(No Model.) 2 Sheets—Sheet 1.

W. H. LENHART.

LATHE FOR TURNING ECCENTRIC OR POLYGONAL FORMS.

No. 293,891. Patented Feb. 19, 1884.

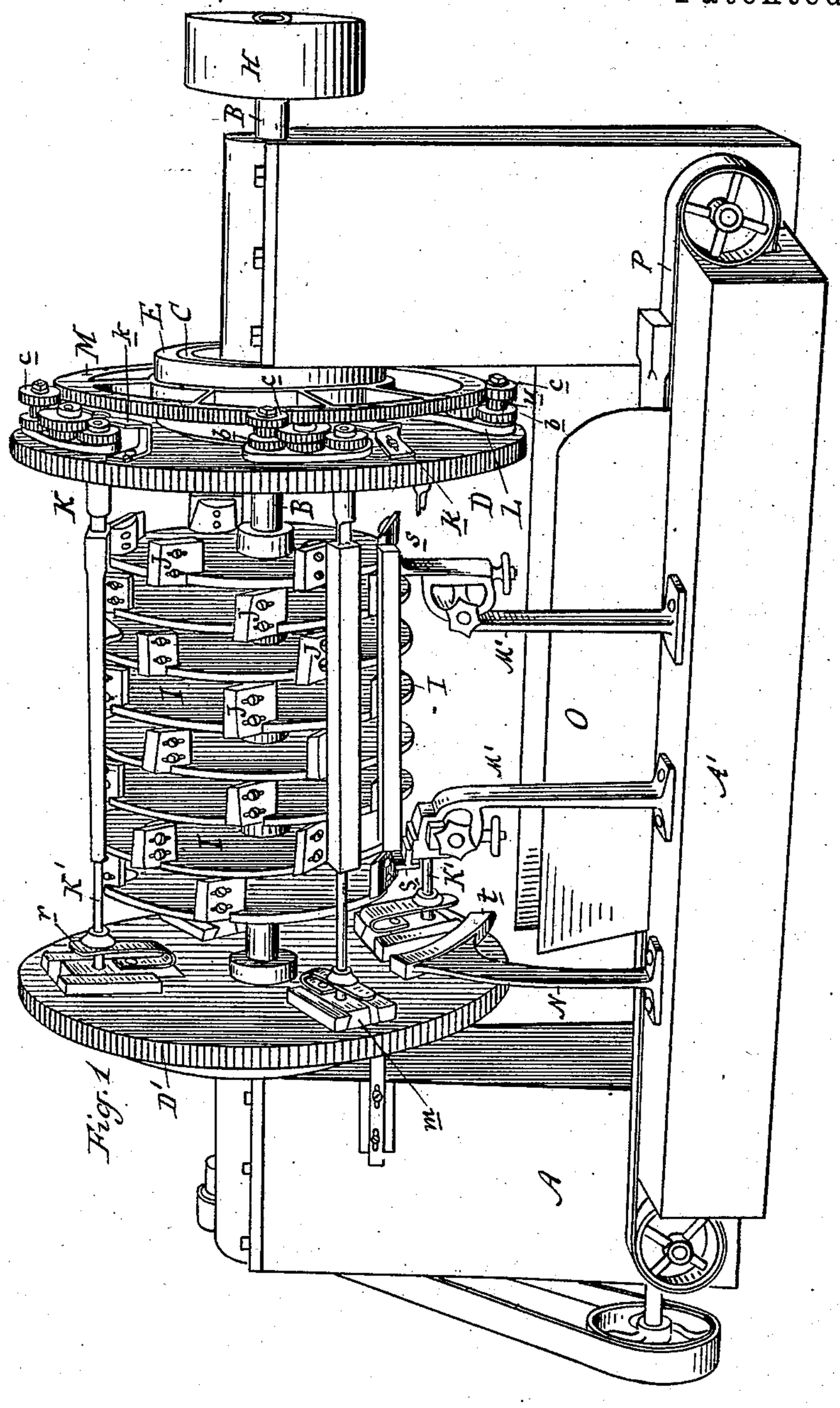

Fig. 1.

