I. B. Hartwell,

Making Wooden Trays.

No. 13,169. Patented July 3, 1855.

Fig. 1.

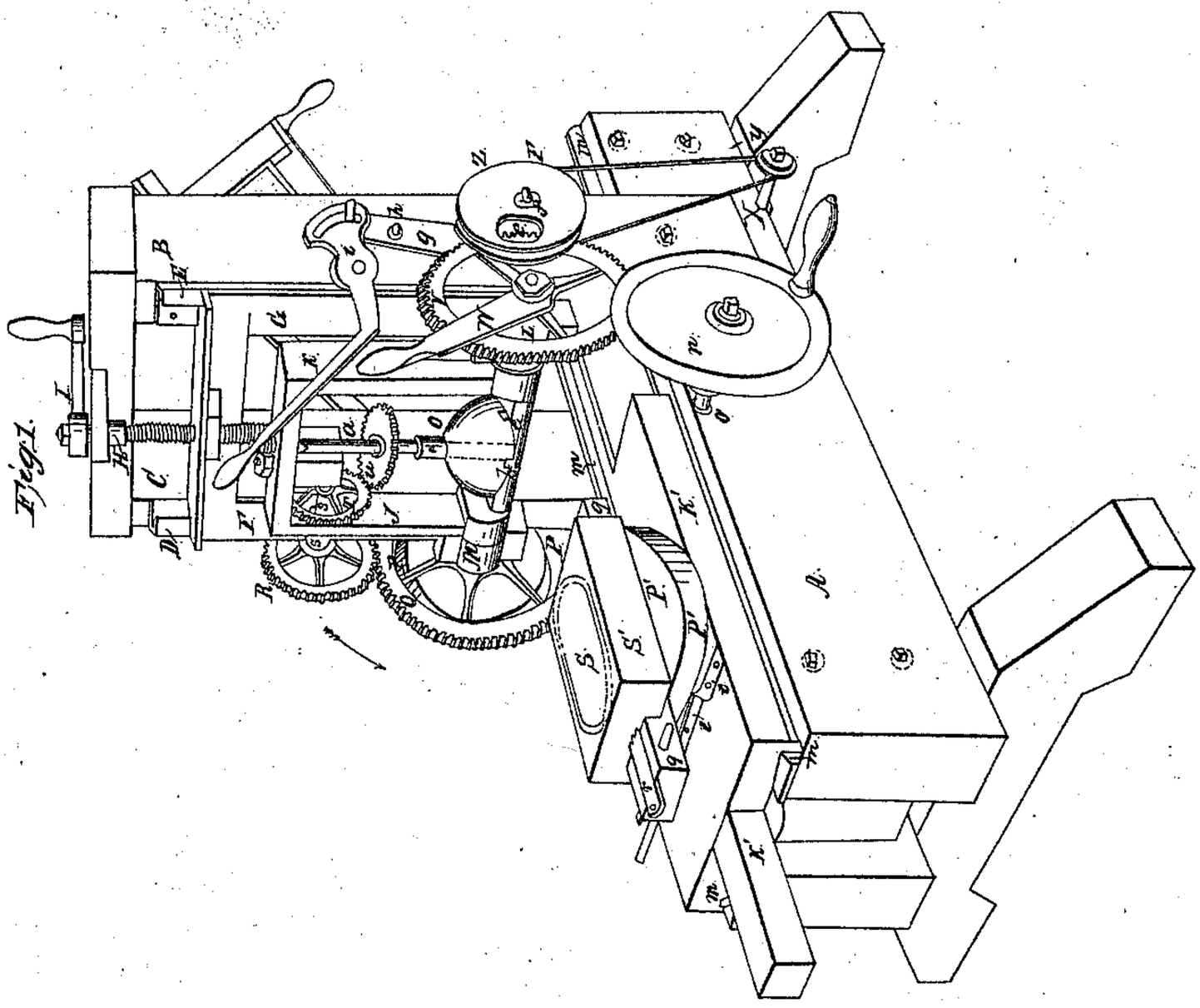


Fig. 2.

