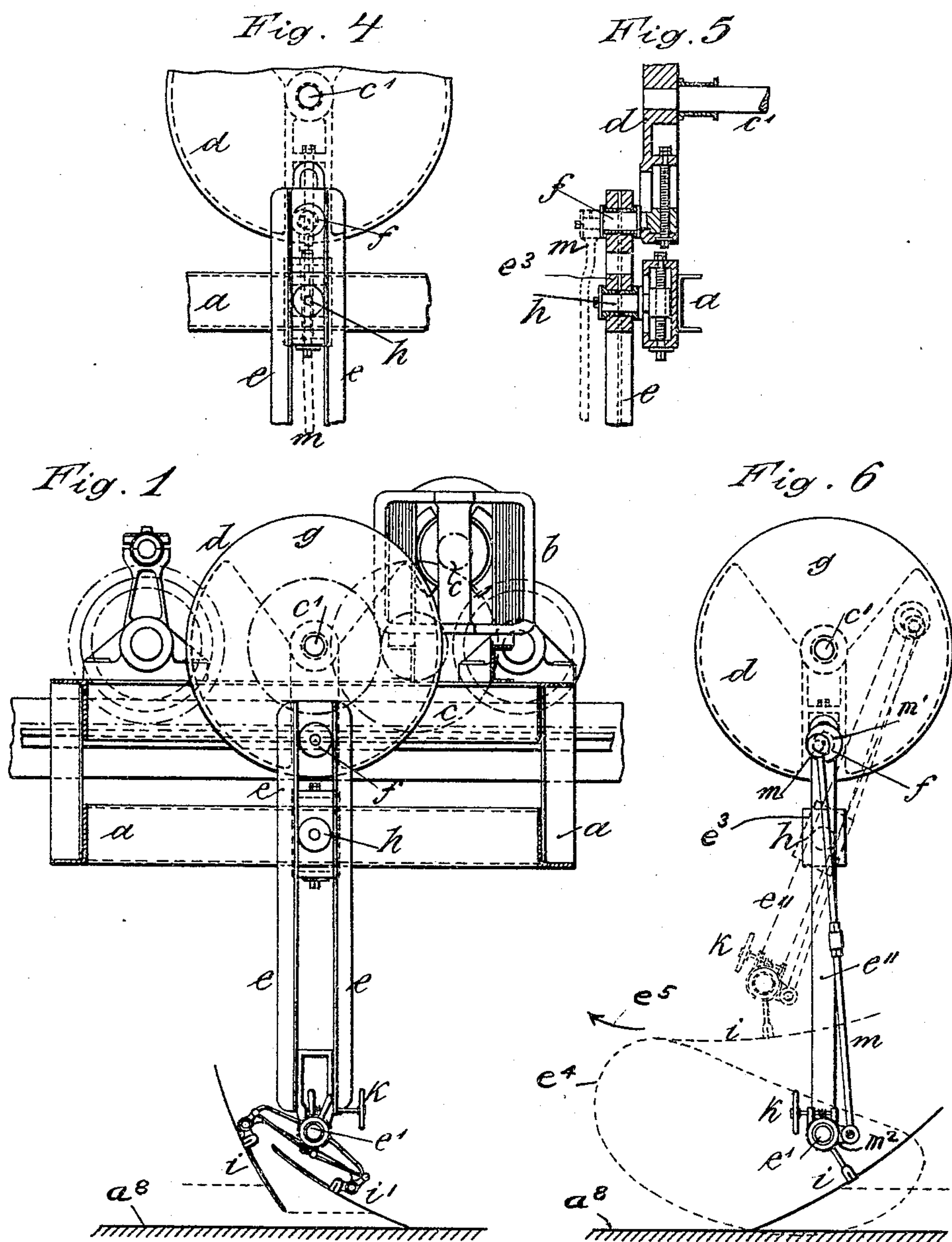


No. 792,106.

PATENTED JUNE 13, 1905.

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MALT TURNING APPARATUS.  
APPLICATION FILED OCT. 13, 1904.

