June 5, 1934. J. W. ATHEY 1,961,656

ROTARY CORE MACHINE

Filed April 18, 1933 3 Sheets-Sheet 1

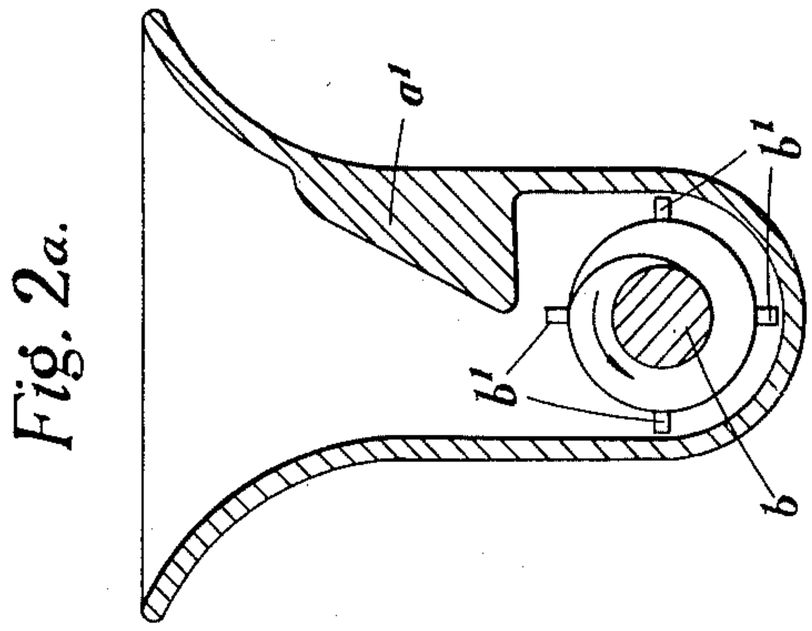

Fig. 2a.

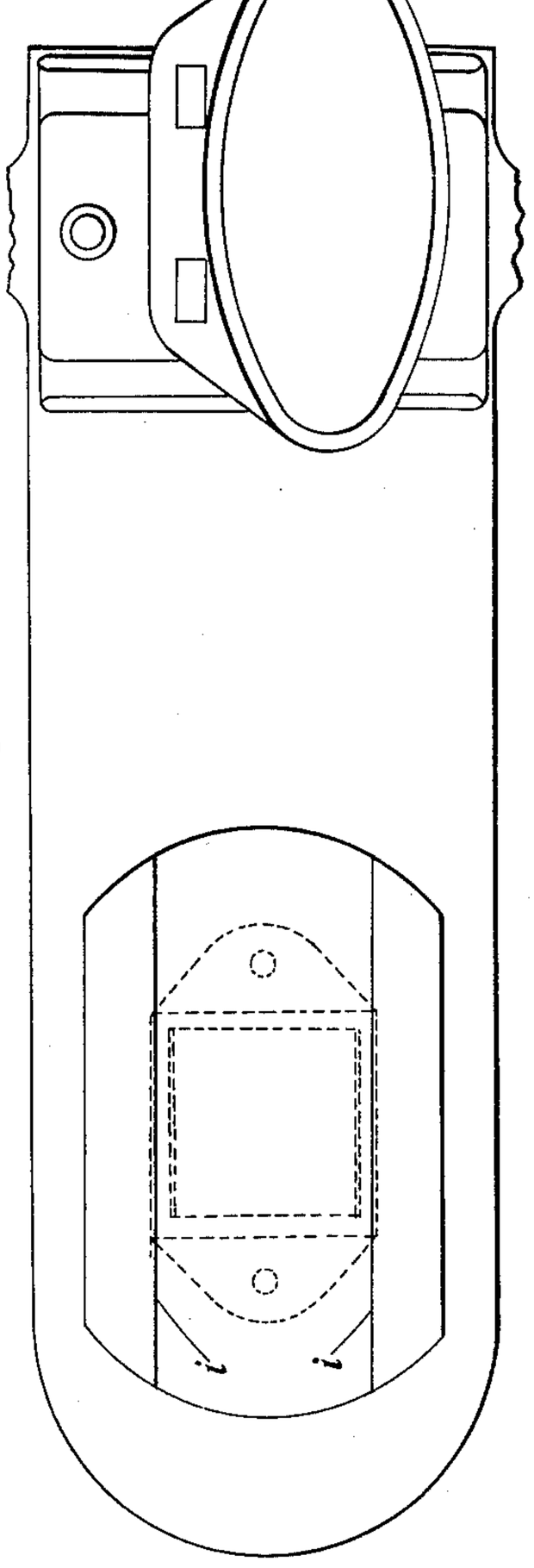

Fig. 3.

