

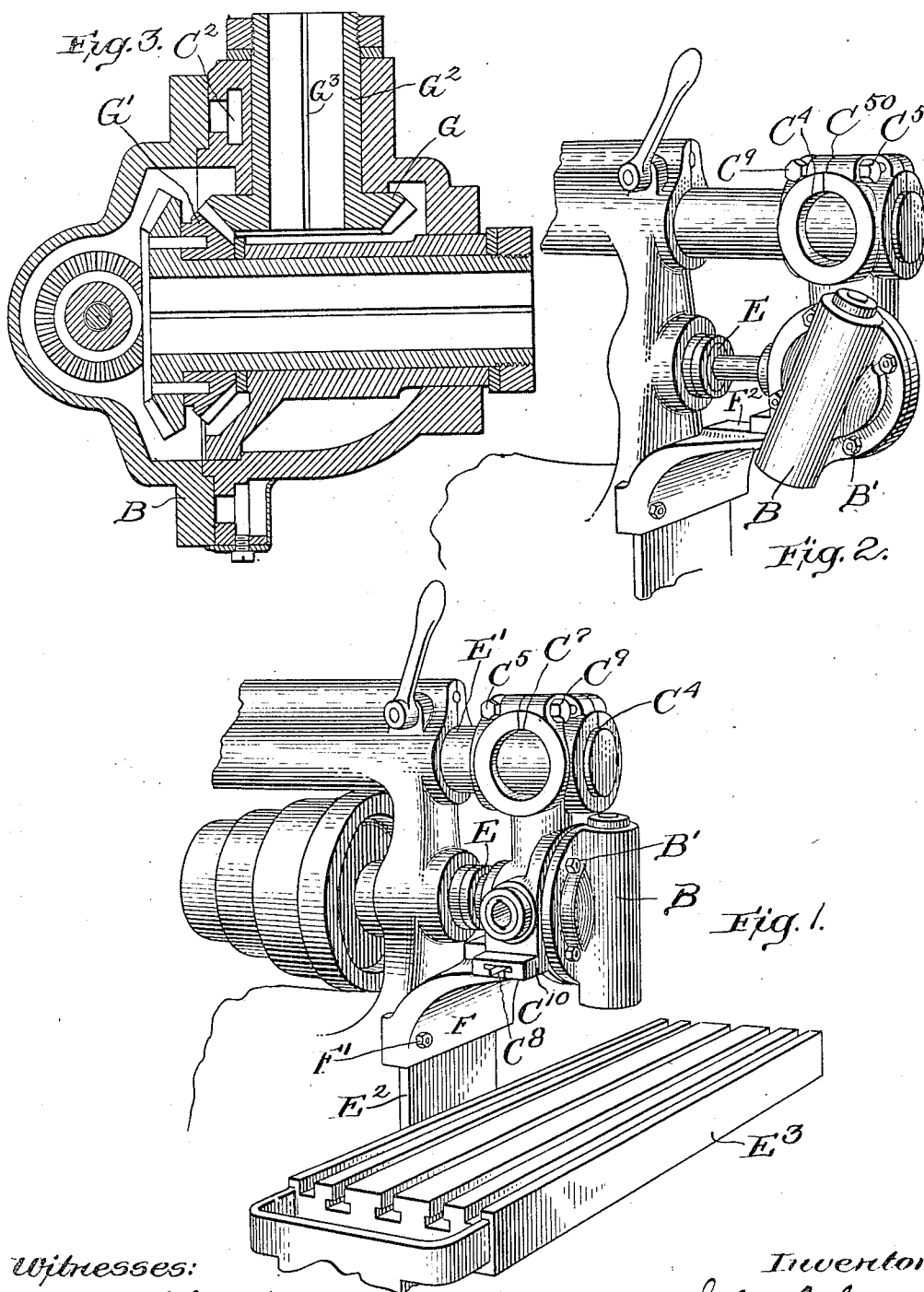
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J. PARKER.
VERTICAL SPINDLE ATTACHMENT.

APPLICATION FILED FEB. 5, 1904.

2 SHEETS—SHEET 1.



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UNITED STATES PATENT OFFICE.

