No. 2,716.

PATENTED JULY 11, 1842.

V. BIRELY.

GRINDING AND HULLING MACHINE.

4 SHEETS—SHEET 1.

Fig: 1.

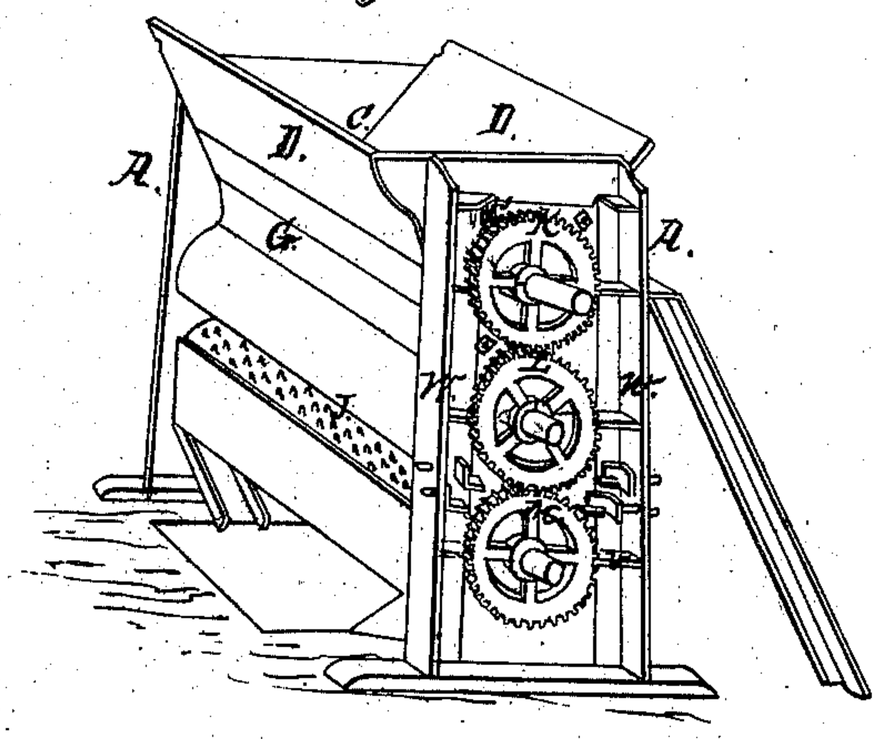
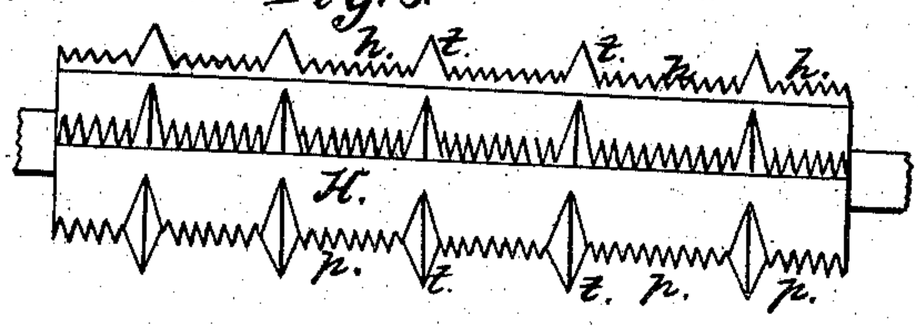


Fig: 5.