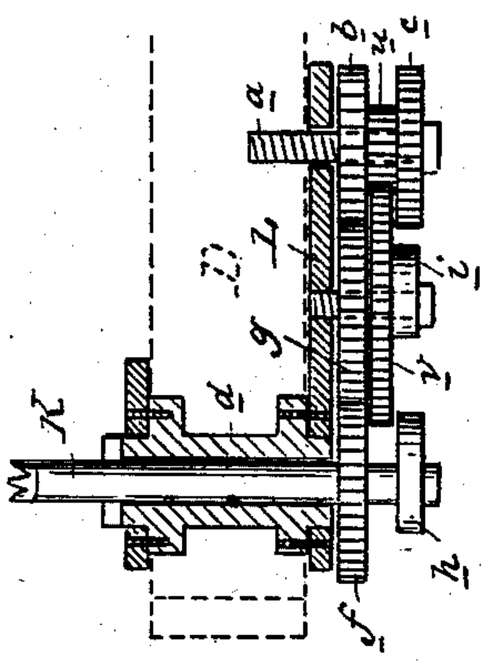

Fig. 6.

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Fig. 2

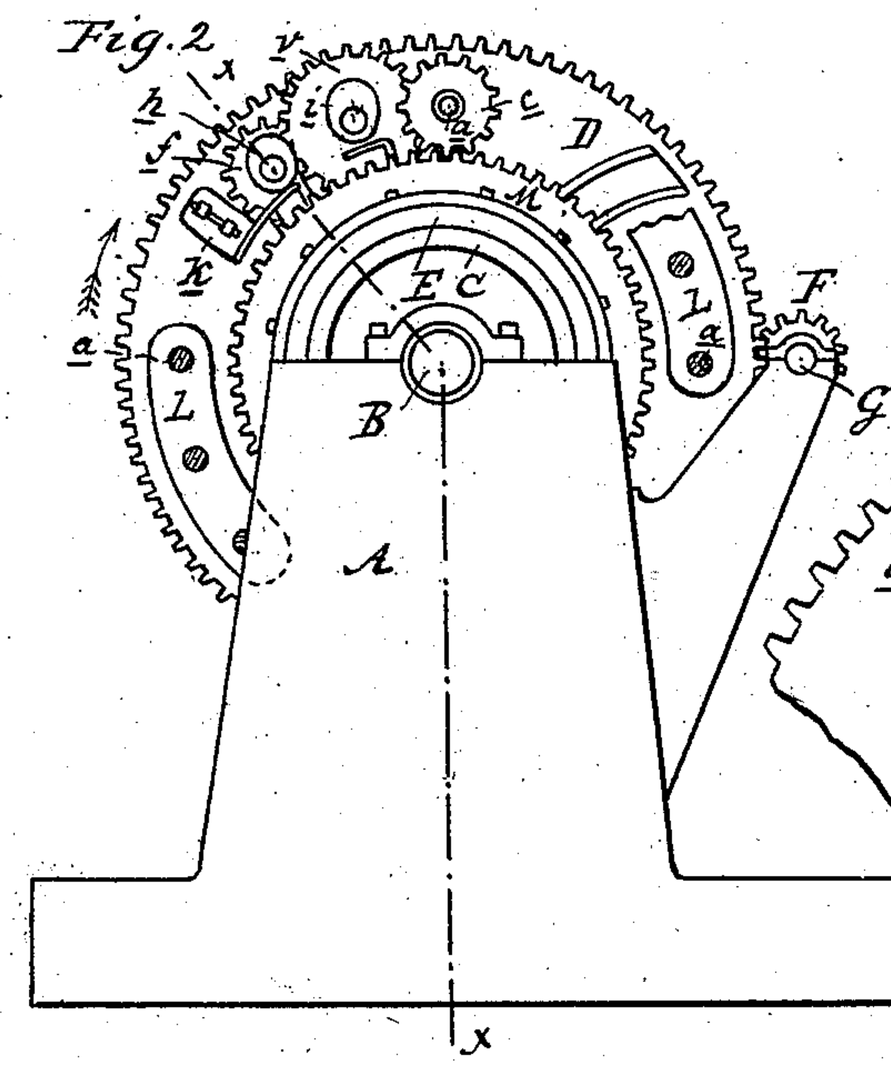


Fig. 4

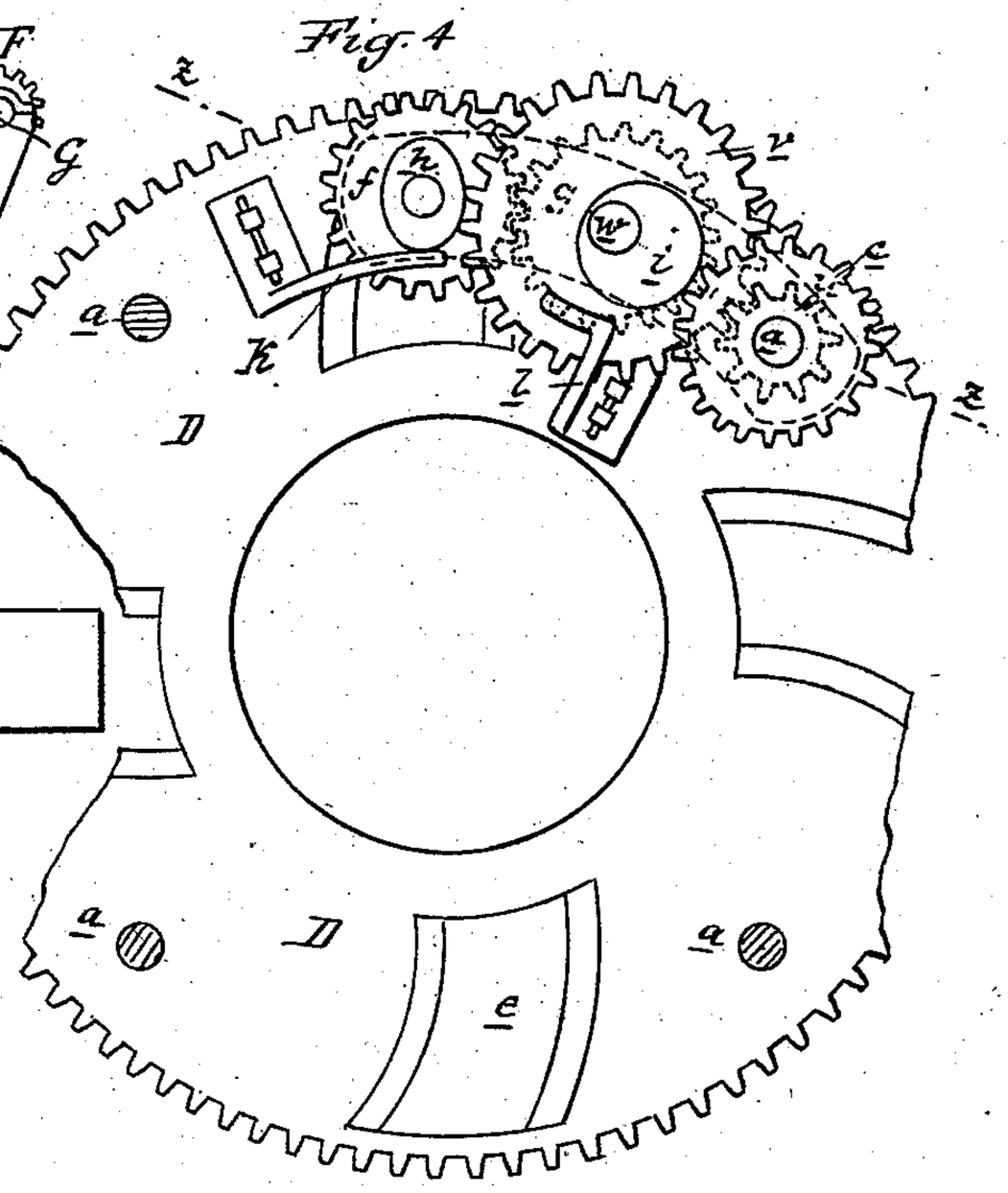


Fig. 5

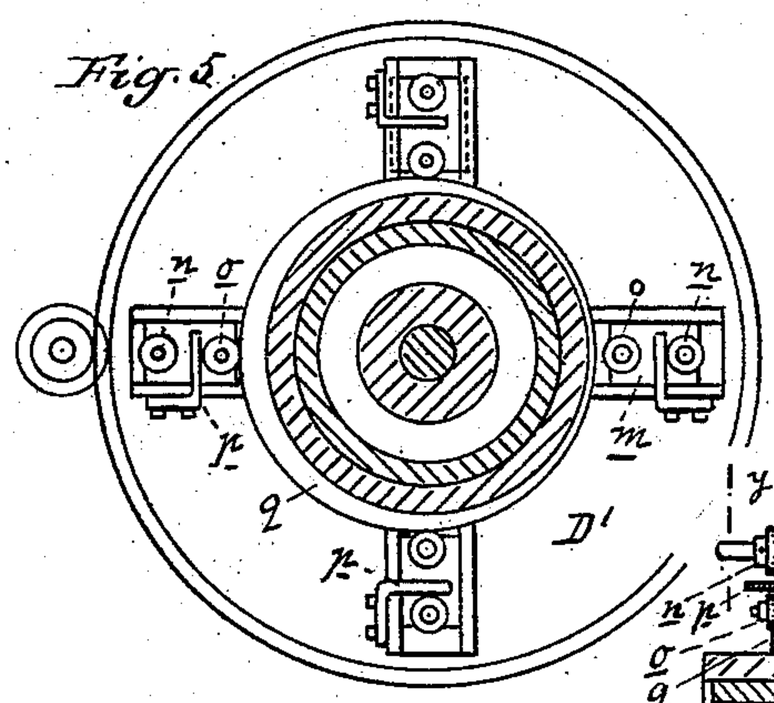
