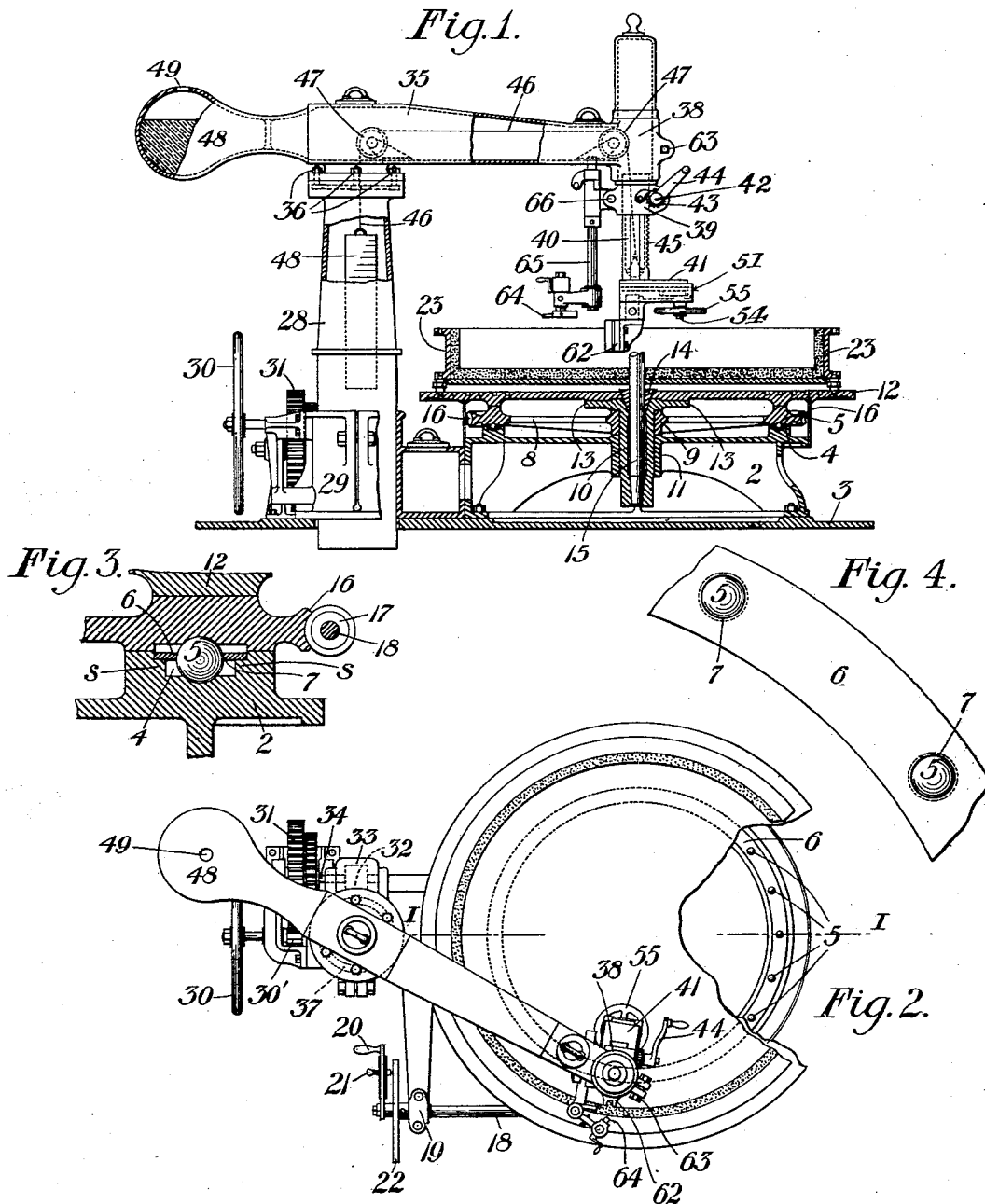


S. GROVES.
MOLDING MACHINE.

No. 573,783.

Patented Dec. 22, 1896.