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VERTICAL SPINDLE ATTACHMENT.

No. 825,409.

Specification of Letters Patent.

Patented July 10, 1906.

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To all whom it may concern:

Be it known that I, JOHN PARKER, of the city and county of Providence and State of Rhode Island, have invented certain new and useful Improvements in Vertical Spindle Attachments; and I do hereby declare the following specification, taken in connection with the accompanying drawings, forming a part of the same, to be a full, clear, and exact description thereof.

The invention relates to vertical spindle attachments for horizontal milling-machines. These attachments are commonly provided with a swivel-head in which the cutter-spindle is mounted and by the adjustment of which the inclination of the spindle to the work-table may be varied. By means of this swivel-head the spindle can be adjusted in but a single plane, and it has been customary heretofore to provide a second swivel in cases where it is desired to vary the adjustment plane of the spindle.

It is the object of the present invention to provide a vertical spindle attachment which will enable the cutter-spindle to be adjusted in different planes without the complication incident to the employment of a second swivel in the attachment.

In practicing my invention I provide means for securing the attachment to a milling-machine in either of two positions which are at right angles to each other and provide driving connections for the spindle which enable the attachment-spindle to be connected with and driven from the spindle of the machine to which the attachment is secured in either of its two positions. This feature of the invention, as well as the further features which I have employed in embodying this feature in a simple and efficient construction, will be understood from the following detailed description of the attachment, in which I have embodied the various features of the invention. This attachment is shown in the accompanying drawings, in which—

Figure 1 is a perspective view showing the attachment secured to a milling-machine in one of its two positions. Fig. 2 is a similar view showing the attachment secured in the other of its two positions. Fig. 3 is a horizon-

tal section through the axis of the swivel-head; and Fig. 4 is a vertical central section, partly in elevation.

In the construction shown in the drawings the spindle A is mounted in suitable bearings in a swivel-head B and is provided with the usual socket A' and bolt A² for connection the shank of the cutter to the spindle. The swivel-head is mounted upon a cylindrical bearing C', formed on the support C, and is held in adjusted position by nuts B', which engage the ends of bolts the heads of which engage T-grooves C², formed in the support C.

The spindle A is driven through a bevel-gear D, which engages a pinion D', secured to the spindle. The gear D is arranged concentric with the axis of the swivel-head, so that the gear and pinion are in proper engagement whatever the adjustment of the swivel-head. The gear D is formed on the end of a sleeve D², which forms a hollow driving-shaft with which the spindle of the machine to which the attachment is secured may be connected. The sleeve D² is mounted in a bushing C³, rigidly fixed in the support C.

The support C is provided at its upper end with an opening C⁴, Figs. 1 and 2, shaped to fit the end of the center-head arm E' of the machine to which the attachment is to be secured. The upper wall of the opening C⁴ is cut through, as indicated at C⁵, so that the walls of the opening may be drawn toward each other by clamping-bolts C⁶, and thus the support be rigidly clamped upon the end of the center-head arm. When the support C is secured in position, it is rigidly supported and held below the driving-shaft D² by connection with a bracket F. The bracket F is constructed to fit over the vertical ways E², on which the saddle of the milling-machine is guided, and is rigidly clamped to said ways by means of a clamping bolt and nut F'. At its upper end the bracket F is provided with a horizontal supporting-surface F², arranged to engage a similar surface C⁸ on the support C. These surfaces are rigidly clamped together by means of a bolt F³, the head of which engages a T-slot in the support C and the lower end of which is engaged by a clamping-nut F⁴. The parts are so constructed and arranged that when the support C is rigidly secured to

the center-head arm E' and the bracket F the axis of the shaft D² is substantially in line with the axis of the milling-machine spindle E. When in this position, the shaft D² is connected with the spindle E by means of an arbor D³, secured in the spindle E and projecting into the bore of the shaft D². The arbor D³ is connected with the shaft D² by means of keys D⁴, carried by the spindle and engaging slots D⁵ in the shaft D².