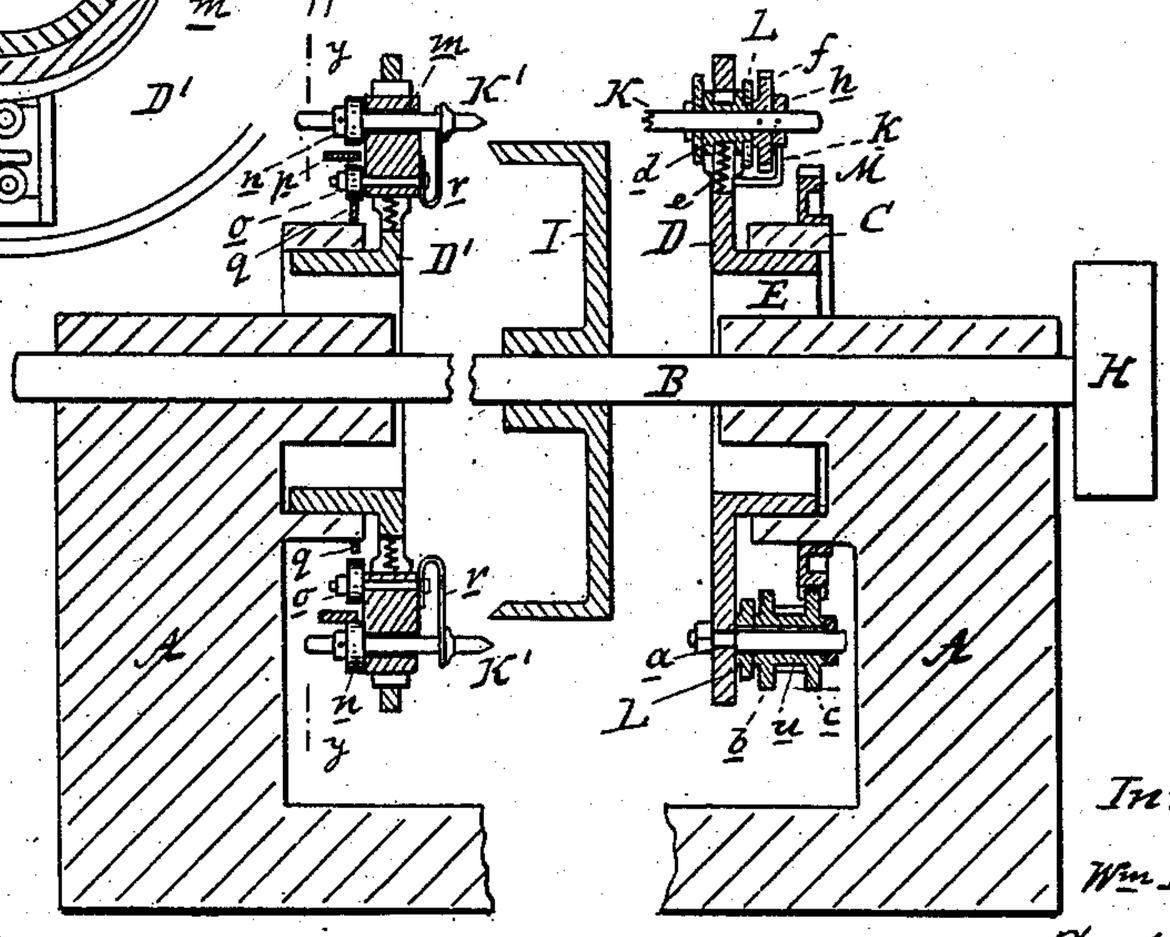


Fig. 3



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UNITED STATES PATENT OFFICE.