WITNESSES:
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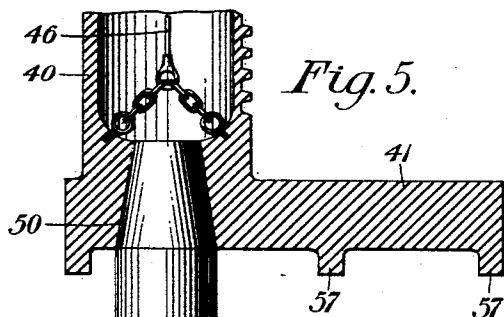


Fig. 5.

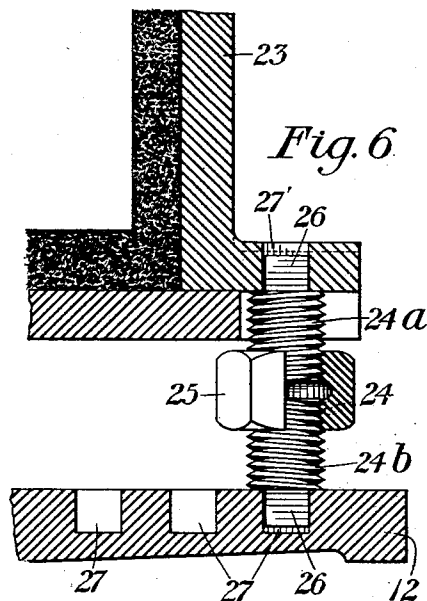
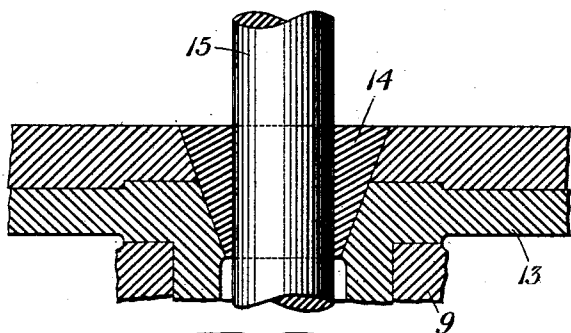


Fig. 6.

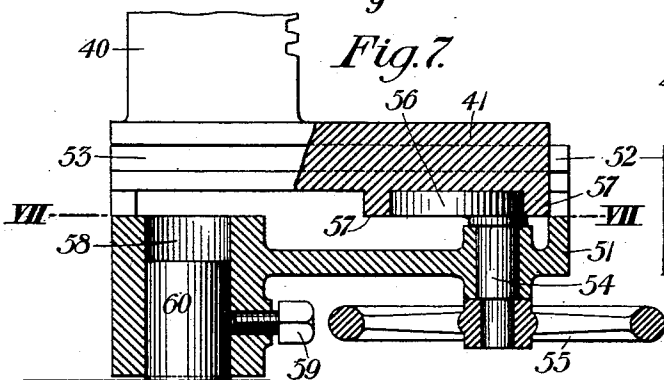


Fig. 7.

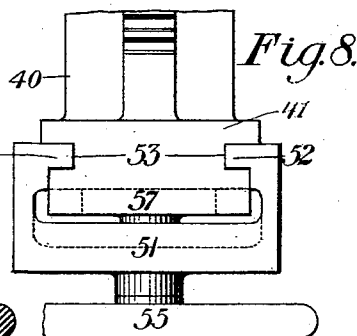


Fig. 8.

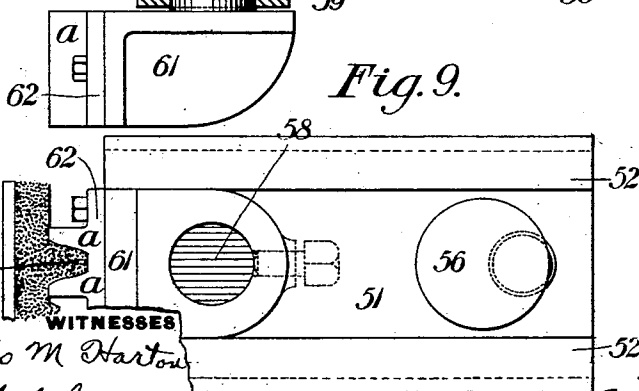


Fig. 9.

