No. 896,920. PATENTED AUG. 25, 1908.

A. R. KELLER.

MASHING MACHINE.

APPLICATION FILED SEPT. 28, 1907.

4 SHEETS—SHEET 1.

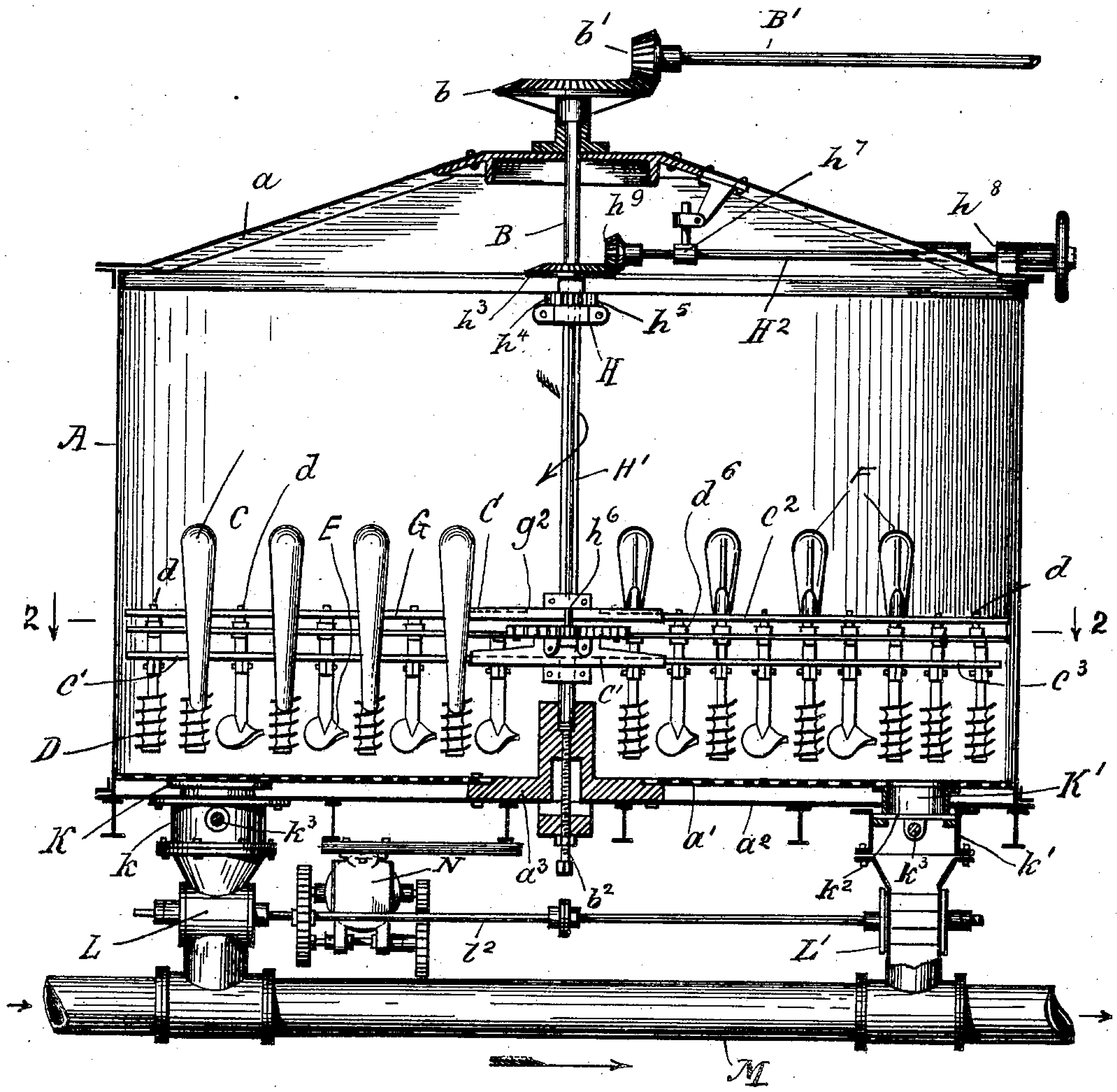

Fig. 1

WITNESSES

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4 SHEETS—SHEET 2.