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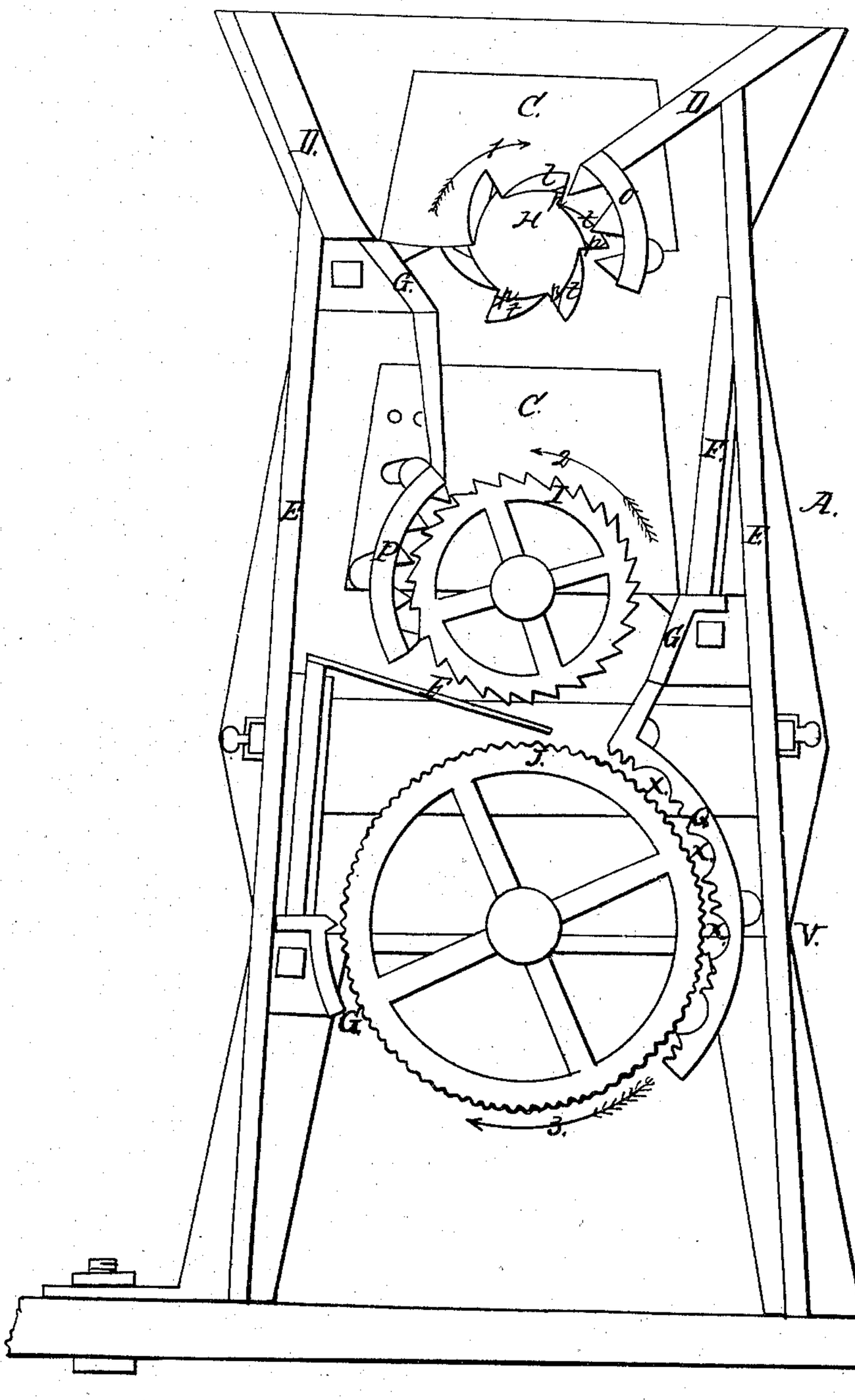
4 SHEETS—SHEET 2.

Fig: 2.



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4 SHEETS—SHEET 3.

Fig. 3.