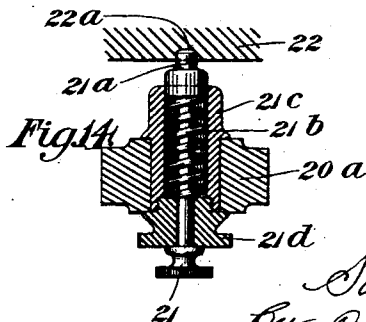
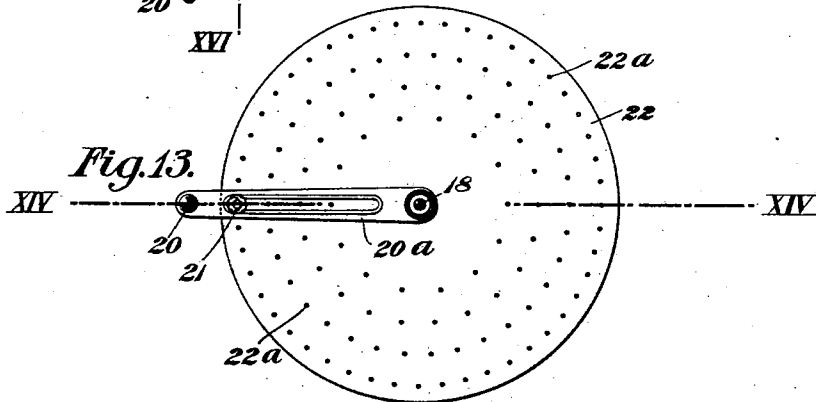
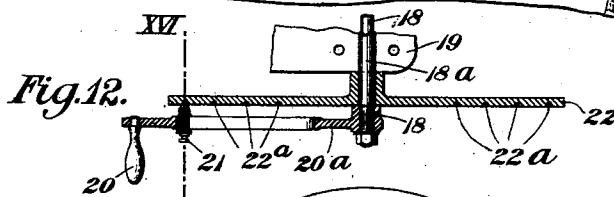
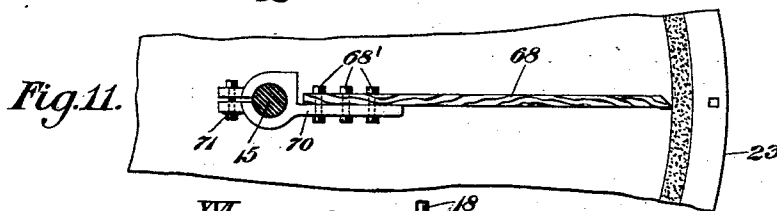
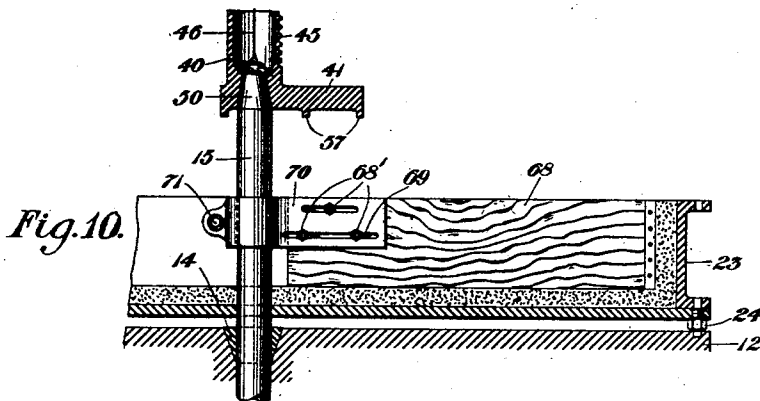
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UNITED STATES PATENT OFFICE.

SAMUEL GROVES, OF PITTSBURG, PENNSYLVANIA.

MOLDING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 573,783, dated December 22, 1896.

Application filed September 16, 1895. Serial No. 562,643. (No model.)