3 SHEETS—SHEET 1.



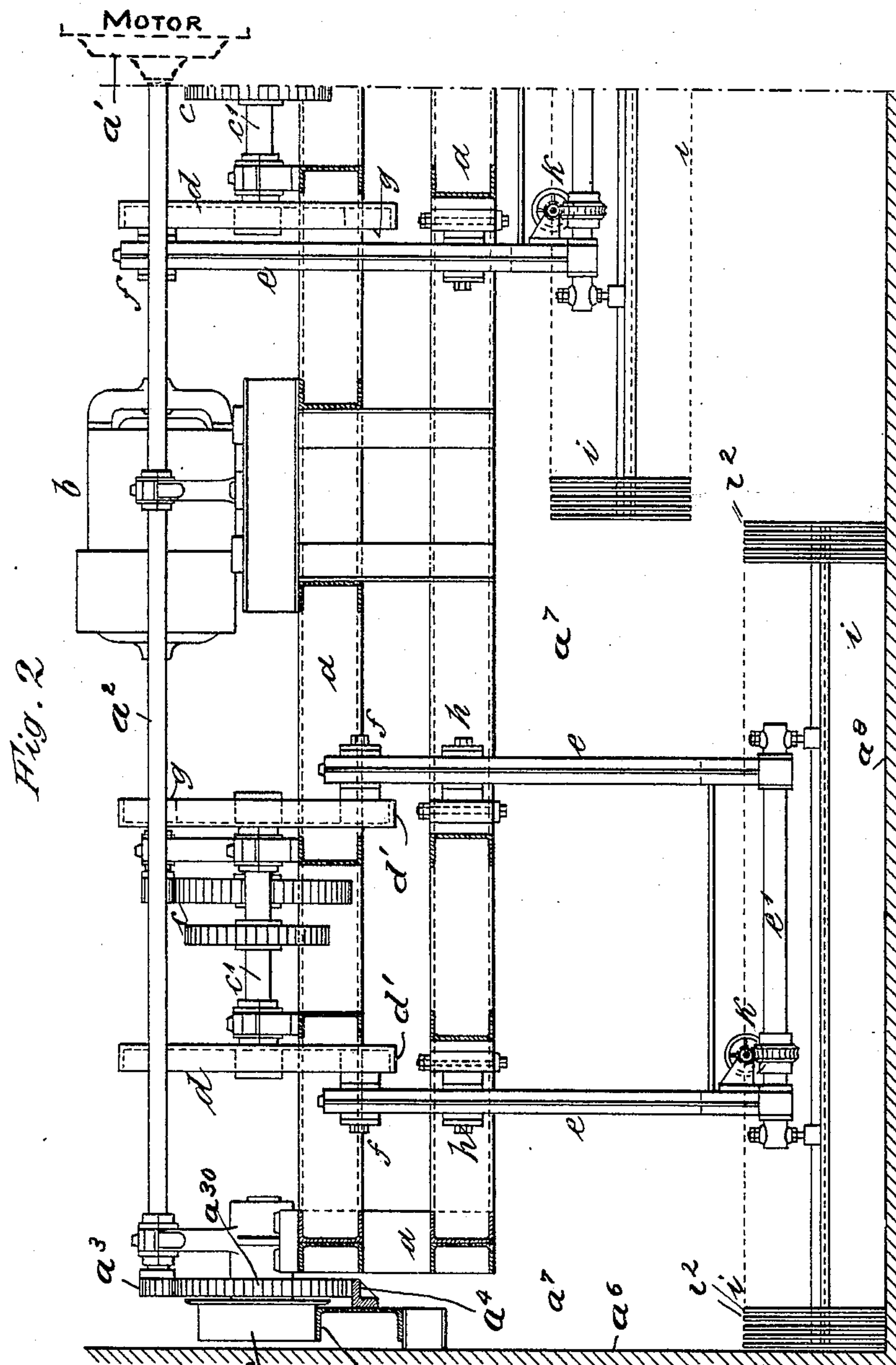
Witnesses:  
Abraham Schlesinger  
Ulysses J. Bywater.