Fig. 2

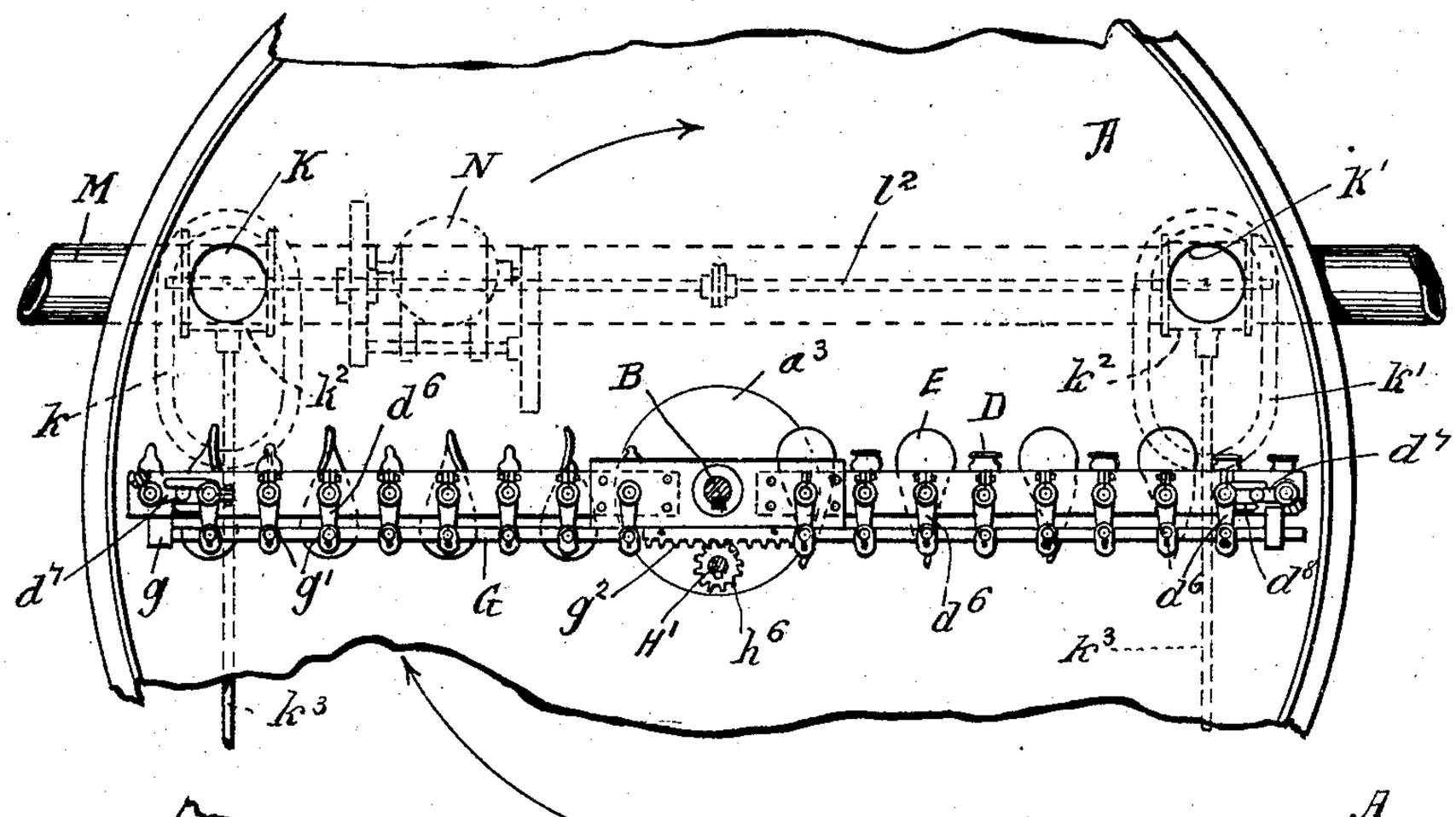


Fig. 3

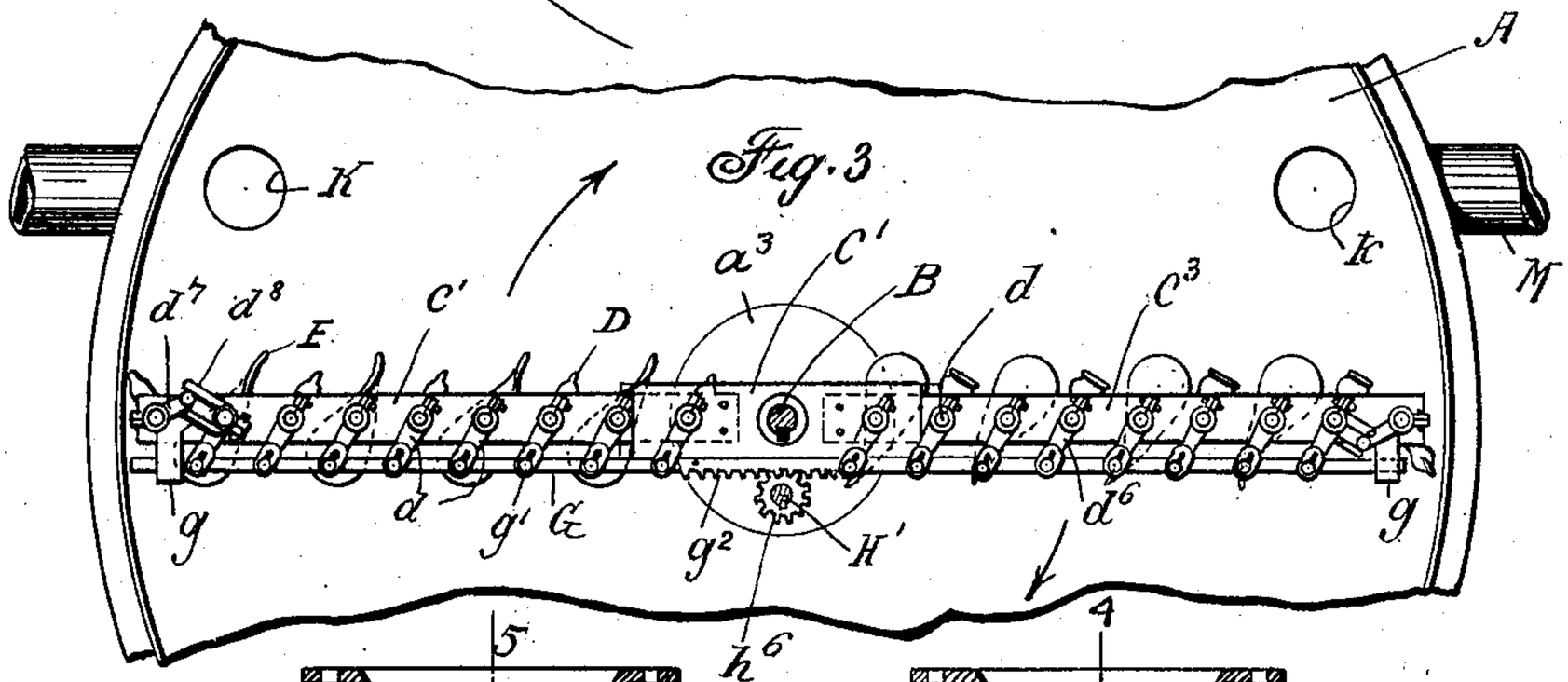


Fig. 4

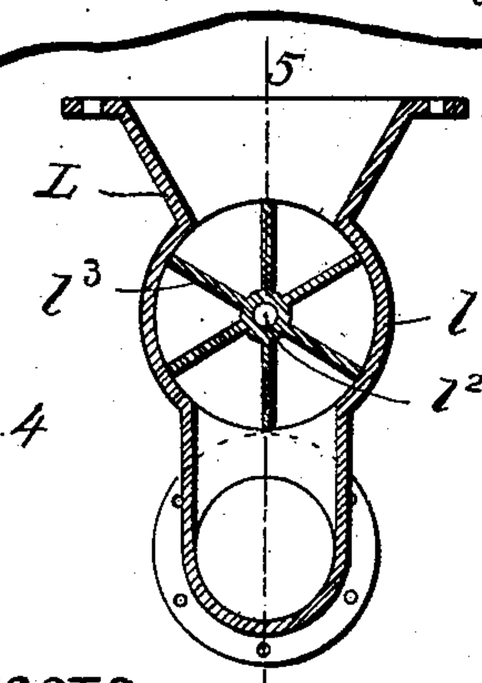