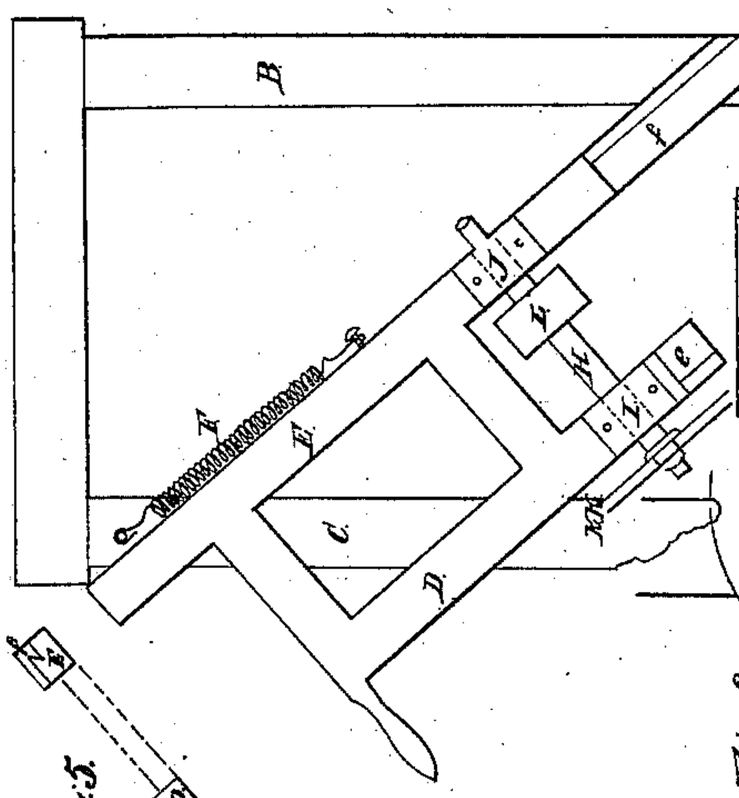


Fig. 5.

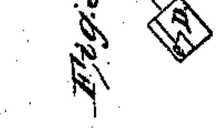


Fig. 4.

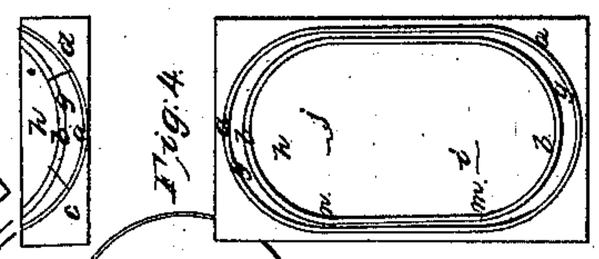
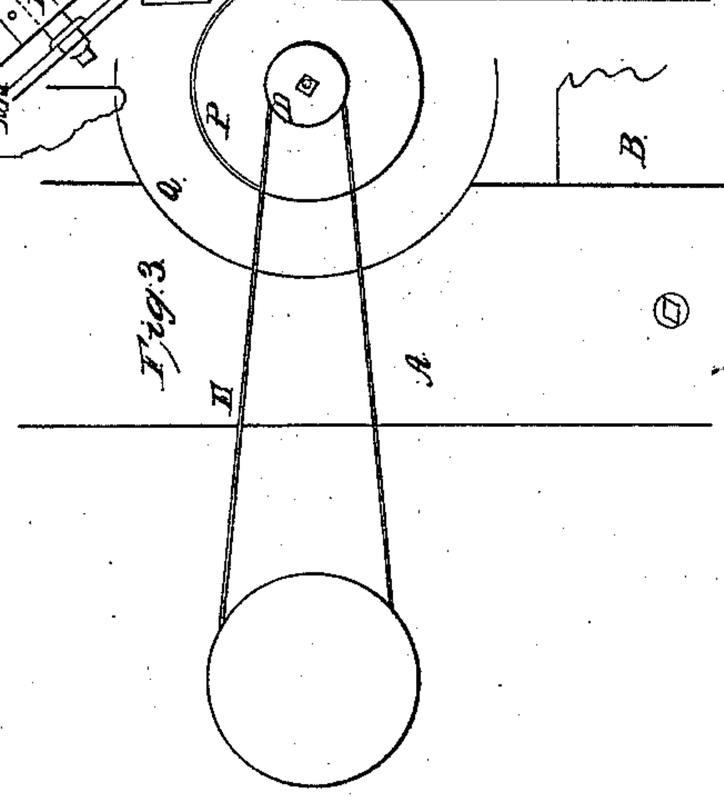


Fig. 3.