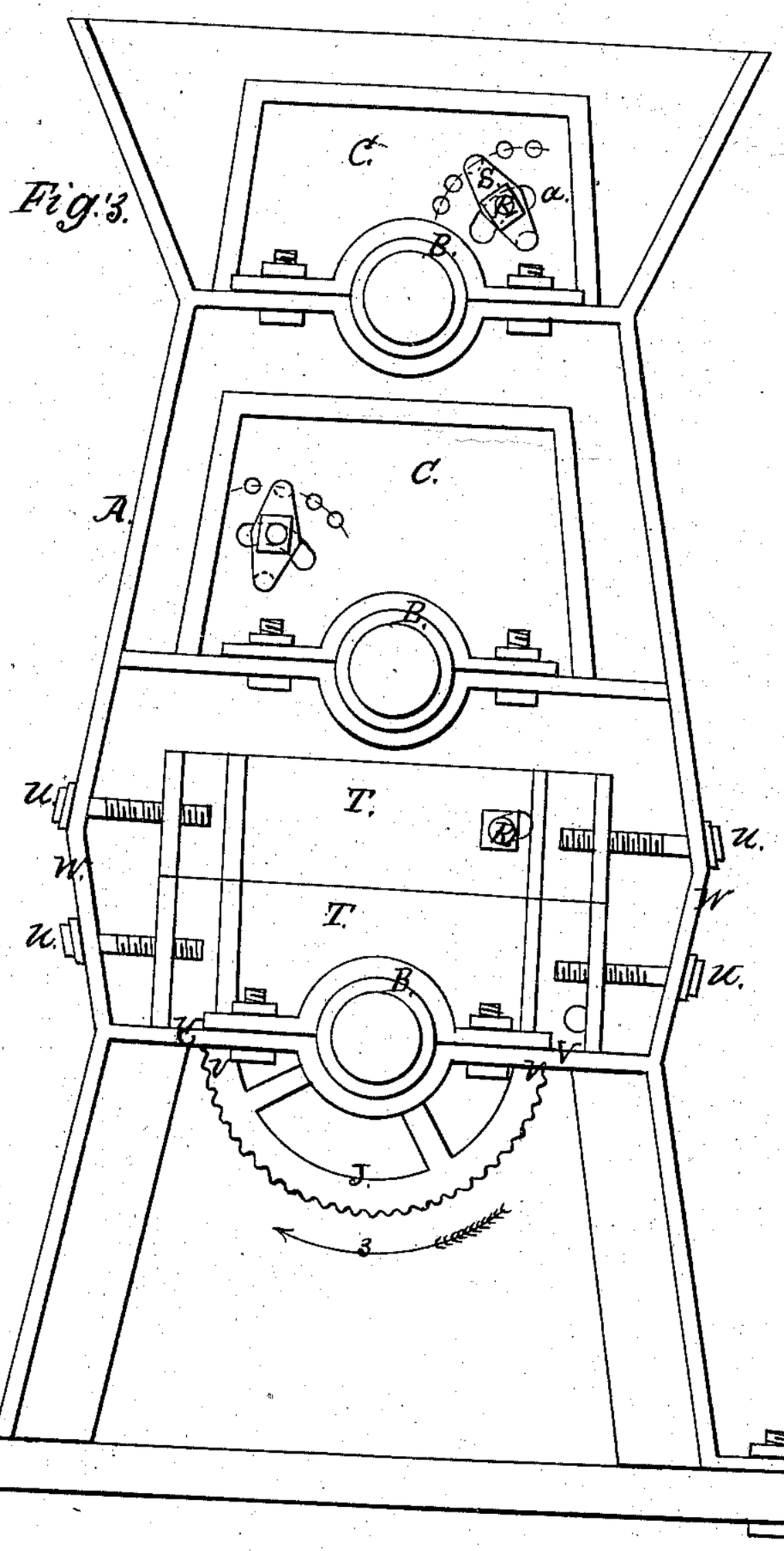

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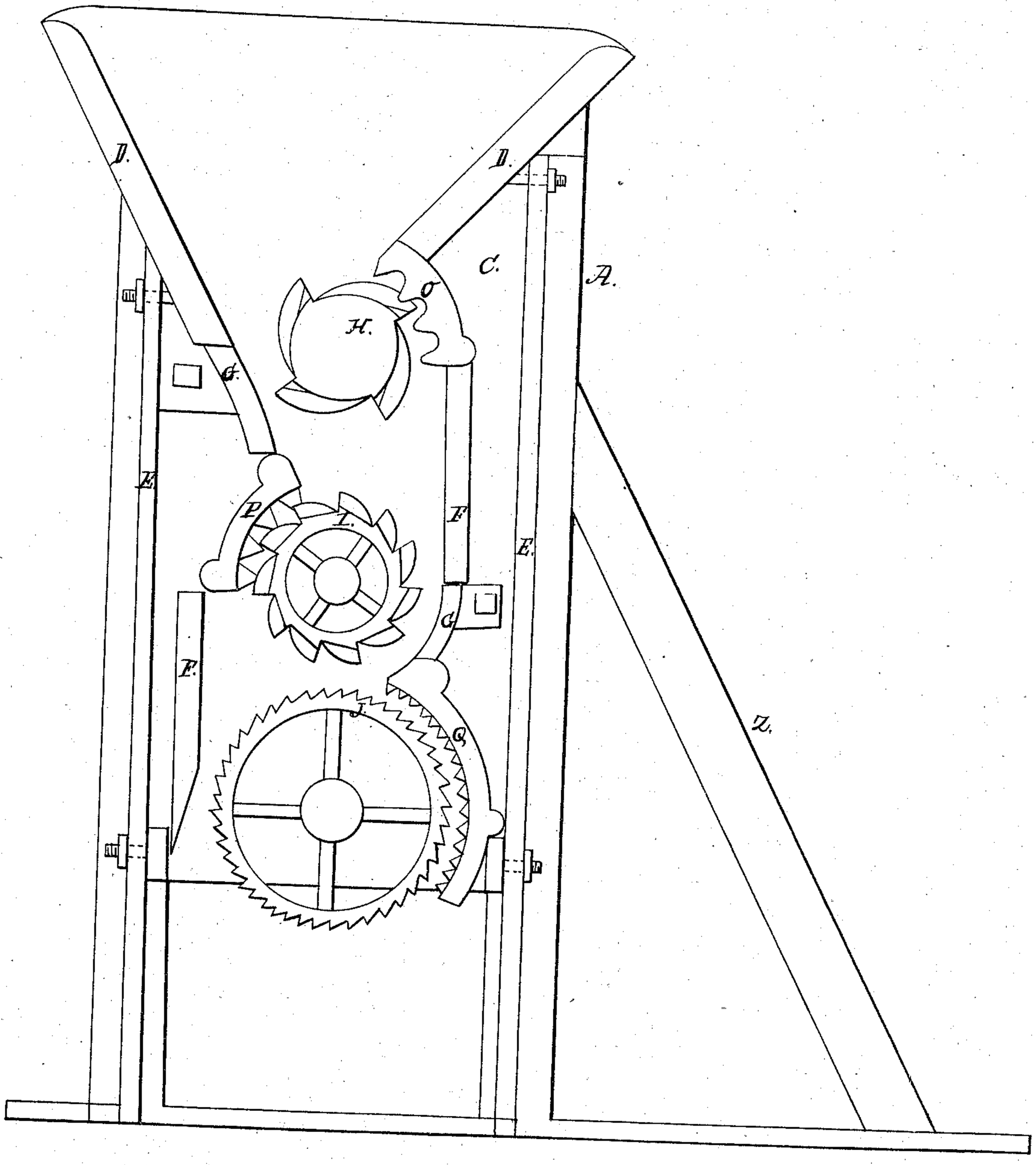
Fig 4.