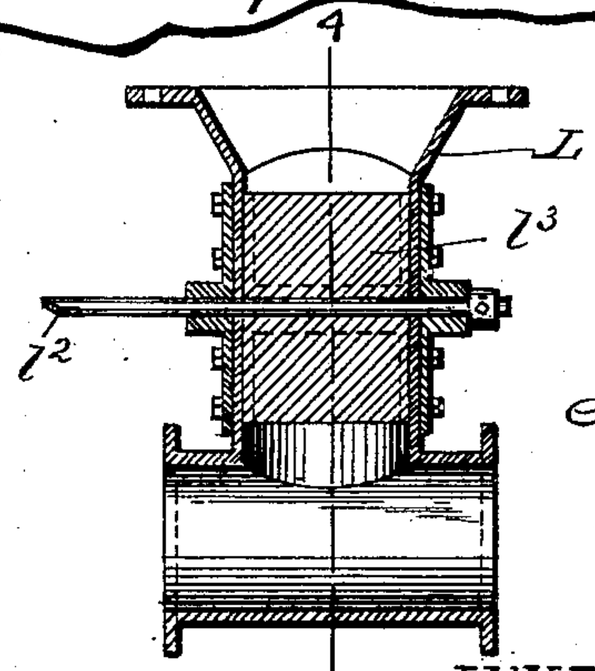


Fig. 5



WITNESSES

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4 SHEETS—SHEET 3.