To all whom it may concern:

Be it known that I, SAMUEL GROVES, a citizen of Great Britain, residing at Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented or discovered a new and useful Improvement in Molding-Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming part of this specification, in which—

Figure 1 is a view in elevation, partly in section, on the line I I of Fig. 2, of my improved molding-machine. Fig. 2 is a plan view thereof, partly broken away. Fig. 3 is an enlarged cross-sectional detail view of the ball-bearing. Fig. 4 is a plan view of a short fragment of the circular ball-separating plate. Fig. 5 is an enlarged detail view illustrating the sweep-arm and tooth-block centering spindle. Fig. 6 is a similar detail view illustrating the flask-leveling device. Fig. 7 is a longitudinal sectional view of the tooth-forming device attached to the sweep-arm and eccentric adjusting mechanism. Fig. 8 is an end view of the same. Fig. 9 is a plan view, detached, on the line VII VII of Fig. 7. Fig. 10 is a view on an enlarged scale, in sectional elevation, illustrating the sweep and tooth-block spindle centered on the post 15. Fig. 11 is a plan view of Fig. 10, the post 15 being in section below the tooth-block spindle. Figs. 12 and 13 are detail views, on an enlarged scale, illustrating the controlling device governing the movement of the base 8 of the machine, Fig. 13 being a face view of the index-plate and crank and Fig. 12 being a cross-section, on the line XIV XIV, of such figure. Fig. 14 is a cross-sectional view in detail, on an enlarged scale, taken on the line XVI XVI of Fig. 14.

Similar numerals and letters of reference refer to like parts wherever used throughout this specification.

My invention relates to the class of molding-machines, and is designed more particularly for the manufacture of large gear-wheels requiring considerable space and accuracy in their construction. In making such wheels the usual practice is to employ a pattern for molding around, at considerable expense and trouble and danger of inaccuracies in the finished casting due to the

difficulty of removing the pattern without disturbing the sand. I desire to obviate these objections and to produce a cast gear-wheel in a more economical, perfect, and satisfactory manner than has heretofore been possible.

Referring now to the drawings, 2 is the base of my machine, bolted or otherwise secured to a base-plate 3. In the upper surface of the base is a circular groove 4, in which rest the bearing-balls 5, separated at equal intervals by the circular plate 6, provided with circular openings 7 for receiving the balls, such openings being of a diameter sufficiently large and cut in a manner to conform to the contour of the ball, so that, as shown, when the outer and inner edges of the plate are resting on a shoulder *s* in the base-frame at each side of the groove the weight of the plate will be held off the balls, but it will be carried around by them in their travel around the groove.

Resting upon the row of balls 5 is a circular revolving base 8, having a hub 9 in the center, through which passes the hollow spindle 10, having a bearing in the center 11 of the base 2. This base 8 constitutes a support for the upper circular revolving flask-table 12, securely attached to it and also resting on flanges 13 of the hollow spindle 10, a center conical brass bearing-block 14 passing through the plate and into the spindle and forming a bearing for the centering-spindle 15, stepped into the bottom of the hollow spindle 10. The periphery of the base 8 is furnished with worm-teeth 16, so that it may be revolved by the worm-wheel 17, secured to the end of the shaft 18, having bearings 19 integral with the framework of the machine. For the purpose of accurately controlling the movement of the base 8 the crank 20 is furnished with a pin 21, arranged to be adjusted longitudinally on the crank-arm 20^a and to register with holes 22^a in the index-plate 22, such holes being arranged in concentric circles and at varying distances apart, so that by changing the pin to engage the proper row of holes the periodical rotation of the worm-wheel 17 may be regulated and thereby the corresponding movement of the revolving base 8 accurately controlled.

The flask 23 is supported upon the revol-

ing table 12, adjusting-screws 24 intervening between the flask and table, consisting of right and left hand threaded screws 24^a 24^b and a similarly-threaded nut 25, the extremities of the screws being provided with square reduced extensions 26, fitting into similar openings 27 and 27' in the table 12 and lower flange of the flask 23, respectively. By means of these adjusting-screws the flask may be quickly brought to a proper level by turning the nut 25.