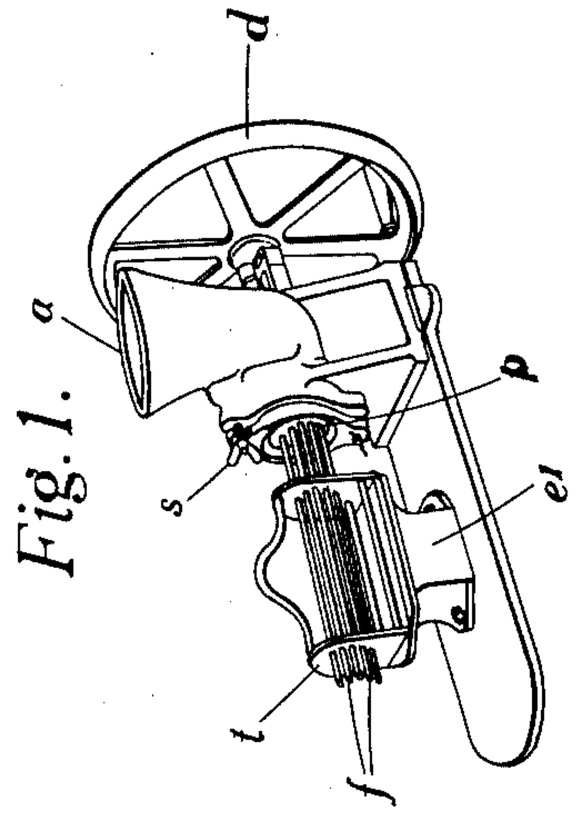

Fig. 1.