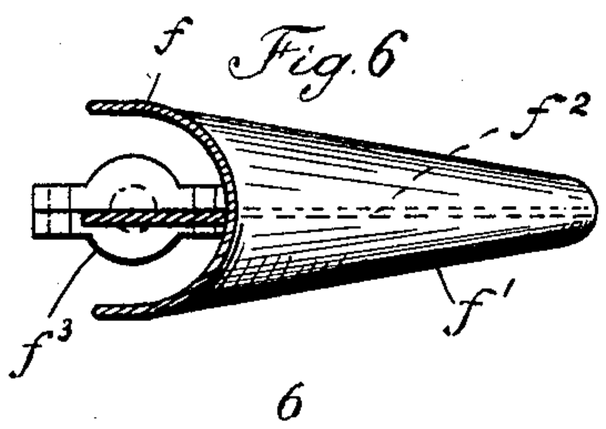

Fig. 6

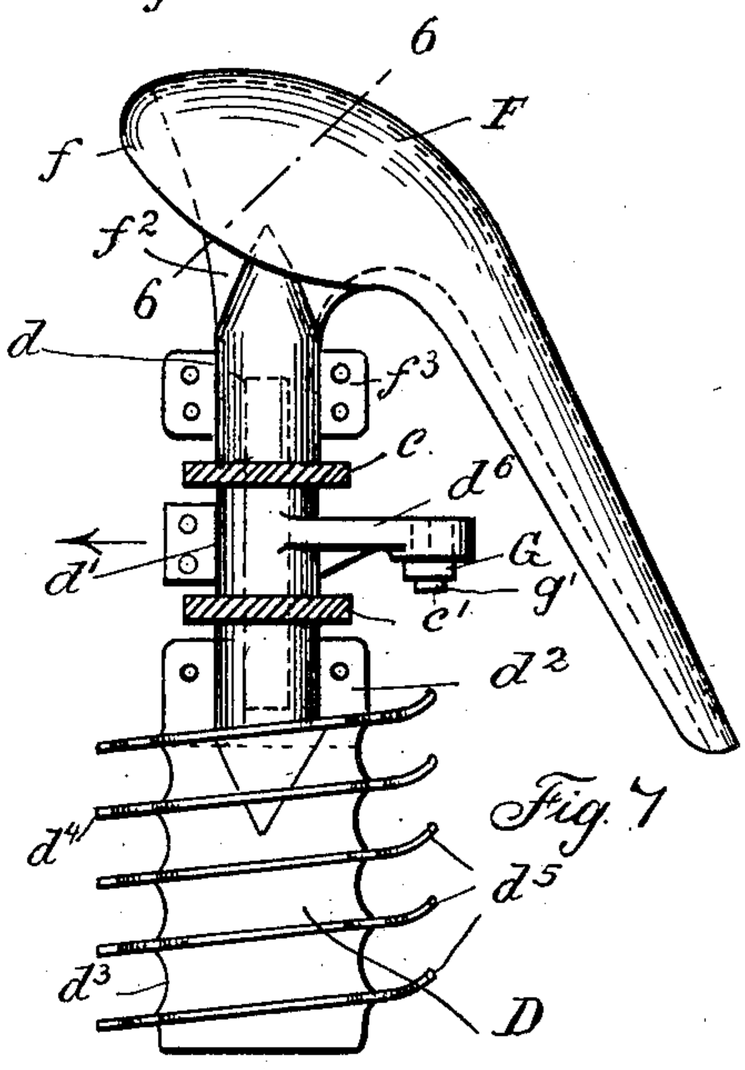

Fig. 7

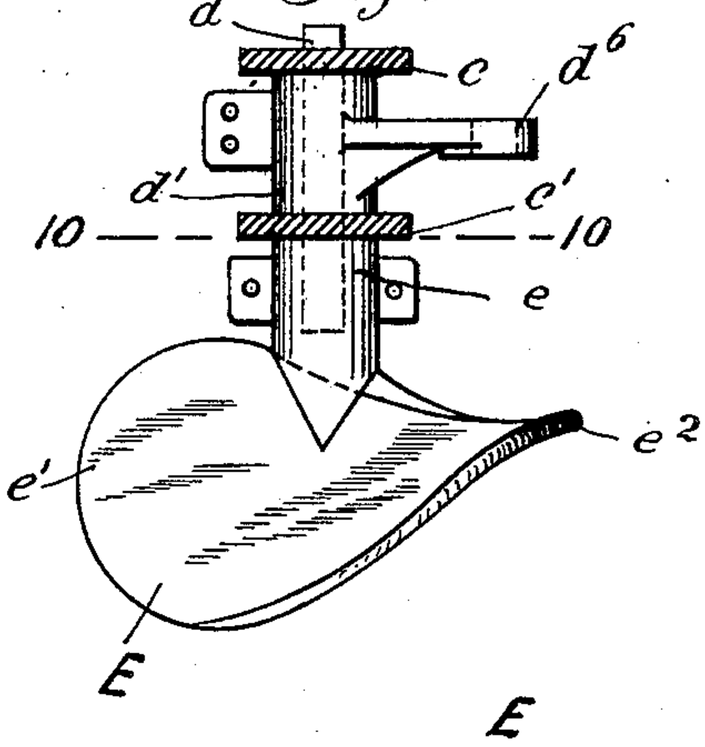

Fig. 9

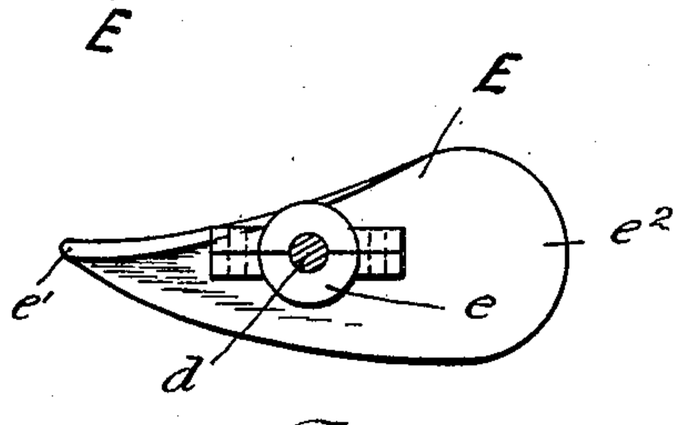

Fig. 10

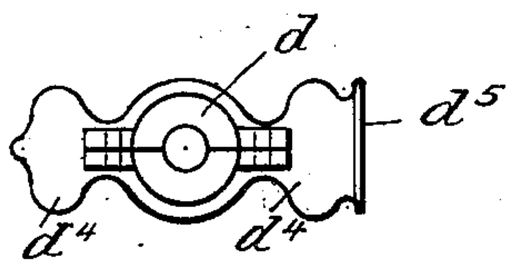

Fig. 8

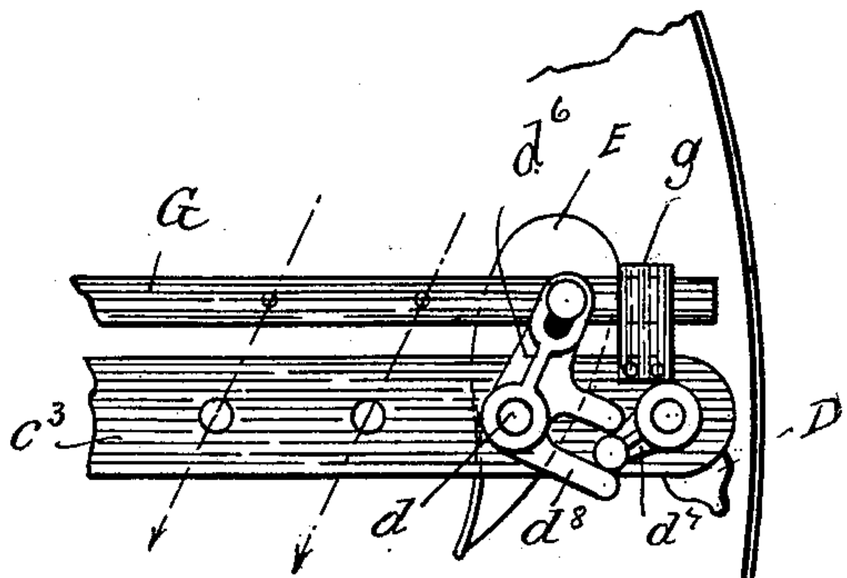

Fig. 11

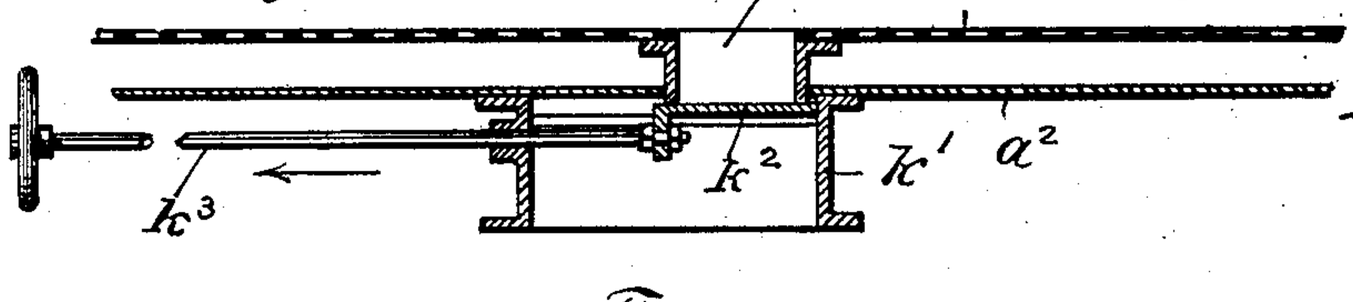

Fig. 12

WITNESSES

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No. 896,920. PATENTED AUG. 25, 1908.

A. R. KELLER.

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4 SHEETS—SHEET 4.

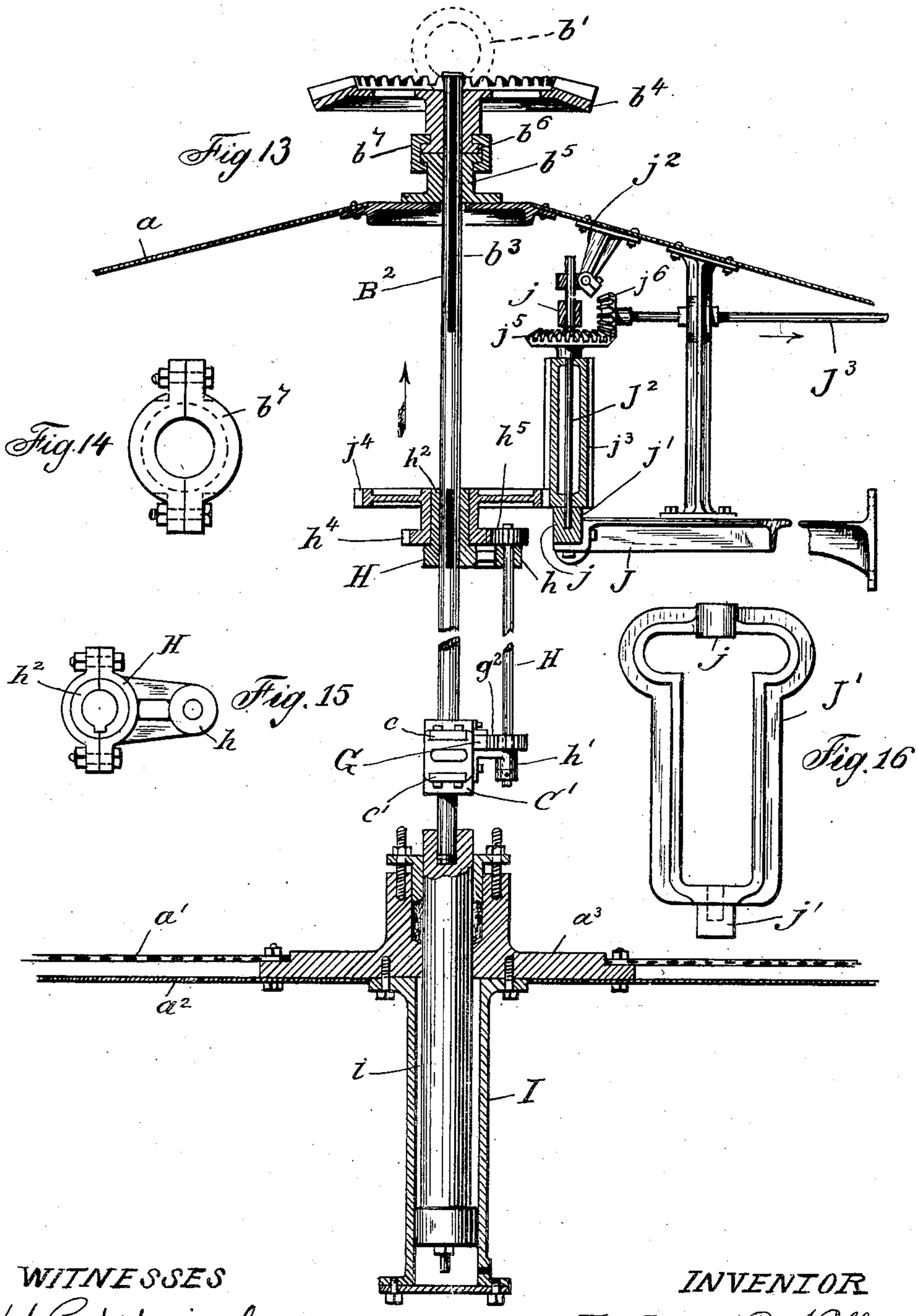

Fig. 13

Fig. 14

Fig. 15

Fig. 16

WITNESSES

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UNITED STATES PATENT OFFICE.

ANDREAS REINHARD KELLER, OF CHICAGO, ILLINOIS.

MASHING-MACHINE.

No. 896,920. Specification of Letters Patent. Patented Aug. 25, 1908.

Application filed September 28, 1907. Serial No. 394,976.

To all whom it may concern:

Be it known that I, ANDREAS REINHARD KELLER, a citizen of the United States, and residing at Chicago, in the county of Cook and State of Illinois, have invented a new and useful Improvement in Mashing-Machines, of which the following is a complete specification.

This invention relates to improvements in mashing machines of that class employed in the process of making beer.