UNITED STATES PATENT OFFICE.

ISAAC B. HARTWELL, OF WOODSTOCK, VERMONT.

MACHINE FOR CUTTING CAVITIES SPHERICAL, ELLIPSOIDAL, &c.

Specification forming part of Letters Patent No. **13,169**, dated July 3, 1855.

To all whom it may concern:

Be it known that I, ISAAC B. HARTWELL, of Woodstock, in the county of Windsor and State of Vermont, have invented new and useful Improvements in Machinery for Cutting Convex and Concave Surfaces in Wood and for Cutting and Finishing Spherical and Ellipsoidal Cavities; and I do hereby declare that the following is a full, clear, and exact description of the construction and operation of the same, reference being had to the annexed drawings, making a part of this specification, in which—

Figure 1 is a perspective view; Fig. 2, a plane vertical projection of a portion of the end opposite to that presented in Fig. 1; Fig. 3, a diagram of a portion of the side opposite to that presented in Fig. 1; Fig. 4, a horizontal projection of the upper surface of a piece of wood with traces of grooves as cut by the machine, and Fig. 5 a transverse section of the small oblique frame D E in Fig. 2.

A B C, Fig. 1, is a solid frame of wood.

D E are metallic ways attached to the upright pieces of the frame.

F G is a vertical sliding frame of metal fitted to the ways D E. This frame is made adjustable to any desired vertical position by means of a crank I and screw H.

J K is a rocking frame suspended in the vertical frame F G on journals at L M.

O is a spherical shell or cutter, being a part of a hollow sphere revolving on an axis *a*, which axis is supported by the rocking frame J K. To the edge of the spherical shell O are attached knives or teeth *b c*, whose cutting-edges extend to the meridian of the sphere, the upper portion or half of the axis of the rocking frame J K being removed to permit the free revolution of the knives *b c*.

On one extremity of the axis of the rocking frame J K is the main pulley P, which receives the motive power and communicates motion to the machinery, and a large gear-wheel Q, the term "gear" meaning in this description a cog or toothed wheel. The pulley P and gear Q are connected, revolving loosely on the axis of the rocking frame J K, using it only as a center of rotation. The gear-wheel Q drives the pinion R, whose axis *s s* is sustained by the rocking frame J K, and by means of the gearing T U gives motion to the spherical shell before described. On the other extremity of the axis of the rocking frame J K and firmly attached thereto is a large gear-wheel V and a hand-lever W, with which to change the position of the rocking frame at pleasure. By means following a slow feed motion is given to the gear V, by which the rocking frame J K is brought forward and outward, turning on its axis in the direction of the arrow from a vertical to a horizontal position.

X is a shaft extending across and under the frame-work of the machine, to which and a pulley Y motion is given by means hereinafter described. From the pulley Y a belt *d* communicates motion to the pulley Z. Behind the pulley Z and connected therewith is a small pinion *e*, (a portion of the pulley Z being removed to show the same,) meshing into the large gear V. This pulley and pinion revolve on a pin *f*, which is supported by a stand *g*. This stand is movable on a pin *h*, and is made to connect and disconnect the pinion *e* with the gear V at pleasure by means of an eccentric hand-lever *i*.

Fig. 3 shows the manner in which the feed motion above described is communicated.

A B C, Fig. 3, is a portion of the frame of the machine; Q, an outline of the large loose gear on the axis of the rocking frame, and P the main pulley before described.

Connected with the main pulley P and revolving therewith is a small pulley D, from which passes a belt E to the large part of a double loose pulley F G, supported on a pin and stand H. From the small part of the double loose pulley F G another belt I passes to a pulley J on the shaft X, Figs. 1 and 3, before described. It will now be seen how by means described that the spherical shell O, Fig. 1, receives a compound motion, causing it to turn on two axes of the sphere of which the shell is a part.

K′ K′, Fig. 1, is a sliding table fitted to ways *m m*. Connected with the sliding table to give it motion is a shaft *o′* and a hand-pulley *n*.