INVENTOR
Joseph William Athey
BY
Eugene E. Stevens
His ATTORNEY

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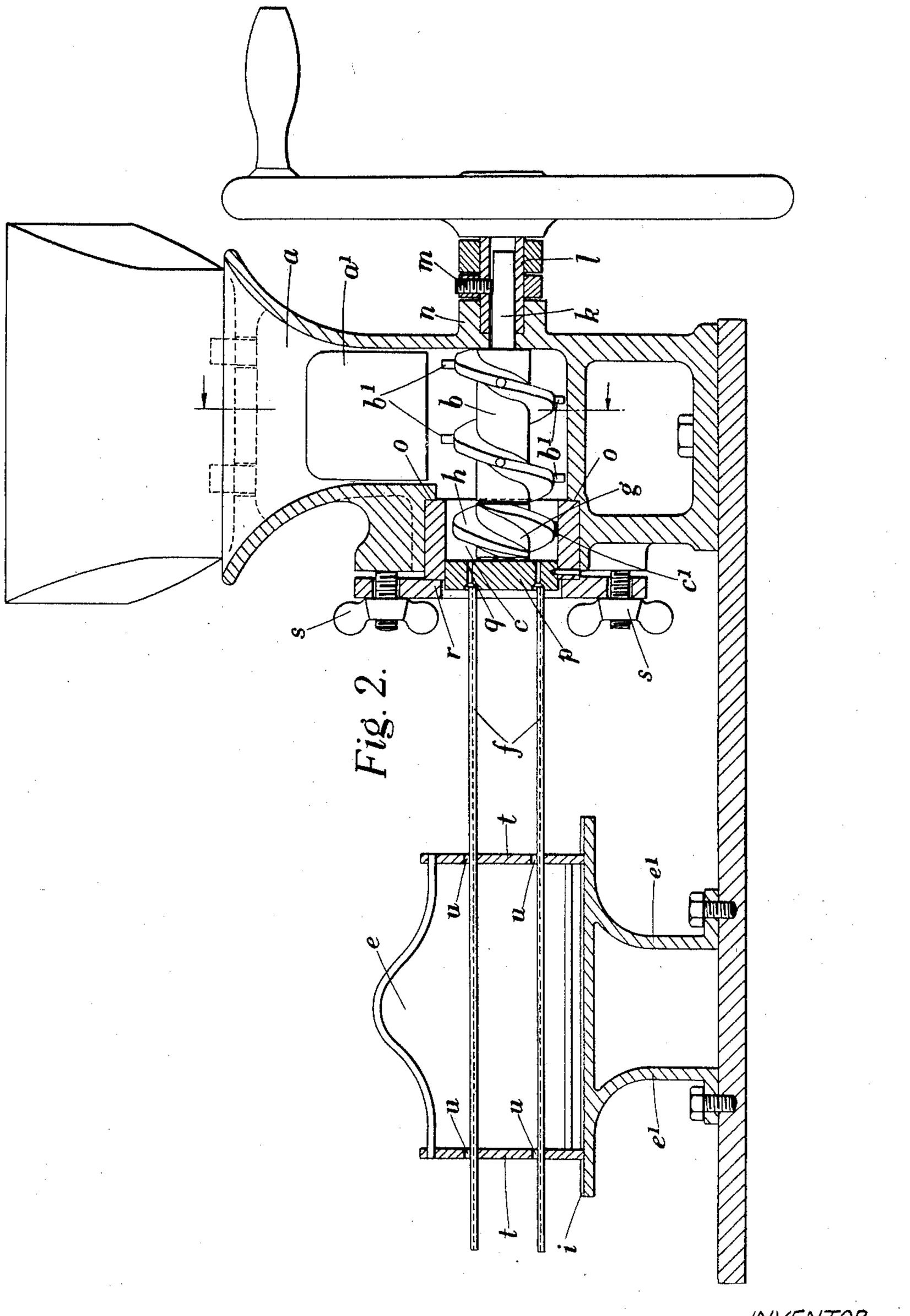

Fig. 2.

INVENTOR
Joseph William Athey
BY
Eugene E. Stevens
His ATTORNEY

June 5, 1934. J. W. ATHEY 1,961,656

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Fig. 9.

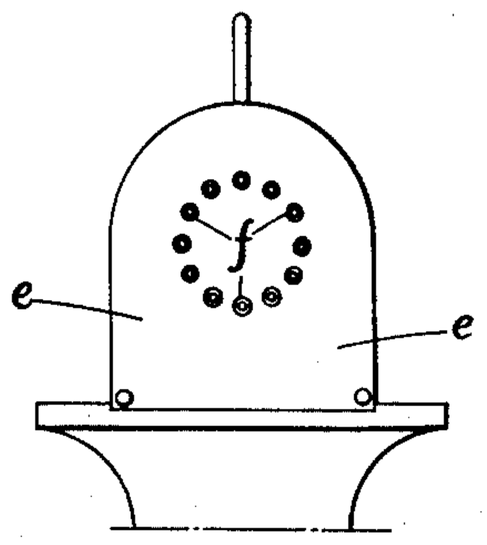


Fig. 4.

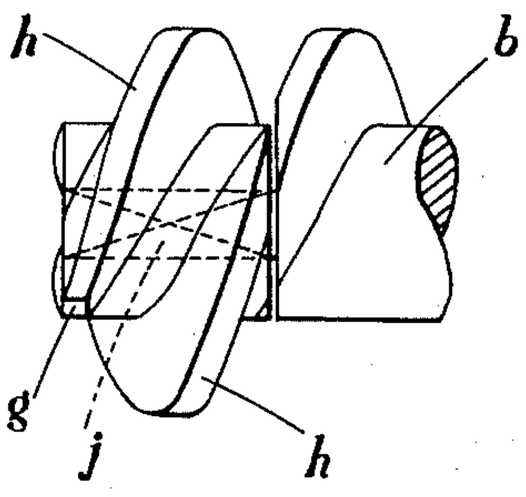


Fig. 5.