One of the difficulties encountered in mixing the mash is the tendency of the grain to settle to the bottom of the tub and leave the wort at the top. The purpose of the mixing or stirring blades or paddles is of course to agitate the contents of the tub and provide a homogeneous mass. These are usually made to revolve vertically, entering and leaving the mass at the surface, and as they present a broad side to the mass the resistance is considerable, and ofttimes enough to break the machinery.

The object of the invention is to provide a mashing machine in which the stirrers revolve in a horizontal plane only but act to throw the grain upwardly from the bottom of the tub to prevent its settling and to allow the wort to mix therewith.

Another object of the invention is to provide means for forcing the wort downwardly through the mass of grain towards the bottom of the tub in jets or streams behind the stirrers, so as to thoroughly mix it with the grain.

It is also an object of the invention to provide a mashing machine which, while it is adapted to thoroughly and quickly mix the mash, yet the power required for its operation is reduced to a minimum.

It is a still further object of the invention to provide means for adjusting the angle of the stirrers with respect to their direction of travel so that the grain may be quickly removed from the tub after the wort has been withdrawn and also to provide a pneumatic conveyer adapted to convey the grain to any suitable place of deposit after its discharge from the tub.

The invention consists of the matters hereinafter described in the specification and more fully pointed out and defined in the appended claims.

In the drawings: Figure 1 is a vertical section of the tub and showing the mixing or stirring apparatus in side elevation. Fig. 2 is a fragmentary section, with parts removed, taken on line 2—2 of Fig. 1 and showing the stirring mechanism in the position assumed in stirring the contents of the tub. Fig. 3 is a view similar to Fig. 2 but showing the stirring mechanism in position for discharging the grain. Fig. 4 is a vertical section, taken on line 4—4 of Fig. 5, of the force feed valve for the grain discharge. Fig. 5 is a section taken on line 5—5 of Fig. 4. Fig. 6 is a plan view, partly in section taken on line 6—6 of Fig. 7, of one of the deflecting hoods. Fig. 7 is a side elevation of one of the hoods and one of the shovels and the supporting means therefor. Fig. 8 is a top plan view of one of the shovels. Fig. 9 is a side elevation of one of the spiral blades. Fig. 10 is a section taken on line 10—10 of Fig. 9. Fig. 11 is a fragmentary plan view showing the means for turning the end stirrers oppositely from the others. Fig. 12 is a vertical section of the slide valve. Fig. 13 is a vertical section of a modified form of the construction shown in Fig. 1 and showing means for elevating the central shaft and stirring devices. Fig. 14 is a plan view of the coupling for the driving gear. Fig. 15 is a plan view of the upper bracket for the rack shaft. Fig. 16 is a side elevation of the bearing bracket for the elongated gear.

As shown in said drawings: A indicates the mash tub of the usual or any desired construction, having a removable cover a and a perforated bottom a' slightly above the bottom a^2 and through which the wort is separated from the grain. A bearing a^3 is rigidly engaged to the bottom of the tub at its axis and journaled therein is the stirrer or beater shaft B which extends upwardly through the cover and is provided with any preferred means for imparting motion thereto, as for instance a beveled gear b driven by a pinion b' on the drive shaft B'. Rigidly engaged to said stirrer shaft, near the bottom thereof, is an upper and lower bracket C and C' to which are rigidly engaged upper and lower arms indicated, on opposite sides of the shaft, by c—c' and c^2—c^3, and which extend radially of the tub in opposite directions to near the side walls thereof. Carried on said arms are the beaters or stirrers comprising a plurality of shovels D and spiral blades or plows E arranged alternately thereon, in such manner that a blade E on one pair of arms will track

directly behind a shovel on the other pair of arms and vice versa. Said shovels and plows may be engaged to the arms in any desired manner but as shown they are adapted to rotate on a vertical axis. For this purpose a plurality of vertical shafts d are journaled in said arms, and a sleeve d' is rigidly engaged in any desired manner on each shaft between said arms, and said shovels and plows are provided respectively on their upper ends with clamps d^2 and e adapted to clamp on the lower ends of said shafts as shown more clearly in Figs. 7 to 10 inclusive.

The shovels D each comprise a central, downwardly directed web d^3 on which are a plurality of upwardly and rearwardly inclined flanges d^4 extending from the sides and front and rear edges thereof, and which are curved upwardly at their rear ends d^5. Said flanges are directed longitudinally of the direction of the travel of the shovel, as shown by the arrow in Fig. 7, and act to elevate the grain as they pass beneath the same. Said spiral blades or plows E comprise a blade of metal, the forward edge e' of which stands in approximately a vertical plane, and the rear edge e^2 of which lies in approximately a horizontal plane, so that it acts to turn the grain over and move it to one side.

Rigidly engaged on the upper ends of a portion of said shafts d are the wort deflecting hoods F, each of which comprises an inverted spoon shaped member, comprising a bowl f and a rearwardly and downwardly directed tail f', the latter of which, as shown, is concave in cross section, though obviously it could be tubular if desired. Said hood is provided with a central, longitudinal web or rib f^2, on the forward end of which is a downwardly directed clamp f^3 adapted to engage the end of the shaft d. Each of said sleeves d' is provided with a horizontal arm, all of which, with the exception of the end ones are indicated by d^6 and are directed in the same direction laterally of the stirrer arms, and which as shown more clearly in Figs. 2 and 3 are provided in their outer ends with slots. A rack bar G is slidably engaged at its ends in bearings g on the ends of said stirrer arms, and bolts g' are carried thereon and are engaged in the slots in the arms d^6. The arm on each end sleeve is indicated by d^7 and projects into a laterally directed fork d^8 on the adjacent arm d^6 so that the two end stirrers rotate oppositely, as shown in Fig. 11, to bring their ends close together when discharging the grain.