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3 SHEETS—SHEET 2



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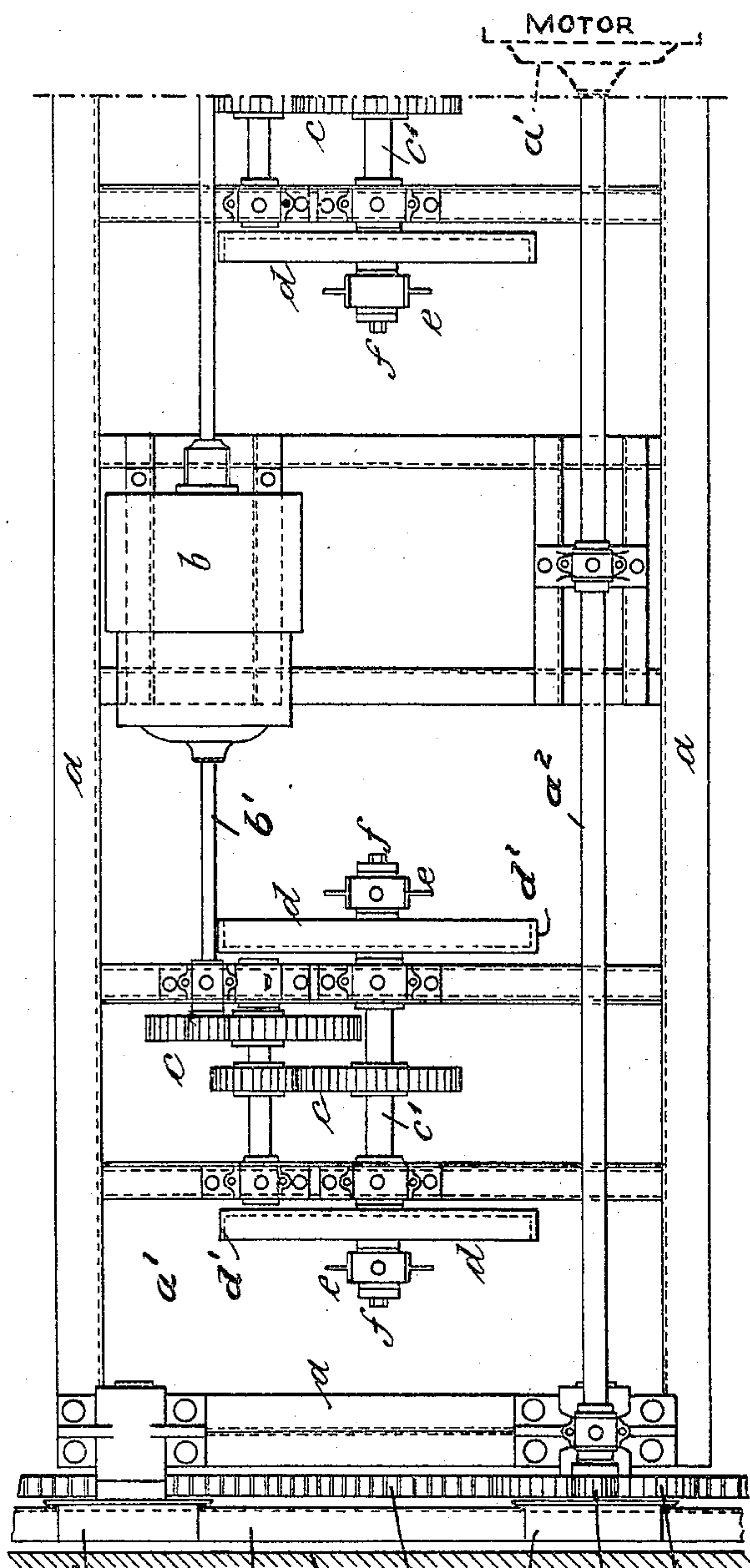
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3 SHEETS—SHEET 3.

Fig. 3



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# UNITED STATES PATENT OFFICE.