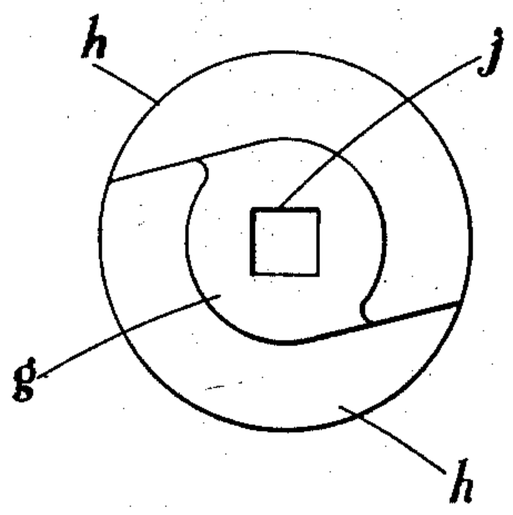


Fig. 6.

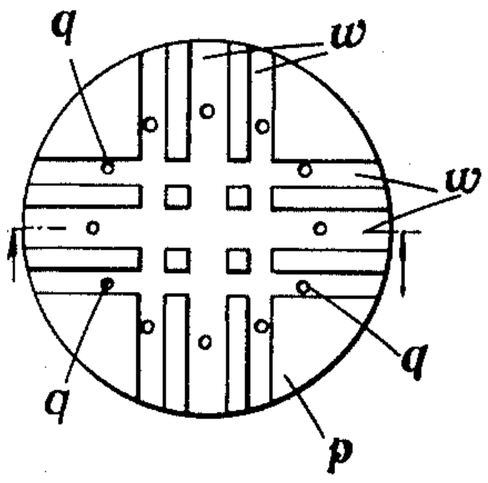


Fig. 7.

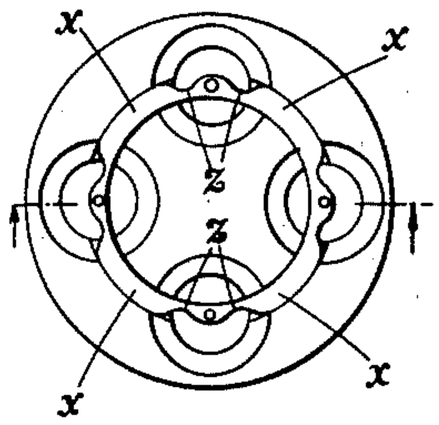


Fig. 8.

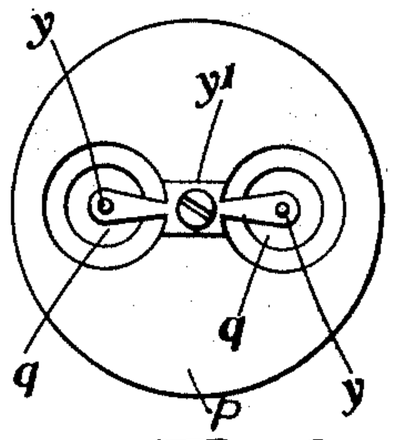


Fig. 8A.

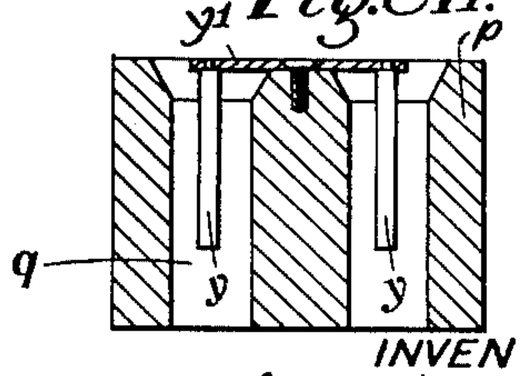


Fig. 6A.