Rigidly engaged on the shaft B above the stirring arms is a bearing bracket H, shown in Figs. 1 and 15, and which is provided in its end with a bearing h, in which is journaled the upper end of the rack shaft H', the lower end of which is journaled in a suitable bearing h' on the bracket C'. Said bracket H is provided with a sleeve h^2 about the shaft B and journaled thereon is a beveled gear h^3, below which and rigidly connected therewith is a spur gear h^4. A pinion h^5 on the upper end of the shaft H' meshes with and is driven by the gear h^4, and a pinion h^6 on the lower end of said shaft meshes with the rack g^2 on the rack bar G. A longitudinally movable shaft H^2 is slidably engaged in suitable bearings h^7 and h^8 on the cover a and is provided on its inner end with a beveled pinion h^9 adapted, when the shaft is at the inner limit of its movement, to mesh with the gear h^3, and when said shaft is rotated to move the rack bar G longitudinally and thereby rotate the stirrers to adjust their inclination to the direction of their travel.

As shown in Fig. 1 the shaft B is mounted upon an adjustable bearing screw b^2 in the bearing a^3, and the stirrers are not adapted to be elevated from the bottom of the tub. If preferred however means may be provided for elevating the stirrers, and for this purpose, as shown in Fig. 13, a hydraulic jack I is provided beneath the tub, in the upper end of the piston i of which is journaled the lower end of the stirrer shaft B^2. The stirrer arms are engaged thereon as before described, and the shaft is provided at its upper end with a keyway b^3. The gear b^4 is keyed in said key way so that the shaft may slide therewith. A flanged bearing b^5 for said shaft is engaged on the top of the tub and the hub of the gear is provided with a flange b^6 which bears on the flange of said bearing. An internally grooved collar b^7 engages over said flanges and secures the gear to the bearing but permits it to rotate thereon.

A bracket J extends inwardly from the side of the tub near the top thereof, and on its inner end is supported a bearing bracket J' having bearings j and j' thereon, in which is journaled a shaft J^2. A bracket j^2 attached to the cover a steadies the upper end of said shaft, and an elongated gear j^3 is rigidly engaged on said shaft within the bearing bracket and meshes with a gear j^4 corresponding with the gear h^3 in the construction shown in Fig. 1. Above said gear j^3 is a beveled gear j^5, rigidly engaged on the shaft J^2, and a slidable shaft J^3, corresponding with the shaft H^2, is mounted in suitable bearings on the cover and is provided on its inner end with a pinion j^6 adapted to mesh with the gear j^5 when the shaft is at the inner limit of its movement.

After the mash has been thoroughly mixed and the wort drawn off it is necessary to remove the grain. For this purpose the tub is provided with two discharge ports K and K' opening from the perforated bottom a'. Beneath these ports and engaged to the bottom of the tub are the valve housings k and k' in which are the slide valves k^2 controlling said ports. An operating rod or handle k^3 is attached to each valve and affords means for operating the same. Beneath the valve cas-

ings k and k' and attached thereto are the force feed valves L and L′ each of which comprises a cylinder l, through both of which and axially thereof, is journaled a shaft l^2. Said shaft is provided in each cylinder with a plurality of radial blades l^3 which are of such length and width that they contact with the walls and ends of the cylinders and thereby control the passage therethrough. Said feed valves are open at their lower ends and discharge into an air pipe M through which a blast of air is forced to carry off the grain to the place of deposit. Any preferred means may be provided to operate said valves but as shown a motor N is geared to said shaft and drives the same.

The operation is as follows: In mixing the mash the stirrers are set to travel straight with their direction of rotation about the shaft B, as shown in Fig. 2, so as to create as little resistance as possible. The shovels act to raise the grain up from the bottom and the plows to turn it over and inasmuch as one shovel and one plow travel in the same path the grain is subjected to a thorough agitation. The deflecting hoods act to catch the wort and force it downwardly into the grain behind the shovels and cause it to very quickly form the mash into a homogeneous mass. When the stirring is completed the wort is withdrawn in the usual manner and the rack bar is shifted to turn the stirrers at an inclination to their path of travel, as shown in Fig. 3, in which position they act to direct the grain to the walls of the tub where it falls through the outlet ports K and K′. The force feed valves having been set in operation the grain is fed downwardly therethrough to the pipe M. Inasmuch as the blades l^3 extend entirely across the cylinders the air from the pipe M cannot enter the tub.

When the construction shown in Fig. 13 is used to permit the stirrers to be elevated, the gear j^4 slides on the gear j^3 so that the stirrers may be shifted when desired regardless of their vertical position.

Obviously many details of construction may be varied without departing from the principles of my invention.

I claim as my invention:

1. In a device of the class described the combination with a mash tub of a plurality of arms therein adapted to revolve about a vertical axis, stirrers therein and means adapted to direct the wort to the bottom of the tub.

2. In a device of the class described the combination with a tub of radial arms therein, means for rotating said arms, stirrers on said arms and downwardly and rearwardly directed deflecting hoods on said arms.

3. In a device of the class described the combination with a tub of a rotative shaft therein, radially directed arms on said shaft, stirrers journaled in said arms, means for simultaneously adjusting said stirrers, and a plurality of deflectors carried on said arms and extending downwardly behind the stirrers.

4. In a device of the class described the combination with a tub of a central shaft therein, radial arms on said shaft, stirrers journaled in said arms, a rack bar connected with each stirrer, means adapted to operate said bar and simultaneously adjust the stirrers, and deflectors carried on said arms and extending downwardly behind the stirrers.

5. In a device of the class described the combination with a tub of a shaft therein, arms on said shaft, stirrers journaled in said arms, a rack bar connected with a portion of said stirrers and adapted to rotate them in the same direction, means connecting the end stirrers with the next adjacent stirrers and adapted to turn them oppositely from the other stirrers, deflectors on part of said stirrers extending downwardly and rearwardly therefrom and means for operating said rack bar.