UNITED STATES PATENT OFFICE.

VALENTINE BIRELY, OF FREDERICK, MARYLAND.

MILL FOR GRINDING BARK, GRAIN, AND OTHER SUBSTANCES.

Specification of Letters Patent No. 2,716, dated July 11, 1842.

To all whom it may concern:

Be it known that I, VALENTINE BIRELY, of the city and county of Frederick and State of Maryland, have invented a new and useful machine for grinding, crushing, and hulling substances for various purposes, namely, grinding bark for tanner's use, plaster for land, and grain, &c., corn with the cob, oats, rye, &c., for horse-feed, and hulling clover, rice, and other seed and grain, which machine is described as follows, reference being had to the annexed drawings of the same making part of this specification.

Figure 1 is a perspective view of the machine. Fig. 2 is a vertical cross section showing it as adapted for grinding corn and cobs, &c. Fig. 3 is an end elevation of same. Fig. 4 is a vertical cross section of the machine as arranged for grinding bark. Fig. 5 plan, showing the upper cylinder.

Similar letters refer to corresponding parts.

The frame A of this machine is made of cast iron about four feet long, one foot six inches wide, four feet high. The ends of the frame are cast whole (except certain openings which will be described presently) with ribs or flanges and braces to strengthen the whole, connected by parallel longitudinal ties bolted or otherwise secured to the ends. Apertures are made in the ends of the frame for the journals of the cylinders hereafter described. The boxes B for the journals are secured to the ends. Oblong or square openings are made in the end castings of the frame which are closed by moveable plates C of corresponding size having beads or projections for closing the joints. Other apertures are made in the end castings for the pivots and screws of the concave hereafter described. Ribs and flanges are cast on the inner faces of the ends to receive and secure the boards D forming the hopper, and the boards or guards E for confining within the frame the substance to be ground, crushed, or hulled, and the guide boards F. The frame has a horizontal base to bolt to a floor or foundation if required. The connecting braces G for holding together and binding the ends of the frame and which form portions of the backs of the hoppers are provided with teeth for preventing the substances acted on from passing down between these braces and the cylinders without being ground or crushed and are made with knees or flanges at each end to bolt to the inner sides of the ends of the frame. The frame may be made of wood or iron of various sizes and proportions and may be braced from the foundation by inclined braces such as represented at Z Fig. 4.

The hopper and guide boards should be made of wood; but may be of other material.