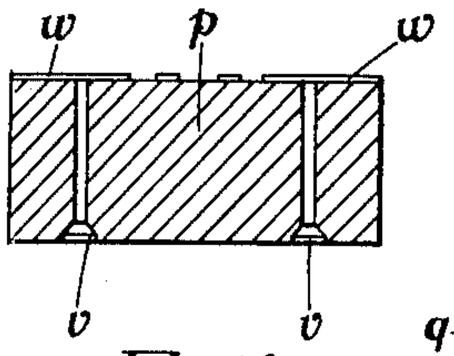
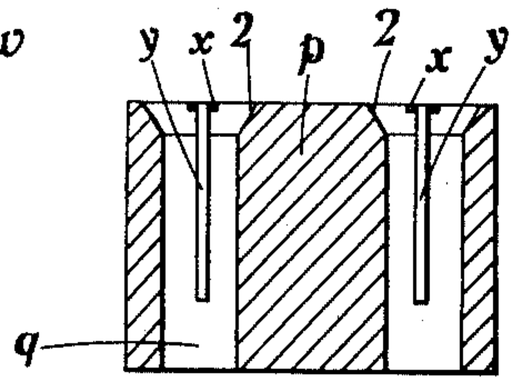


Fig. 7A.



INVENTOR
Joseph William Athey
BY
Eugene L. Stevens
His ATTORNEY

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UNITED STATES PATENT OFFICE

1,961,656

ROTARY CORE MACHINE

Joseph William Athey, Birmingham, England

Application April 18, 1933, Serial No. 666,757
In Great Britain April 25, 1932

12 Claims. (Cl. 22—11)

Rotary core machines for making foundry cores from sand and suitable binders frequently comprise a hopper, and a feed screw arranged below it in a manner enabling the screw to be rotated by suitable gearing from a suitable source of power or a hand wheel, in order to convey the sand mixture, which is charged into the hopper into dies arranged on the delivery side of the machine.

The screw usually consists of a quick thread around an axle or pin, the ends of which project in the following manner.

One end of this screw passes through a bearing and carries a means for rotating it, while the other end projects centrally into the hole in the die. The sand mixture is fed around this latter end into the die; and a core is thus produced having a central hole.

This method is slow as it produces only one core per machine, and it is unsuitable for making very small cores, as the screw axle end has to be so small that it is rapidly subject to damage and wear. It is customary to taper the screw and its pin to a gradual point, but there is a limit to which this can go in use, and for small cores of say one eighth of an inch in diameter or less it becomes impracticable to put a central hole in the core. Moreover the construction of the screw with an integral extension forming the pin to vent the core requires a separate conveyor screw for every size of core.

An object of this invention is to modify this machine and the method of working whereby a number of cores, from very small ones up to large ones, can be made by the use of one conveyor.

A further object of the invention is to produce a machine which permits very small cores of greater strength to be made without difficulty and without the necessity of reducing the feed screw, and which permits cores of larger diameter provided with a vent to be made on the same machine.

The present invention consists in the combination with a chamber to which the materials are supplied and in which a feed screw is arranged for rotation, of a removable die plate having a number of apertures through it, arranged at the end of the chamber.

Instead of requiring a different screw for each die or approximately so as formerly, one screw is effective for various sizes of apertures in the die plate.

The screw may be stoutly built with a parallel barrel and a thread thereon; and a turned down axle end projects from the barrel through a bearing to the driving means as before.

The screw thread or threads finish adjacent the die plate and form one or more pressure surfaces at the fore end of the screw member for pressing the sand mixture through the die plate apertures. In some cases I make use of multiple start threads at the delivery end of the screw so as to give more than one of these pressure surfaces.

In a preferred form the die is of cylindrical form with its outer end closed by the die plate which is formed with a number of apertures for the cores.

It is preferred to form the inner face of the die plate with grooves or recesses from which the core apertures lead; this is done with the object of preventing the sand or mixture from rotating solidly, and assisting in breaking it up.

The die plate for larger cores may be provided with a ring carrying one or more pins corresponding to the number of holes in the die plates, which project centrally in each die aperture and form vents in the cores.

In the appended drawings is illustrated a convenient embodiment of construction of the improved machine and accessories.