WILLIAM H. LENHART, OF DEFIANCE, OHIO.

LATHE FOR TURNING ECCENTRIC OR POLYGONAL FORMS.

SPECIFICATION forming part of Letters Patent No. 293,891, dated February 19, 1884.

Application filed July 14, 1883. (No model.)

To all whom it may concern:

Be it known that I, WILLIAM H. LENHART, of Defiance, in the county of Defiance and State of Ohio, have invented new and useful Improvements in Lathes for Turning Eccentric or Polygonal Forms; and I do hereby declare that the following is a full, clear, and exact description thereof, reference being had to the accompanying drawings, which form a part of this specification.

This invention relates to an improvement in lathes for cutting forms which are wholly or partially eccentric—such as spokes, whiffletrees, neck-yokes, &c.—and the invention consists in the mechanical devices for giving to the work the necessary eccentric movement, and also in general features of construction, whereby the lathe is adapted to be readily adjusted to different kinds of work, and do the same in a perfectly automatic manner, all as more fully hereinafter described.

Figure 1 is a perspective view of my lathe, ready for operation in cutting spokes. Fig. 2 is an end view thereof, showing the mechanical devices for imparting motion to the live-spindles, and for operating the same eccentrically. Fig. 3 is a central section on the line *x x*, Fig. 2. Fig. 4 is a detached elevation of one of the geared disks, showing more plainly the mechanical devices for moving the live-spindles eccentrically. Fig. 5 is a cross-section on the line *y y*, Fig. 3. Fig. 6 is a cross-section on the line *z z*, Fig. 4.

In the accompanying drawings, A A represent the two end sections of the frame, which support the operating parts of the lathe, and in which the main shaft B is journaled.

C C are circular rims, either cast integral with the end frames, A, or secured thereto in any convenient manner.

D D′ are large geared disks of corresponding diameter, each provided with a circular hub, E, by means of which the said disks are journaled upon the frames A.

G is a counter-shaft, journaled in proper bearings upon the rear side of the lathe. It is provided with two like pinions, F F, which mesh with the geared disks D D′, and impart a rotary motion thereto.

H is the drive-pulley for the shaft B, upon which are secured a number of cutter-heads, I, to which cutter-knives J are secured in the usual manner.

K are a number of live-spindles carried by the geared disk D, and K′ are a corresponding number of dead-spindles carried by the disk D′.

L are segmental plates, pivotally secured at like intervals upon the disk D, by means of the stub-shafts *a*, which also carry the triple pinion *b c u*. The opposite ends of the plates L are provided with boxes *d*, which pass through slots *e* in the disk D, and form journals for the live-spindles K.

f are pinions secured upon the ends of the spindles K, and *g* and *v* are intermediate pinions secured upon the plate L, the pinion *g* meshing with the pinions *f* and *b*, and the pinion *v* with the pinion *u*. The pinion *c* meshes with the circular gear M, stationarily secured to the frame of the lathe.

h is a cam secured upon the end of the spindle K, and *i* is another cam, secured upon the hub of each intermediate pinion *v*.

k are guide-plates for the cams *h*, and they are adjustably secured to the disks D.

l is another guide-plate for the cams *i*. It is also adjustably secured to the disk D.

The dead-spindles K′ are journaled in the radially-adjustable boxes *m*, held in radial slots in the disk D′.

n are stops secured upon the ends of the spindles K′. These stops may be made in the form of rollers or collars, which may be changed for others of different size; or they may be in the form of cams, in which case the required adjustments can be obtained by giving a partial turn to the cams and securing them in that position.

o are rollers, secured near the inner ends of the boxes *m*.

p are guide-plates for the stops *n*, and they are secured to the disks D′.

q is a guide-track for the rollers *o*, and it is secured to the frame A of the lathe.

r are springs secured at one end to the sliding blocks or boxes *m*, embracing with their free ends the spindles K′.