FRITZ WÖRZ AND GUSTAV EISNER, OF MUNICH, GERMANY.

## MALT-TURNING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 792,106, dated June 13, 1905.

Application filed October 13, 1904. Serial No. 228,336.

*To all whom it may concern:*

Be it known that we, FRITZ WÖRZ and GUSTAV EISNER, subjects of the King of Bavaria, residing at Munich, Germany, have invented  
 5 certain new and useful Improvements in Malt-Turning Apparatus, of which the following is a specification.

This invention relates to malt-turning apparatus; and its object is to allow of suitably  
 10 adjusting the strokes of the turning-shovels as regards height and length.

The devices hitherto designed for the purpose of turning germinating grain (green malt) lying on the malting-floor by means of mechanically-operated shovels instead of by means of hand-shovels are in principle based on the arrangement of a long horizontal crane extending across the malt-house at a distance of approximately one meter above the malt,  
 20 which is spread over the floor in a layer of approximately fifteen centimeters thickness. The ends of the crane are supported, like the axle of a carriage, by wheels resting on rails fixed to the side walls of the malt-house.  
 25 From the crane depend supporting-arms, to which are connected long broad shovels, (approximately three,) each preferably consisting of a row of prongs arranged side by side. The crane also carries electrically-driven mechanical apparatus for its locomotion and for moving the shovels. In use the crane travels slowly over the malting-floor and the layer of malt, while vertical and oscillatory motion is imparted to the shovels below the crane by  
 35 means of movable arms. The downward movement of the shovels causes them to penetrate into the malt layer in an inclined direction, so that the lifted malt remains thereon until it is discharged above the malt layer by the centrifugal force due to the motion of the oscillating shovels. The disturbed and aerated malt behind the turning apparatus forms the turned layer. Several malt-turning machines of this kind have been designed by the inventors, the particular construction in each case relating to a particular group of parts comprised in the apparatus. As regards general efficiency these known malt-turning machines are highly satisfactory; but in the course

of time various points have been discovered  
 50 in respect of which further improvements in the arrangement and modifications in the action of the turning apparatus have been found to be desirable. Regard must, for instance, be had to the fact that the buildings containing malting-floors are at present in most cases  
 55 not provided with cooling arrangements, so that in the early fall and in winter when a sudden thaw occurs and also during mild spring weather the temperature of the malt layer is liable to rise. In such cases it is found necessary to air and turn the malt more energetically than at other times, and for this purpose the discharge of the malt from the shovels must take place at a comparatively high level  
 60 and through a comparatively large arc or trajectory. When, on the other hand, the weather is cold and the temperature of the malt-house falls, it is necessary that the discharge should be lower and shorter in order not to take the  
 65 germinating malt too much out of the "sweat" or to reduce the germinating energy by excessive cooling.

None of the malt-turning machines hitherto constructed allows of adjusting the shovel-  
 75 stroke as regards height and length in a manner which answers these requirements—that is to say, which allows of controlling the height and length of the discharge of malt from the shovels. Adjusting devices which  
 80 have been provided in these known machines—as, for instance, in the machine described in United States Patent No. 766,230—are only for the purpose of adjusting and fixing the shovels in their direction and position on the  
 85 supporting-arms and for altering the extent of their separate oscillations from the vertical cutting position to the horizontal position independently of the general rotatory movement of the shovels. With all the known  
 90 turning-machines the malt is discharged from the shovels at a fixed unalterable level and through an always equal distance.

In order that a single malt-turning apparatus can be used under the various conditions referred to and that the discharge of the malt can be made to take place at a high level through a large arc or at a low level



through a small arc, the entirely-altered apparatus hereinafter described has been designed for operating the shovels.

One form of the apparatus is shown in the annexed drawings, in which—

Figure 1 is a side view of the apparatus; Fig. 2, a front view, and Fig. 3 a partial plan view, of the crane or carriage. Figs. 4 and 5 are detail views relating to Fig. 1, and Fig. 6 is a side view illustrating a modification.