Figure 1 is a perspective view of the complete machine;

Figure 2 is a longitudinal cross-section of the machine showing internal parts;

Figure 2*a* is a cross-section, at right angles to the plane of Figure 2, of the upper part of the hopper chamber;

Figure 3 is a partial plan;

Figure 4 shows on a larger scale the forward end of the screw turned round 180°;

Figure 5 is an end view;

Figures 6, 7 and 8 show in elevation three examples of die plates;

Figures 6*a*, 7*a*, and 8*a* are sectional views of Figures 6, 7, and 8 respectively, and

Figure 9 is an end view of a carrier for the cores.

The improved apparatus shown in Figures 1 to 3 consists of two main parts, namely the core making portion and the core receiving portion.

The core making part of the apparatus consists of a hopper chamber *a* for the sand or mixture in which is arranged a conveyor screw *b* and a die chamber *c* having a base *c'*, the screw being rotated by suitable means such as the hand wheel *d*. The other part comprises a carrier or tray *e* adapted to support the core receiving elements *f* in proper relation to the die chamber *c* of the apparatus.

The screw *b* is preferably made with a detachable forward end *g* formed with a double or multiple start thread *h* (see also Figures 4 and 5), the

said end having a square or like hole *j* engaging a similarly fashioned projection on the extremity of the screw *b*. The pitch of the screw *b* is of ordinary parallel single thread form, and the extremity which is the part subjected to hardest wear can thus be renewed when necessary without the necessity of having to change the whole screw. The other extremity of the screw has a turned down axle *k* engaging a hollow trunnion *l* on the driving wheel *d*, and is formed with a flat portion for locking it thereto by a screw, stud, or the like *m*. A suitable bearing *n* is provided for the driving wheel.

The die chamber *c* is a cylindrical member fitting into the forward end of the machine against a shoulder *o* and carries a die plate *p* formed with core holes *q*, which die plate is suitably secured as by a radial screw or like means. This die chamber is retained in position by an apertured strap *r* clamped in position by nuts or the like *s*, or instead thereof I may form a recess in the periphery of the die chamber for engagement by the end of a rotatable stud or screw arranged in the surounding boss of the machine. The screw would have a crank or handle part outside the boss so that it could be quickly operated by hand.

The carrier or tray *e* comprises a pair of end plates *t* formed with a series of apertures *u* corresponding to those in the die plate *p*, into which are placed the core supports *f*. The core supports as here illustrated are channel strips or half tubes but they may be complete tubes. They are of appropriate length for receiving the cores as they emerge from the die plate, and for supporting them during the drying process.

The stand *e'* which supports the tray *e* may be suitably recessed as shown at *i* to take the end plates *t* and keep the tray in alignment with the machine.

The die plate *p* shown in Figs. 6 and 6*a* is an example of construction suitable for making small cores without a vent. This plate has a number of holes *q* formed with enlargements *v* at their outer ends for receiving the extremities of the core supports *f*, and its inner face has grooves *w* or serrations adapted to break up the sand and prevent it packing and rotating against the die plate and generally to assist the feed through the holes *q*.

The other example shown in Figs. 7 and 7*a* shows a construction intended for the production of a larger size of core having a vent. For this purpose a ring carrier *x* is arranged at the entrance to the apertures *q*, and supports a pin *y* centrally in each aperture. The pins are loosely mounted so that a small amount of movement is permitted them in the carrier in order that they may be self-aligning in the centre of the die aperture as the sand stream flows into the aperture.

It is desirable that the carrier shall present as small an obstruction as possible to the sand flow, and accordingly each part which bridges an aperture in the die plate is preferably reduced in depth except where the pin is secured as shown at *z*.

The die plate may be grooved as shown between the apertures and the ring carrier *x* inserted and secured to the groove.

To facilitate the entrance of sufficient sand mixture into each die aperture for the streams to reunite beyond the carrier *x* and form a well shaped core, I may provide an enlargement or countersink 2 at the mouth of each die aperture *q*.

In the die plate construction shown by Figs. 8 and 8*a*, the pins *y*, for forming vents in the cores, are not carried by a ring member as shown in Figs. 7 and 7*a*, but by bridge pieces *y'* secured in sunk recesses in the face of the die plate. The pins may either be secured fixedly in the bridge pieces or be mounted loosely so as to be capable of self-alignment. If only one aperture is provided in the die plate to produce a single core, and it is desired to have the core vented, the bridge piece could be, as it were, cut in half, that is to say it would comprise a portion adapted to be secured in a sunk recess in the die plate and a portion projecting over the aperture to carry the vent pin.