M′ are standards secured to the front side of the lathe, and provided on top with the adjustable shelves *s*, upon which the blanks are deposited.

N is another standard, secured to the front side of the lathe near the rear end thereof, carrying on top the segment *t*, which is designed to automatically trip the spindles K′.

O is a trough secured under the lathe upon the part A′ of the frame, and P is an endless belt traversing said trough.

In practice, motion being given to the parts, as indicated, the cutter-disks I are revolved by the shaft B at a high rate of speed, and the gear-disks D D revolve in the same direction (as indicated in Fig. 2) at a low rate of speed. The live-spindles K are revolved by reason of the engagement of the pinions *c* of each vibrating plate L, meshing with the stationary circular gear M, and transmitting their motion to the train of pinions *b g f u v* upon each vibrating plate L, thereby revolving the spindles K, and also the cams *h i*, which latter govern the movement of the vibrating plates, and thereby control the eccentric movement of the spindles K. The triplet pinions *b c u* form but one piece, and revolve upon the stub-shaft *a*. The diameter of the pinion *u*, however, is smaller than that of the pinions *b c*. The intermediate pinions, *g v*, revolve independently from each other upon the stub-shaft *w*, which is secured to the vibrating plate L. The cam *i* forms an eccentric, and is secured to the hub of the pinion *v* and revolves with it. The cam *h* is secured upon the spindle K, and is revolved with it by the pinion *f*, which meshes with the intermediate pinion *g*. By reason of the small diameter of the pinion *u*, the cam *i* revolves much slower than the spindle K and cam *h;* and it is best for the purpose to proportion the size of the different pinions in such manner that the cam *i* will make just one revolution while the disk D is making one. The object of giving to the cams *i l* this difference in speed is to govern the eccentric motion of the vibrating plate L, first by eccentric cam *i*, which controls the roughing of the stick, and requires at least one revolution of the spindle K; then by allowing the cam *h* to gain bearings for one or more revolutions of the spindle K, so as to control the finishing of the stick. A blank deposited upon the standards M′ M′ is automatically dogged by a pair of spindles as soon as the trip *t* allows the spring *r*, which has been depressed by it, to again project its spindle and dog the blank between it and the live-spindle upon the opposite end of the blank. A stationary pressure-foot acts at the same time upon the end of the spindle K′, so as to dog the blank more securely. At first the eccentric movement of the spindle K is governed by the cam *i*, which rests upon the bearing or guide plate *l*, and the spindle K′ upon the other end of the blank is governed by the roller *o*, which travels upon the stationary guide-track *q*, the blank meanwhile being subjected to the cutting action of the knives J, which thereby reduce the blank to a rough shape. As soon as this is done, (and one revolution of the blank is sufficient,) the cam *h* upon the spindle K and the stop *n* upon the spindle K′ gain their bearings upon the guide-plates *k* and *p* for one or more succeeding revolutions of the spindles, and govern the further eccentric movement of the spindles K and K′ until the blank is finished, when the trip *t* retracts the spindle K′ and lets the finished work drop into the trough O and upon the endless belt P, which carries it away from the lathe. As the finishing of the work is done while the spindles K and K′ are guided by the cams *h* and stops *n*, the shape of the finished article will precisely correspond upon its ends with the shape of these cams; but the diameter will entirely depend upon the position of the plates *k* and *p*, which act as gages, and they are therefore made radially adjustable upon the disks D D′.

It will of course be understood that when the stops *n* are made in the form of cams there is usually no necessity of the guide-plate *p* being made adjustable, although it may sometimes be found advantageous to have both adjustable. The arrangement for controlling the size of the work by the adjustment of the two guide-plates *k* and *p* is one of great simplicity, and as the cams *h* and stops *n* can easily be removed, different-shaped ones may be put in place, thereby adapting the lathe for different kinds of work without complicated adjustment. The cams *i*, as before described, govern the eccentric movement of the spindles K at the beginning of the operation, and thereby the shape of the blank in the rough, and their bearing-plates *l* are also adjustably secured to the disk D, and the cams *i* fall off as soon as the blank is sufficiently reduced in size, so as to allow the finishing-cams to gain their bearings and govern the rest of the cutting.

While I have described the two disk D D′ of different construction, I do not intend to confine myself to their use in one machine, as it may be advisable to use the disk D, as described, upon both ends of the lathe, especially in a machine intended for long and slender work. To keep the cams which govern the eccentric movement of the spindles in proper contact with their guides, proper springs are arranged to draw the spindles toward the center of the disks D D′.