Mounted outside the flask and independent thereof is the mast 28, arranged to move vertically within and to be firmly clamped by the housing 29, motion being imparted to it by means of a hand-wheel 30, trundle 30', gearing 31, and a pinion 32 inside the shrouding 33 on the end of the shaft 34, meshing into a rack on the side of the mast. This mast is preferably made hollow and of large diameter for securing lightness and stiffness and is provided at the top with a circular flange forming a bearing for the jib-arm 35, secured thereon by bolts 36, passing upwardly through circular grooves 37, thus allowing for circumferential adjustment of the jib-arm. At its inner end this arm, which is also made hollow throughout, is provided with a vertical hollow housing 38, the lower section of which, 39, forms a guideway for the vertical tooth-block slide and spindle 40, having at its lower end an L-shaped arm 41, to which is secured the tooth-forming mechanism, as will be described hereinafter. The vertical tooth-block slide and spindle 40 is adjusted vertically within the section 39 by means of a pinion on the end of the shaft 42, supplied with a ratchet-wheel 43 and crank-handle 44, the pinion meshing into the rack 45 on the side of the spindle 40.

For the purpose of counterbalancing the weight of the hollow spindle 40 and the various parts secured to it, I employ a wire rope 46, attached to the inside of the post at its lower end, as indicated by dotted lines in Fig. 1 and in detail Fig. 5, the wire rope passing up through the spindle and over sheave-wheels 47 47', supported on brackets on the inside of the jib-arm, and having attached at the other end, hanging within the mast 28, a counterweight 48 of approximately the same weight as the spindle 40 and the other parts secured to it, thus taking the strain off the rack 45 and pinion meshing into it. For the purpose of also counterbalancing the jib-arm 35 I have constructed it with a hollow overhanging extension 48, which may be filled with molten lead, iron-filings, or other desirable material through a small hole 49 until such filling material shall counterbalance the weight of the other end, when the hole may be plugged.

In the operation of preparing the flask 23 for casting it is first selected of the proper size to suit the size of wheel desired and is leveled on the table 12, as already described. The usual sweep for preparing the tooth-

backing form is then centered on the permanent center-post 15 and the tooth-block spindle is lowered onto it, thus giving a rigid support for the sweep-arm and at the same time keeping all of the operative parts in perfect alinement. The sweep-arm and spindle are then removed, the eccentric draw-back device comprised in the sliding head 51 is inserted, the horizontal slides 52 being engaged by the guideways 53, thus permitting of horizontal adjustment. Mounted in the lower part of the head 51 is the short vertical shaft 54, provided at its lower end with the hand-wheel 55 and at its upper end having an eccentric 56, fitting between the cross-ribs 57. Thus when the eccentric is turned a half-revolution by the hand-wheel the head 51 will be advanced a distance equal to the throw of the eccentric. At its other end the head 51 is furnished with a vertical socket 58, within which is adjustably secured by means of a set-screw 59 the stud 60, forming part of the tooth-block 61, having removably attached to it the former 62, made to suit the size and dimensions of the tooth required. The lower section 39 of the hollow housing 38 is clamped within the housing by means of the bolt 63, the housing being split, thus allowing of radial adjustment of the post 40, so that when in the process of forming the teeth the jib-arm is swung round, as shown in Fig. 2, to bring the tooth-former into close proximity to the inside face of the flask, the spindle 40 may be also adjusted to proper position, as shown in same figure, squarely against the inside face of the sand. Then sand is rammed in between the two side pieces *a a*, constituting the tooth-space, the former is raised by means of the crank 44, the flask revolved for the space of one tooth, and the operation is repeated and continued until an entire revolution has been made and all the teeth of the wheel finished. A stop 64 is hinged to the lower end of a downwardly-projecting support 65, secured at 66 to the section 39 of housing 38, so that it may be swung around and over that portion of the sand *b* between the ends *a a* of the tooth-former, preventing any disturbance of the sand during the withdrawal of the former.