In the frame are arranged three parallel longitudinal revolving grinding or hulling cylinders H I J placed vertically over each other having their journals projecting through and beyond the ends of the frame, those at the back end sufficiently far to receive the cog wheels K L M Fig. 1 which mesh into each other for causing them to turn together, the middle journal extending beyond the face of the cog wheel L on which is a pulley for the band leading to the steam engine, horse power or other propelling agent. All the cylinders revolve in concaves armed with teeth or parallel ribs in the manner to be described for grinding, &c., adjustable toward or from the cylinders by screws, &c., in the manner hereafter particularly set forth. The arrows indicate the direction in which the cylinders revolve.

The first cylinder, that meets the substance to be acted on is the uppermost, lettered H. It is solid, four inches diameter exclusive of the teeth *t* which are shaped like a hawk's beak one and three quarters inch long, one end a half inch wide, and one inch thick at the base. The second or middle cylinder I is hollow five inches diameter exclusive of the teeth which are also shaped like a hawk's beak but of smaller size and more thickly set being about one inch long, three-eighths thick at the base and one inch broad. The third and lower cylinder J is hollow about nine inches diameter armed on its circumference with teeth shaped as above described, but of reduced size, say five eighths of an inch long, five eighths inch and three eighths thick at the base. The length of the cylinders is equal to the width of the frame inside. The distance from center to center of the cylinders is about 11 or 12 inches. The teeth *t* of the first cylinder are made long and coarse for the purpose of taking in feed with facility. Those of the second are finer for preparing the substance to be ground for the teeth of the third cylinder which are the finest and which give a finish to the work. The teeth of the sev-

eral cylinders are made to correspond with those of the concaves.

Between the rows of teeth and parallel with them is a raised edge which is notched presenting or forming a series of sharp points *p* or small teeth between the large ones that relieve the cylinders from friction by carrying substances through them that frequently wedge on plain ones and clog and stop the motion of the cylinder. For grinding corn, &c., the teeth of the cylinder and concave may be of a wedge form and of wrought or cast iron. The cylinders may be made of wood or iron and being geared together by cog wheels meshing into each other will turn in opposite directions and at the same velocity when the wheels are of equal diameter but the velocity may be changed by changing the diameter of the cog wheels.

There are three concaves in this machine, one for each cylinder arranged in alternate order to correspond with the reversed movements of the cylinder—they are lettered O, P, Q. The upper concave O in which the first cylinder turns encircles about one third the circumference of this cylinder, the upper end being nearly perpendicularly over the center of said cylinder to prevent wedging, jamming or choking by weight or gravitation, the substances being thrown up before the mouth or entrance of the concave in the manner of articles in a falling mill, and all the substances are thus ground or crushed, being rather coaxed into the mouth or concave and passed through between the concave and cylinder freely, then dragged through by absolute force, which is an important improvement. The teeth of this concave are made in the form of a hawk's beak arranged in parallel rows corresponding with the teeth in the cylinder which are designed to work between them. In each of the concaves near the lower edge thereof is a horizontal pivot or axle turning in corresponding apertures on the aforesaid end plates C on which the concave turns in the arc of a circle for the purpose of enlarging or diminishing the space between the upper edge of the concave and cylinder which space may be appropriately termed the mouth.

A horizontal screw R is inserted into or formed on the ends of the concave near the top thereof passing through apertures *a* in the aforesaid end plates C made on a line described from a point in the center of the aperture into which is inserted the lower round stud of a vibrating bar or washer S. This vibrating bar S is about 21 inches in length and vibrates against the outside of plate C. The aforesaid screw R in the end of the concave which passes through the segment slot *a* in plate C enters a round aperture in the middle of the vibrating bar S. Two horizontal studs project from the inner face of the vibrating bar near the extremities thereof and enter round apertures in the plate C. The lower stud serves as a pivot on which the bar S vibrates. The upper stud of the bar is shifted from one aperture to another according as the mouth of the concave is to be enlarged or diminished, said apertures being in the same arc of the circle in which the upper end of the concave moves described from the center of the lower stud, as before stated. This vibrating bar S acts as a lever for moving the concave and the aperture and studs to secure it in the position desired.

One of the inclined sides of the hopper rests upon the convex surface of the concave and is raised or lowered in an inclined line as the upper end of the concave is moved toward or from the cylinder.