The advantage of the vibrating plate L carrying the spindle K over a sliding plate, as in my previous patent, No. 252,481, is manifold. Where the plate slides there is necessarily a great amount of friction. Besides, the means devised for sliding such frame must bear the whole weight of the plate and gearing, thus causing a great wear of parts and consumption of power, which objection is overcome by my arrangement. The friction being greatly reduced, and the means for vibrating the plate having to overcome only a portion of the weight, affords a greater saving of wear of the parts and power, which saving cannot be accomplished by a sliding

plate, as heretofore constructed. Moreover, the first cost of building the parts is less, because straight-cut gears only are employed, while in my previous patent bevel-gearing must be used, which is more costly to cut.

What I claim as my invention is—

1. In a lathe for turning irregular forms, the rotating disks D D′, carrying one or more pairs of spindles journaled in bearings eccentrically adjustable in said disks, in combination with cams secured upon the ends of said spindles, and bearing upon guide-plates or gages secured to the rotating disks, and radially adjustable thereon, substantially as and for the purpose specified.

2. The revolving disk D, having one or more vibrating plates, L, pivotally secured thereto at one end, and provided with a bearing for the spindle upon the opposite end, said bearing passing through a curved-slot, *e*, in said disk, so as to allow the plate or plates to vibrate, in combination with means, substantially as described, for vibrating said plates, so as to produce an eccentric movement of the spindle, substantially as described.

3. One or more vibrating plates pivotally secured at one end to the rotating disk D, and provided with a bearing for a spindle upon the opposite end, said bearing passing through a slot of the disk, in combination with two revolving cams adapted to vibrate said plates by bearing successively upon guide-plates adjustably attached to the disk, for the purpose of imparting an eccentric motion to the spindle, substantially as described.

4. As a means for imparting a rotary motion to the eccentrically-movable spindle K, a vibrating plate pivoted at one end to the rotary disk D, and carrying the spindle upon the other end in a bearing passing through a curved slot in the disk, a pinion, *c*, secured at the pivotal point of the vibrating plate, and a train of intermeshing pinions connecting the same with a pinion upon the spindle and in combination with the stationary circular gear M, meshing into the pinion *c*, substantially as described and shown.

5. In a lathe for turning irregular forms, a series of cutter-heads which simultaneously work upon the stick, and in combination with one or more pairs of spindles revolving the stick, exchangeable cams secured upon the spindles, and radially-adjustable guide-plates secured to the disks which carry the spindles, whereby the size and shape of the work may readily be adjusted, substantially as described.

6. In a lathe for cutting irregular work, a series of cutter-heads revolving at a high rate of speed with the main shaft B, the spindle-carrying disks D D′, revolving at a low rate of speed independent of the cutter-heads, but in the same direction and around the same line of motion, cams *i*, secured on the stub-shaft *w*, and geared with spindle K, rollers *o*, secured near the inner ends of the boxes *m*, cams *h*, secured upon the spindle K, and stops *n*, secured upon the spindle K′, guide-plates *l*, adjustably secured to the disk D, and stationary guide-track *q*, secured to the frame A, and gages *k*, adjustably secured to the disk D, and gages *p*, secured to the disk D′, all substantially as and for the purposes specified.

7. The combination, with the vibrating spindle-carrying plate L and disks D D′, having guides, as shown, of the revolving cam *i*, bearing upon the guide-plate *l*, and revolving cam *h*, bearing upon the guide-plate *k*, the eccentric cam *i* arranged to revolve slower than the cam *h*, and allow the other cam, during a portion of its movement, to gain a bearing, substantially as described.

8. The vibrating plate L, pivoted at one end to the disk D, and carrying a spindle at the other, in combination with the disks D D′, having guides, as shown, the stationary gear M, secured to the frame A, a train of pinions, *b f g u v c*, secured to the vibrating plate L, and the latter pinion meshing with the gear M, cams *h* and *i*, secured upon the spindle K and stub-shaft *w*, respectively, and driven by said train of pinions, and bearing-plates *k* and *l*, adjustably secured to the disk D, substantially as and for the purpose specified.

WILLIAM H. LENHART.

Witnesses:
F. G. BROWN,
CHARLES SEYMOUR.