By the construction thus far described the spindle A may be rigidly secured in position and driven from the spindle E of the milling-machine and may be adjusted in a vertical plane at right angles to the axis of the spindle E. In this construction the attachment is supported independently of the spindle E or of the arbor D³, carried by said spindle. By thus supporting the attachment and by forming the arbor D³ so that the part which enters the hollow shaft D² is of smaller diameter than the bore in the shaft I am enabled to dispense with adjusting devices for bringing the axis of the driving-shaft upon the attachment in exact alinement with the spindle E. Heretofore such adjusting devices have been necessary for the reason that the distance between the axis of the spindle and the center-head arm will vary slightly in different milling-machines of the same construction, and consequently an attachment constructed to properly fit one machine might not fit another machine of the same construction. It has been customary, therefore, to provide an eccentric bushing within a clamping-recess corresponding to the recess C⁴, which bushing fits over the end of the center-head arm and may be turned to bring the driving-shaft of the attachment into exact alinement with the milling-machine spindle.

In practicing the feature of the invention above referred to the clearance between the arbor D³ and the hollow shaft D² enables the parts to be properly connected and driven even if the driving-shaft D² is slightly out of alinement with the spindle E.

When the attachment is secured in the position already described and as shown in Fig. 1, the axis of the swivel-head is in line or parallel with the axis of the spindle E, and in cutting inclined surfaces with an ordinary end mill the feed of the work-supporting table E³ must be in a direction across the table. As milling-machines are usually constructed, however, the work-table may be fed to a much greater extent longitudinally than transversely, and in cutting long inclined surfaces it is frequently desirable to so adjust the vertical spindle that an ordinary end mill may be used in cutting bevels or inclines extending longitudinally of the table. To enable this to be done, the attachment-spindle should be so arranged that it may be adjusted in a plane parallel to the axis of the

milling-machine spindle, or, in other words, in a plane transverse to the feed-table. I provide for this adjustment of the attachment-spindle by providing a second set of attaching devices for securing the attachment in a position at right angles to the position shown in Fig. 1 or in the position shown in Fig. 2. These attaching devices consist of a clamping-recess C⁷, similar to the recess C⁴ and intersecting said recess at right angles, and also a T-slot C⁸, formed in the lower end of the support C at right angles to the T-slot C⁶. When the attachment is to be secured in the position shown in Fig. 2, the recess C⁷ is fitted over the end of the center-head arm E' and the clamping-bolts C⁹ tightened to clamp the attachment firmly to the arm. In passing the upper end of the support onto the arm E' the slot C⁸ passes over the head of the bolt F³. When the attachment is in proper position, the nut F⁴ is tightened to clamp the bearing-surface C¹⁰ firmly to the bearing-surface F² of the bracket F. When the attachment is secured in this position, the axis of the swivel-head B is at right angles to the axis of the spindle E, and by means of the swivel-head the attachment-spindle A may be adjusted in a plane parallel to the axis of the spindle E. In this position of the attachment the spindle A is driven through a gear G, engaging a gear G', secured to the concentric gear D, Fig. 3. The gear G is formed on the end of a sleeve G², mounted in the support C with its axis at right angles to the axis of the sleeve G². This sleeve G² forms a hollow driving-shaft, which may be connected with the spindle E by the arbor D³ in the same manner that the shaft D² is connected with the spindle E in Fig. 4. The shaft G² is so arranged that when the attachment is secured in the position indicated in Fig. 2 its axis is substantially in line with the axis of the spindle E. The shaft G² is provided with slots G³, similar to the slots D⁵, for receiving the keys D⁴ of the arbor D³.

What I claim, and desire to secure by Letters Patent, is—

1. A vertical spindle attachment for horizontal milling-machines, comprising a support, a swivel-head thereon, a spindle mounted on said head, devices for attaching the support to a milling-machine with the axis of the swivel-head parallel to the axis of the machine-spindle, a second set of securing devices for attaching the support to the milling-machine with the axis of the swivel-head at right angles to the axis of the machine-spindle, and driving means for connecting the attachment-spindle with the machine-spindle in either position of the support, substantially as described.

2. A vertical spindle attachment for horizontal milling-machines, comprising a support, a spindle mounted thereon, means or

adjusting the spindle in a vertical plane, devices for attaching the support with the plane of the spindle adjustment parallel to the axis of the machine-spindle, a second set of devices for attaching the support with the plane of the spindle adjusted at right angles to the axis of the machine-spindle, and driving means for connecting the attachment-spindle with the machine-spindle in either position of the support, substantially as described.