On the outer end of the screw R is a nut which presses the bar S against the plate C. Therefore when the position of the concave is to be changed this nut must be unscrewed, the upper stud withdrawn from one of the apertures in the plate *c* and inserted into another aperture and the nut replaced, the lower stud remaining in its aperture and serving as a pivot or axle on which the bar vibrates or turns. It will thus be seen that by removing the upper stud to one of the higher apertures that the mouth of the concave will be enlarged, and that by reversing the operation it will be diminished. A similar turning bar to that above described is applied to the other end of the concave and is operated in like manner.

The concave P of the second or middle cylinder I is made and arranged in the same manner as that above described but on a reversed position on account of the reversed motion of the cylinder which is in the direction of the arrow No. 2 which has the effect of carrying the substance to be ground from the back to the front of the machine. This concave may have more rows of teeth than the first for the purpose of producing an increased action on the bark or substance to be ground.

The third concave Q Fig. 4 is arranged on the opposite side of the interior of the machine to the middle or second concave and immediately below the first concave. It has an increased number of teeth and of the required size for reducing or grinding the bark to the degree of fineness required. It is adjusted to the cylinder in the manner hereafter described and represented in Fig. 3 by having it attached to two horizontal sliding plates T T at either end of the frame moved horizontally to the right or left by screws U. The upper part of this lower concave is connected to the two upper parallel sliding plates T. And the lower segment is connected to the two lower sliding plates T.

The two lower plates T slide on horizontal flanges V of the frame. The two upper plates of the upper segment or part of the concave slide back and forth upon the upper edges of the lower plates. The four plates T have each two flanges at their ends through which pass the horizontal screws U inserted through apertures in ribs W of the cast end of the frame against which ribs the heads of the screws turn. The screws R on the ends of the segments pass through segment slots in the aforesaid plates T and are secured by nuts. By unscrewing two of the screws of the upper plates and screwing the other two screws of the same plates the upper part of the concave may be adjusted to or from the upper portion of the cylinder. The lower part of the concave may be operated in a similar manner by means of the lower plate and screws. Instead of moving the concave it may be stationary and the cylinder may be moved by having the boxes of the axle of the same to slide on the horizontal ribs of the frame.

The teeth of the lower concave must be adapted in size, number, and position, to those on the cylinder and for the substance to be ground or hulled.

In Fig. 2 the lower concave is represented as fluted and ribbed in parallel longitudinal flutes and ribs with alternate semicircular or segment parallel horizontal channels between every section of three ribs to prevent the concave from becoming choked and to cause it to discharge freely of the ground substance. Fig. 2 also represents the cylinder ribbed on its circumference to correspond therewith. This construction of cylinder and concave is more particularly designed for grinding corn and cobs for horse feed and other substances.

The machine as described and represented in cross section in Fig. 4 is adapted for grinding bark. The vertical closing boards E prevent the escape of the substance to be ground from the sides of the machine. The inclined boards D, F, conduct the substance to be ground or hulled, to the first, second, and third cylinders.

The third concave when desired for grinding bark is made of rows of teeth and grooves alternately—first there is a row of teeth and then a space which is grooved deeper than the base of the teeth by which construction of the concave the cylinder will be greatly relieved from friction, because the particles of bark or other substance in being ground are made to change their position and present other sides to the work and ground fine without having the concave brought so close to the cylinder.

What I claim as my invention and which I desire to secure by Letters Patent is—

1. The combination and arrangement of the three grinding and hulling cylinders of different diameters and arrangement of teeth placed over each other and revolving in opposite directions for carrying the substance to be ground or hulled from one side of the machine to the other in combination with the three concaves in which the cylinders revolve arranged on opposite sides of the machine constructed and arranged in the manner set forth to prevent the machine from becoming choked and to cause it to grind freely by bringing the upper ends of the concaves nearly vertically over the center of the cylinders in the manner before described.

2. In constructing the lower concave with deep parallel grooves or channels between the teeth or ribs to cause the concave to discharge itself freely as above described.

3. The manner of increasing or diminishing the space between the upper edge of the concave and the cylinder by means of the combination of the turning bars or washers S, screws R, axle, and plate C as herein set forth.

4. The manner of adjusting the lower concave to the cylinder by means of the combination and arrangement of the double set of horizontal sliding plates T and screws U arranged and operated in the manner herein set forth.

5. The arrangement of the horizontal toothed ties forming part of the back of the hopper in the manner and for the purpose set forth.

6. Constructing the hawked beak toothed cylinder with parallel longitudinal ribs *p* between the hawk beak teeth *t* notched in the manner and for the purpose set forth.

VAL. BIRELY.

Witnesses:
WM. P. ELLIOT,
EDMOND MAHER.