If desirable, the tooth-former may be advanced and withdrawn horizontally for each successive operation by means of the eccentric 56, such a process possessing certain advantages in operation, inasmuch as in such horizontal withdrawal of the tooth-former it is not necessary to give any draft to the tooth, nor is the sand liable to be disturbed by excessive friction, as in the vertical raising operation, and the mechanical operation is much more accurate, steady, and regular by the horizontal eccentric travel than by the vertical rack lift, it being also quicker than the vertical movement, especially in the case of wide-faced teeth. As illustrated in Figs. 10 and 11, the sweep 68 is adjustably secured on the spindle 15 by means of bolts 68', passing

through the inner end of the sweep and through longitudinal slots 69 in a wing 70, clamped loosely on the spindle by bolt 71.

The advantages of my improved molding-machine will be appreciated by those skilled in the art, as it possesses valuable features of advantage not before employed in machines of this character.

I am aware of the patent granted to Walker, No. 248,535, and to Kepp, No. 432,243, for molding-machines for doing similar work, but do not desire to claim such construction as is therein shown and described, particularly as my invention contains features of adjustment of the flask, adjustment of the tooth-former, and balancing of the jib and tooth-block spindle, thus securing greater rigidity, easy movement of the flask-supporting table on the base by means of the separated ball-bearing, and various other valuable features not shown or described in such patents.

Changes and modifications may be made in its construction without departing from my invention, since I do not desire to be confined to the particular arrangement and construction of parts shown and described, but desire to obtain Letters Patent for my invention as expressed in the following claims.

I claim—

1. In combination with the vertical tooth-block spindle provided with a supporting-arm at its lower end, a slide secured to the supporting-arm carrying a tooth-forming pattern, a shaft having a bearing in the slide, an eccentric mounted on the end of the shaft, and lateral ribs on the supporting-arm, engaged by the eccentric, whereby the slide may be advanced or withdrawn, substantially as set forth.

2. In a molding-machine, the combination, with the vertically-adjustable tooth-block spindle 40, provided with a socket in its under portion, alining with the center of the tooth-block spindle; of the center-spindle 15, set in the center of the molding-machine, and engaging at its top the socket in the under portion of the tooth-block spindle, and the sweep 68 journaled on the spindle 15, substantially as set forth.

3. In a molding-machine comprising a flask-supporting table secured to a revolving supporting toothed worm-wheel, in combination with the shaft of the worm, a circular stationary index-plate, concentric with the shaft, provided on its face with a series of concentric rows of holes, a crank-arm secured to the

shaft having a longitudinal slot, and a spring-controlled pin capable of being adjusted lengthwise of the slot, so as to register with either of such concentric rows of holes, substantially as set forth.

4. The combination, in a molding-machine, of a hollow mast, a hollow balanced jib revolvably secured to the hollow mast, a vertically-adjustable tooth-block spindle supported at the end of the jib, a counterbalancing-weight hanging within the hollow mast secured to the end of a cable passing over sheave-wheels supported in the hollow jib and attached to the tooth-block spindle, with a slide secured to a supporting-arm at the lower end of the tooth-block spindle carrying a tooth-forming pattern, an eccentric mounted on the end of a shaft having a bearing in the slide, engaging lateral ribs on the supporting-arm, whereby the slide may be advanced or withdrawn, substantially as set forth.

5. The combination, in a molding-machine, of a hollow mast, a hollow balanced jib revolvably secured to the hollow mast, a vertically-adjustable tooth-block spindle supported at the end of the jib, a counterbalancing-weight hanging within the hollow mast secured to the end of a cable passing over sheave-wheels supported in the hollow jib and attached to the tooth-block spindle, with a slide secured to a supporting-arm at the lower end of the tooth-block spindle carrying a tooth-forming pattern, an eccentric mounted on the end of a shaft having a bearing in the supporting-arm whereby the slide may be advanced or withdrawn, substantially as set forth.

6. In a molding-machine, the combination with a stationary supporting-frame provided with an annular trough having at its bottom a concave groove and shoulders at each side of the trough above the groove and below the top of the supporting-frame, an upper revolving supporting-wheel, and a series of balls resting in the groove; of a circular ring resting on the shoulders at each side of the trough and provided at intervals with circular openings fitting over the balls, substantially as set forth.

In testimony whereof I have hereunto set my hand this 9th day of August, 1895.

SAMUEL GROVES.

Witnesses:

F. K. MELANCE,
C. M. CLARKE.