Another convenient method of arranging the carrier for the venting pins in the die apertures is to provide a thin steel band like a watch spring and slot the rear ends of the various pins to receive this band. The band is then edgewise with respect to the flow of the sand, and only a slight obstruction is presented.

The ends of the pins could still be loosely mounted on the band by leaving play in the slot and passing a small attaching pin through the slotted end and the band.

In order to assist in breaking up the sand in the hopper chamber, so that as the screw revolves a continuous supply of sand will be ensured, the periphery of the screw thread may be provided with projections such as *b'*.

It is also found advantageous to provide in the hopper chamber, immediately above the screw, a stop member *a'*, see particularly Figure 2*a*. This stop member functions to prevent the upwardly moving side of the screw from raising the sand in the hopper chamber and by so doing it assists the axial movement of the sand towards the die plate.

With the improved machine in use, the feed screw provides a pressure surface or surfaces at its forward end passing the various holes in the die plate in succession and forcibly feeding the sand into the holes *q* in the die plate *p*.

The improved core making machine may be used for the manufacture of cores of various diameters by merely changing the die and its die plate, the same screw feed remaining in the machine and serving for feeding the sand through the various die apertures.

Having thus described my invention, what I claim as new and desire to secure by Letters Patent is:—

1. In rotary machines for making foundry cores from sand and suitable binders in which the materials are supplied to a chamber in which a feed screw is arranged for rotation, the combination therewith of a removable die plate having a number of apertures through it, arranged at the end of the chamber in which the feed screw works.

2. An improved foundry core making machine, comprising a rotating screw member having its threads at its forward end forming a plurality of pressure surfaces, a cylindrical die chamber surrounding this end of the screw and a removable die plate having a plurality of apertures closing the chamber, whereby the pressure surfaces are adapted to force a core mixture through the apertures to form a plurality of cores upon rotation of the screw member.

3. Foundry core making machine comprising a hopper chamber, a feed screw working therein, a die chamber surrounding the delivery end of the screw, and a perforated die plate removably secured in the die chamber, the inner face of the said die plate having a number of grooves arranged to form breaking surfaces for the sand mixture.

4. Foundry core making machine comprising a hopper chamber, a feed screw working therein, a die chamber surrounding the delivery end of the screw, a perforated die plate removably secured in the die chamber and a pin located in each perforation of the die to form a vent along each core.

5. Foundry core making machine according to claim 4 wherein the entry end of each perforation is enlarged to compensate for the obstruction caused by the support for the vent pin.

6. A foundry core making machine according to claim 1, said feed screw having a screw portion detachably connected to its forward end, said portion having a different number of threads than the screw proper.

7. A foundry core making machine according to claim 2, said screw member having a screw portion detachably connected to its forward end, said portion having threads dissimilar in number from the screw member proper.

8. Foundry core making machine according to claim 1 in which the leading end of the feed screw is made separate from the main portion and is detachably secured to the said main portion to rotate therewith, the thread of the said detachable leading end having a plurality of starts adapted to impart a plurality of impulses for each revolution of the screw.

9. In a foundry core making machine for simultaneously producing a number of cores, core receiving means comprising a pair of spaced, rigidly connected end plates, each of said plates being formed with a series of circular apertures corresponding to and aligned with the paths to be taken by the cores, said apertures being connected by open-topped troughs of the same radius as the apertures.

10. The structure of claim 1, said die plate having a vent pin mounted within an aperture.

11. Rotary core making machine comprising a hopper chamber, a feed screw working therein, a stop member in said hopper chamber disposed above that side of the screw which moves upwardly, a die chamber surrounding the delivery end of the screw and a perforated die plate removably secured in the die chamber.

12. Rotary core making machine comprising a hopper chamber, a feed screw working therein and having radial projections on the periphery of its thread, a die chamber surrounding the delivery end of the screw and a perforated die plate removably secured in the die chamber.

JOSEPH WILLIAM ATHEY.