P′ P′ is a turning-table having raised projections *q q*. In these projections are dogs of the form *r* to hold a block of wood *s′ s′* to be operated upon by the machine.

t is a spring-latch for holding the turning-table in place.

To operate the machine for the purpose of

cutting ellipsoidal cavities like that of wooden trays, the sliding table K′ K′ with its appendages is brought under the spherical shell O till the hither end of the block of wood *s′ s′* is nearly under the front edge of the shell or cutter. The spherical shell O being now put in motion on two axes cuts its way in the wood until the axis *a* is brought to a horizontal position. The pinion *e* is then disconnected from the gear V by the eccentric-lever *i* and the rocking frame J K again brought to a vertical position by means of the hand-lever W. The shell is then raised a little by means of the screw and crank H I and the sliding table brought back a little, and the same process of cutting is repeated. This process forms spherical grooves of less extent than a quadrant of an entire hollow sphere, yet corresponding in shape to such a section of a hollow sphere as is formed by passing two planes at right angles through the same. In Figs. 2 and 4 are seen traces of these spherical grooves. *a b c d h*, Fig. 2, is a vertical section of a block of wood, showing traces *a b* of the spherical grooves extending to their greatest depth. *a b*, Fig. 4, are traces of the same grooves on the upper surface of a block of wood. When the desired number of spherical grooves are cut at one end of the block, it is passed to the rear end of the machine to the position as seen in Fig. 2, when B C are the uprights of the wooden frame; D E, an oblique sliding frame fitted to ways *e f*. (Fig. 5 is a transverse section of the oblique frame and ways, showing the manner in which they are fitted, where like letters refer to the same parts as in Fig. 2.)

F, Fig. 2, is a spiral spring sustaining the oblique frame D E at its greatest elevation.

G′ is a handle for forcing down the frame at pleasure.

H is a saw-shaft having its journal-boxes I J in the oblique frame D E.

K K are two circular saws, and L is a pulley for receiving and giving motion to the circular saws. After the spherical grooves before described are cut and the block *a b c d* brought to the position shown in the figure, the circular saws being in motion are pressed down to the dotted line *c*. The block is then passed along till the saw-grooves extend from *n* to *m*, Fig. 4. The block is then reversed by means of the turning-table P′ P′, Fig. 1, and the same process of cutting and sawing is repeated on the other end and side of the block. The sections of wood *g h*, Fig. 2, and *g g h i*, Fig. 4, are now attached to the main block only by the sections *a b*, extending between the dotted lines *c d* in width and extending between *i j*, Fig. 4, in length. The section *h*, Fig. 3, is then split out and removed, and the ellipsoidal cavity *h j i*, Fig. 4, is smoothed and finished by applying the spherical cutter or shell to its concave surface. The ellipsoidal shell *g g*, Fig. 4, is then split out and removed, and the cavity *c d*, Fig. 2, and *a a*, Fig. 4, is finished, as before described. The term "ellipsoidal" is used in this description to represent a cavity merely approaching in shape that formed by an ellipse revolving on its axis, while the form of the cavity made by the process herein described and that which is most desirable for wooden trays is perhaps more properly cylindrico-spherical.

Having thus fully described the nature and operation of my invention, what I claim as new, and desire to secure by Letters Patent, is—

1. The spherical shell or cutter O, Fig. 1, turning at the same time on two axes of the sphere of which the shell is a part, so as to cut a spherical groove or a convex and concave surface of less extent than a quadrant of the superficies of a sphere, yet corresponding in shape to the convex surface of a spherical section formed by two planes passing through the sphere at right angles.

2. The method of giving a compound motion to the spherical shell or cutter by means of the tight gear-wheel *v*, Fig. 1, and the loose gear-wheel Q, revolving on the axis of the rocking frame J K, so as to be in connection with the pinion R in all necessary positions of the rocking frame J K.

3. The use of circular saws set in an oblique sliding frame, in connection with the spherical cutter, for the purpose of cutting straight grooves to connect with the spherical grooves at each end of the block of wood.

Woodstock, Vermont, May 5, 1854.

ISAAC B. HARTWELL.

Witnesses:

L. A. MARSH,

NORMAN WILLIAMS.