6. In a device of the class described the combination with a tub of a vertical, rotary shaft therein, arms on said shaft, a plurality of shovels on said arms, each comprising a central web having upwardly and rearwardly inclined flanges thereon, a plurality of spiral blades on said arms and alternating with said shovels, means for simultaneously adjusting the angle of said shovels and blades with respect to their direction of travel, and a plurality of deflectors adapted to direct material towards the bottom of the tub.

7. In a device of the class described the combination with a tub of a central shaft therein, arms on said shaft, a plurality of vertical shafts journaled in said arms, stirrers on said shafts, a rack bar connected with a portion of said shafts and adapted to rotate them, a rack shaft supported adjacent the central shaft, a pinion thereon meshing with the rack on said bar, a longitudinally slidable shaft adapted to operate said rack shaft and downwardly and rearwardly directed deflectors on part of said vertical shafts.

8. In a device of the class described the combination with a tub of a central shaft journaled therein, arms on said shaft, a plurality of vertical shafts journaled in said arms, stirrers on said shafts, a rack bar connected with a portion of said shafts, a rack shaft journaled adjacent the central shaft, a pinion thereon meshing with said rack, a longitudinally movable shaft, intermeshing gears adapted to connect the same with the rack shaft to operate the rack bar and concave deflectors on part of said vertical shafts extending down behind the arms.

9. In a device of the class described the combination with a tub having an outlet port in the bottom thereof, of a central rotary shaft, arms on said shaft, stirrers journaled

in said arms, means for inclining said stirrers so as to direct material towards said port, a slide valve beneath said port, a force feed valve beneath said slide valve and an air pipe into which said feed valve discharges.

10. In a device of the class described the combination with a tub having an outlet port in the bottom thereof, of a central, rotary shaft, arms thereon, stirrers journaled in said arms, a rack and pinion adapted to incline said stirrers to their direction of travel and direct material to said port, a slide valve controlling the port, a rotary force feed valve beneath the slide valve, means for operating the same, and an air pipe into which said force feed valve discharges.

11. In a device of the class described the combination with a tub of a shaft journaled therein, arms on said shaft, stirrers on said arms adapted to throw material upwardly from the bottom of the tub, downwardly and rearwardly directed deflectors above said stirrers adapted to direct material towards the bottom of the tub and a rack and pinion adapted to partially rotate said stirrers.

12. In a device of the class described the combination with a tub of a central, rotary shaft therein, arms on said shaft, stirrers on said arms, a rack bar connected on said stirrers and adapted to incline them to the direction of their travel, a bearing bracket on said shaft, a rack shaft journaled therein, a pinion on said shaft adapted to operate the rack, gears rotatively engaged on said bracket and adapted to drive the rack shaft, an elongated gear in mesh with one of the same, means for rotating said elongated gear and means for raising and lowering the central shaft and stirrers.

13. In a device of the class described the combination with a tub of a rotary, vertical shaft therein, arms on said shaft and a plurality of deflecting hoods on said arms, said hoods being concave on their under sides and extending downwardly behind said arms.

14. In a device of the class described the combination with a tub of a vertical, rotary shaft therein, arms on said shaft, a plurality of stirrers journaled on said arms, downwardly and rearwardly directed deflectors on part of said stirrers, and means adapted to turn the end stirrer on each arm in one direction and to simultaneously turn the remaining stirrers oppositely therefrom.

15. In a device of the class described the combination with a tub of a central, vertical shaft therein, means for rotating said shaft, horizontal stirrer arms on said shaft, a plurality of vertical shafts journaled in said stirrer arms, downwardly and rearwardly directed deflectors on part of said stirrer shafts, stirrers on the lower ends of said shafts, an arm on each of said shafts, a rack bar connected with all of said arms except the end ones, a fork on the arm adjacent each end arm and adapted to engage the end arms and turn the end stirrers oppositely from the others, and means for operating said rack bar.

16. In a device of the class described the combination with a tub of a rotary shaft therein, arms on said shaft, means on the under side of said arms adapted to throw material up from the bottom of the tub, and means on the upper side of said arms and extending downwardly at the rear thereof adapted to direct material downwardly towards the bottom of the tub.

17. In a device of the class described the combination with a tub having an outlet port in the bottom thereof, of stirrers in said tub, means for adjusting the inclination of said stirrers with respect to their direction of travel to direct material towards said port, a valve controlling said port, an air pipe and a rotary force feed valve adapted to deliver material from said tub to said pipe.

18. In a device of the class described the combination with a tub having an outlet port near each side thereof, of stirrers in said tub, means for adjusting the inclination of said stirrers to direct material to said ports, a valve controlling each port, a rotary force feed valve beneath each of said valves, an air pipe into which said force feed valves discharge, a shaft connecting said force feed valves and means for rotating said shaft and operating the valves.

19. In a device of the class described the combination with a tub of a vertical, rotary shaft therein, arms on said shaft, stirrers on said arms, a rack bar connected with said stirrers and adapted to adjust their inclination with respect to their travel, a rack shaft, a pinion thereon adapted to mesh with the rack on said rack bar, a pinion on the upper end of said rack shaft, rigidly connected gears journaled on said vertical shaft, one of which meshes with said pinion, an elongated gear meshing with the other of said gears, means for supporting said elongated gear parallel with the vertical shaft, a beveled gear connected with said elongated gear, a longitudinally movable shaft supported in the tub, a gear thereon adapted to mesh with said beveled gear when the shaft is at the inner limit of its movement, and means for raising and lowering the vertical shaft and stirrers.

In testimony whereof I have hereunto subscribed my name in the presence of two witnesses.

ANDREAS REINHARD KELLER.

Witnesses:
H. R. WEIGLE,
B. ZEITZ.