; but the tubular trunnions are preferred on account of their axial position.

During the germinating part of the process it may sometimes be considered desirable to force the air through or into the germinating cars or vessels, in order to assure a full and steady supply of oxygen and nitrogen to the sprouting grain, the adequate airing of the grain at this stage of its treatment being of vital importance to the healthy development of the germs. To this end pipes may be laid along between or beside the tracks or arranged overhead, with flexible or jointed connections

or branches for coupling to the tubular collars of the cars, and air may thus be forced into or through the germinating grain in the cars by any suitable blowers connected with the main pipes. With the pipes and couplings thus provided the grain may be aired as often as desired; or the airing may be omitted altogether when not deemed necessary. Flexible hose and couplings like those used with the Westinghouse air-brake will admirably answer the purpose for connecting the mains to the cars.

Having thus described my invention, I claim as new—

1. As an improvement in malting apparatus, a germinating-vessel provided with means for moving and rotating the same about its horizontal axis, said vessel being divided into compartments by horizontal perforated floors or partitions, and said compartments being further divided by longitudinal vertical partitions, substantially as described, whereby the charge of grain is distributed into separate layers with intervening air-spaces, and the layers are prevented from unduly shifting from side to side of the vessel during its rotation on its said axis.

2. In malting apparatus, a germinating-vessel provided with means for moving and rotating the same about its horizontal axis, divided into compartments by horizontal perforated floors, said compartments being further divided by longitudinal vertical partitions, and having the coarse sieves interposed in the compartments to prevent the matting of the grain, substantially as described.

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