The crane or carriage *a* is of any suitable construction and is adapted to be slowly driven by an electric motor through a shaft *a*<sup>2</sup>, toothed wheels *a*<sup>3</sup> *a*<sup>30</sup>, wheels *a*<sup>40</sup>, and rack *a*<sup>4</sup> along rails *a*<sup>5</sup>, fixed to the side walls *a*<sup>6</sup> of the malt-house *a*<sup>7</sup> at a certain distance above the malting-floor *a*<sup>8</sup>. From this crane is suspended, as heretofore, the supporting-arm *e* or arms for moving the shovels, which is or are operated by means of a separate motor *b*, arranged on the crane itself. In the arrangement in question the said motor *b* drives, by means of shaft *b*<sup>1</sup> and suitable transmission-gear *c*, a shaft *c*<sup>1</sup>, to which a disk or disks *d* (in the example illustrated two disks) is or are fixed. To each disk *d* an oscillatory shovel-supporting arm *e* is so connected that its distance from the center of the disk can be adjusted, the connection being made by means of an adjustable crank-pin *f*. Diametrically opposite the crank-pin each disk *d* is provided with a balance-weight *g*, which counterbalances the weight of the respective supporting-arm and shovel. In the form of construction illustrated the disk is provided with a broad projecting flange *d*<sup>1</sup>, and the balance-weight is arranged within the recess thus formed.

Each shovel-supporting arm *e* is adjustably connected, by means of a guide-block *e*<sup>3</sup>, to a pivot-pin *h*, arranged below the crank-pin *f*. The said pin *h* can either be permanently fixed in position or it can be vertically adjustable, as shown in the drawings. Figs. 4 and 5 are a side view and cross-section, respectively, illustrating the arrangement of the pins *f* and *h*; but this arrangement can be made in a different manner, if desired. The arm *e* can be constructed in any suitable manner—for instance, of T-irons, as shown in Figs. 1 to 5, or of a rod or tube *e*<sup>1</sup>, as shown in Fig. 6. At its lower end the arm *e* supports the axle *e*<sup>1</sup>, to which is connected either a double shovel *i* *i*<sup>1</sup>, as shown in Fig. 1, or a single shovel *i*, as shown in Fig. 6. In the form of construction illustrated the shovel consists of separate prongs *i*<sup>2</sup>, Fig. 2. Since the shovels are more or less broad and since double shovels are heavier, two supporting-arms *e* are preferably used for supporting the shovel, as shown in Fig. 2. Each single or double shovel can be adjusted for working in either direction by means of a suitable known worm or worm-wheel or other device *k* and can also be adjusted in the desired fixed position with re-

gard to the floor—for instance, at an angle of thirty-two degrees, as shown in the drawings—according to the angle at which the cut into the malt is to take place. The rotation of the disks *d* and the movement of the oscillatory shovel-supporting arms *e*, guided at *h*, causes the shovels to travel through substantially oval paths, as indicated in Fig. 6 by dotted lines *e*<sup>4</sup>. When the point of the shovel enters the malt, the shovel is in an approximately vertical position, from which it is then immediately swung into a more inclined position, carrying malt with it to the highest point of its path, at which the malt is energetically discharged in the direction of the arrow *e*<sup>5</sup> shown in Fig. 6. When the malt has been discharged by centrifugal force, the shovel is moved toward the rear and again cuts into the malt when the rocking of the arm *e* in the opposite direction has moved the shovel from a substantially horizontal position into a substantially vertical position. If the pin *h* is made adjustable, the length and height of the oval path, and consequently the height and length of the discharge of malt from the shovel, can be altered as desired. The higher the sliding pin *h* is adjusted the longer will be the oval path and the discharging swing. If at the same time the crank-pin *f* is adjusted nearer the circumference of the disk *d*, the height at which the discharge takes place will also be increased, so that when the temperature is high the malt can be flung from a greater height through a longer distance in order to be energetically aired. If the pin *h* is moved downward, the curvilinear movement of the shovel is reduced and the discharge becomes shorter. If at the same time the throw of the oscillating arm is reduced by moving the crank-pin *f* toward the center of the disk, the height at which the discharge takes place is also reduced, so that when the temperature is low the malt can be aired to a less degree while being turned. Besides this a further very important advantage is obtained by the arrangement and motion described. The velocity of the shovel during the time at which it approaches the spiring malt for making the cut is increased, so that the cut and the gathering up of the malt takes place very rapidly and compression of the malt layer by the shovel is as far as possible avoided. Thereafter, on the other hand, more particularly at the highest point of discharge, where the centrifugal force of the swinging malt is greatest, the velocity decreases, so that the malt is not discharged in the form of a lump, but leaves the shovel in a loose condition through a large arc. The discharged germinating grain therefore lies much more loosely together and the turned layers lie more lightly upon each other than when turned by the machines hitherto known, which caused the discharged malt to fall with too great an impact. The high and long lift