3. A vertical spindle attachment for horizontal milling-machines comprising a support, a swivel-head thereon, a spindle on said head, two sets of attaching connections arranged at right angles to each other, and correspondingly-arranged driving connections for connecting the spindle and machine-spindle, substantially as described.

4. A vertical spindle attachment for horizontal milling-machines comprising a support, a swivel-head thereon, a spindle in said head, two sets of devices for attaching said support to a machine with the axis of said head in either of two positions at right angles to each other, and driving connections for connecting the spindle with the machine-spindle in either position of the support, substantially as described.

5. A vertical spindle attachment for horizontal milling-machines comprising a support, a spindle mounted thereon, means for securing the support to the center-head arm of a milling-machine, means for securing the support to the vertical ways of the machine, a hollow driving-shaft connected with the spindle, and a driving-arbor between the machine-spindle and shaft smaller than the bore in the shaft and connected therewith by a key and slot, substantially as described.

6. A vertical spindle attachment for horizontal milling-machines comprising a support provided with a clamp for engaging the center-head arm of a milling-machine, a bracket for rigidly securing the support to the frame of the machine, a spindle mounted on said support, a hollow driving-shaft connected with said spindle, and a driving-arbor smaller than the bore of said shaft and connected therewith by a key and slot, substantially as described.

7. A vertical spindle attachment for horizontal milling-machines comprising a support rigidly supported independently of the machine-spindle, a spindle mounted on said support, a hollow driving-shaft connected with said spindle, and a driving-arbor smaller than the bore of said shaft and connected thereto by a sliding connection, substantially as described.

8. A vertical spindle attachment for horizontal milling-machines, comprising a support, a swivel-head thereon, a spindle mounted on said head, two driving connections ar-

ranged at right angles to each other, a set of securing devices for securing the support to a milling-machine with one of the driving connections in position for connection with the machine-spindle, and a second set of securing devices for securing the support to a milling-machine with the other driving connection in position for connection with the machine-spindle, substantially as described.

9. A vertical spindle attachment for horizontal milling-machines, comprising a support, a spindle mounted thereon, two driving connections arranged at right angles to each other, two sets of securing devices correspondingly arranged for securing the support to a milling-machine with either driving connection in position for connection with the machine-spindle, substantially as described.

10. A vertical spindle attachment for horizontal milling-machines, comprising a support, a swivel-head thereon, a spindle mounted on said head, a driving-shaft concentric with the head, gearing between said shaft and spindle, a second driving-shaft at right angles to the first and geared to the spindle, and two sets of securing devices corresponding to the two driving-shafts for securing the support to a milling-machine with either driving-shaft in position for connection with the machine-spindle, substantially as described.

11. A vertical spindle attachment for horizontal milling-machines, comprising a support, a swivel-head, a spindle mounted thereon, a gear concentric with the head, a gear connected with the spindle engaging said concentric gear, two driving connections at right angles to each other and connected to drive said gear, and two correspondingly-arranged sets of securing devices for securing the support to a milling-machine with either driving connection in position for connection to the milling-machine spindle, substantially as described.

12. A vertical spindle attachment for horizontal milling-machines comprising a support, a swivel-head thereon, a spindle mounted on said head, two driving connections arranged at right angles to each other, two correspondingly-arranged clamps for securing the support in position with either driving connection in line with the machine-spindle, substantially as described.

13. A vertical spindle attachment for horizontal milling-machines comprising a support, a swivel-head thereon, a spindle mounted on said head, two driving connections arranged at right angles to each other, and having two correspondingly-arranged clamping-openings for engaging the center-head arm of the machine, substantially as described.

14. A vertical spindle attachment for horizontal milling-machines comprising a sup-

port, a swivel-head theeron, a spindle mounted on said head, two driving connections arranged at right angles to each other, said attachment having two correspondingly-arranged clamping-openings for engaging the center-head arm, two correspondingly-arranged T-slots in the support, and a bracket provided with a bolt for engaging said slots, substantially as described.

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