of the grain during the turning allows of doubling the depth of the shovel cut into the malt, since the grain is more effectually aired during the discharge. The improved turning-machine is therefore capable of attaining up to double the efficiency which has hitherto been obtained. The arrangement described also allows of driving a plurality of shovels on a single shaft.

If desired, the shovel-supporting arm can be provided, as was the case with apparatus of the kind previously known, with means for imparting to each shovel besides its rotary movement a special oscillating movement, the latter being produced by means of an extensible connecting-rod *m*, Fig. 6, the upper end of which is pivotally connected to an eccentric *m'* and the lower end to an arm *m''* of the shovel. The latter is, of course, in this case rotatable on the axle *e'*.

Like the machines of a similar kind hitherto known, the apparatus described can be used for turning, mixing, and airing, &c., other materials besides malt in various branches of industry.

We claim—

1. In apparatus for turning malt and other materials, the combination with a carriage adapted to be moved across a malting-floor, of an arm adapted to carry a shovel, rotatory means for moving said arm in an upward and downward direction, an adjustable connection between said arm and its moving means and a slide-bearing for said arm below the aforesaid adjustable connection substantially as described.

2. In apparatus for turning malt and other materials, the combination with a carriage adapted to be moved across a malting-floor, of an arm adapted to carry a shovel, rotatory means for moving said arm in an upward and downward direction, an adjustable connection between said arm and its moving means and an adjustable slide-bearing for said arm below the aforesaid adjustable connection substantially as described.

3. In apparatus for turning malt and other

materials, the combination with a carriage adapted to be moved across a malting-floor, of a tubular arm adapted to carry a shovel, rotatory means for moving said arm in an upward and downward direction, an adjustable connection between said arm and its moving means and a slide-bearing for said arm below the aforesaid adjustable connection, substantially as described.

4. In apparatus for turning malt and other materials, the combination with a carriage adapted to be moved across a malting-floor, of a crank-disk mounted on said carriage, means for rotating said disk, an arm adapted to carry a shovel at its lower end, and adjustably connected to said crank-disk, and a slide-bearing on said arm and below the point of connection of the latter with the aforesaid disk substantially as described.

5. In apparatus for turning malt and other materials, the combination with a carriage adapted to be moved across a malting-floor, of a crank-disk mounted on said carriage, means for rotating said disk, a double arm adapted to carry a shovel at its lower end, and adjustably connected to said crank-disk, a slide-bearing between the members of said arm and below the point of connection of the latter with the aforesaid disk, substantially as described.

6. In apparatus for turning malt and other materials, the combination with a carriage adapted to be moved across a malting-floor, of a crank-disk mounted on said carriage, means for rotating said disk, an arm adapted to carry a shovel at its lower end, and adjustably connected to said crank-disk, a slide-bearing on said arm and below the point of connection of the latter with the aforesaid disk and means operated by the latter for rocking the shovels substantially as described.

In witness whereof we have signed this specification in the presence of two witnesses.

FRITZ WÖRZ.

GUSTAV EISNER.

Witnesses:

ABRAHAM SCHLESINGER,

ULYSSES J. BYWATER.