G. G. PORTER & F. E. CABLE.

UNIVERSAL MILLING ATTACHMENT.

APPLICATION FILED MAR. 22, 1909.

943,845. Patented Dec. 21, 1909.

3 SHEETS—SHEET 1.

Fig. 1.

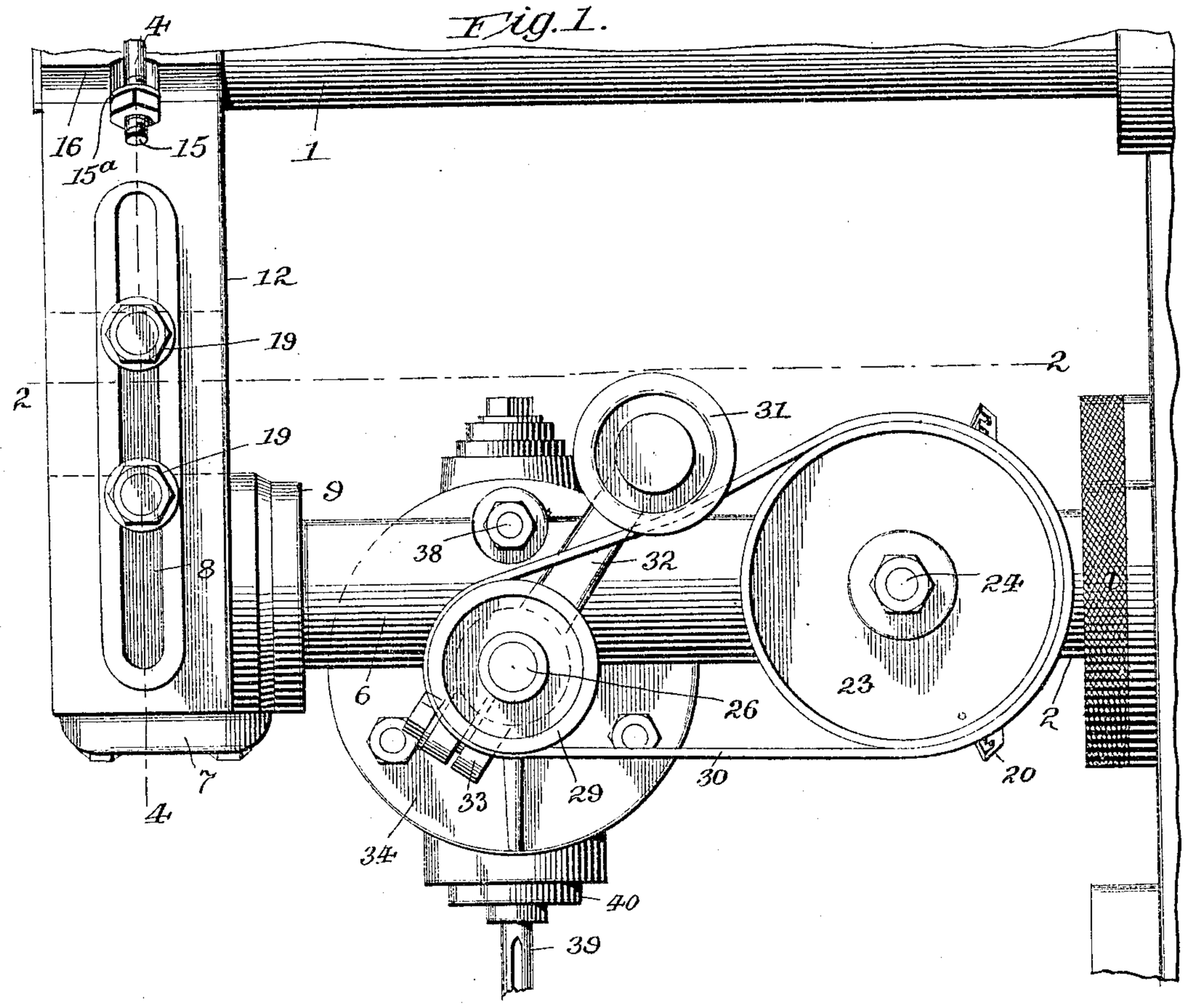
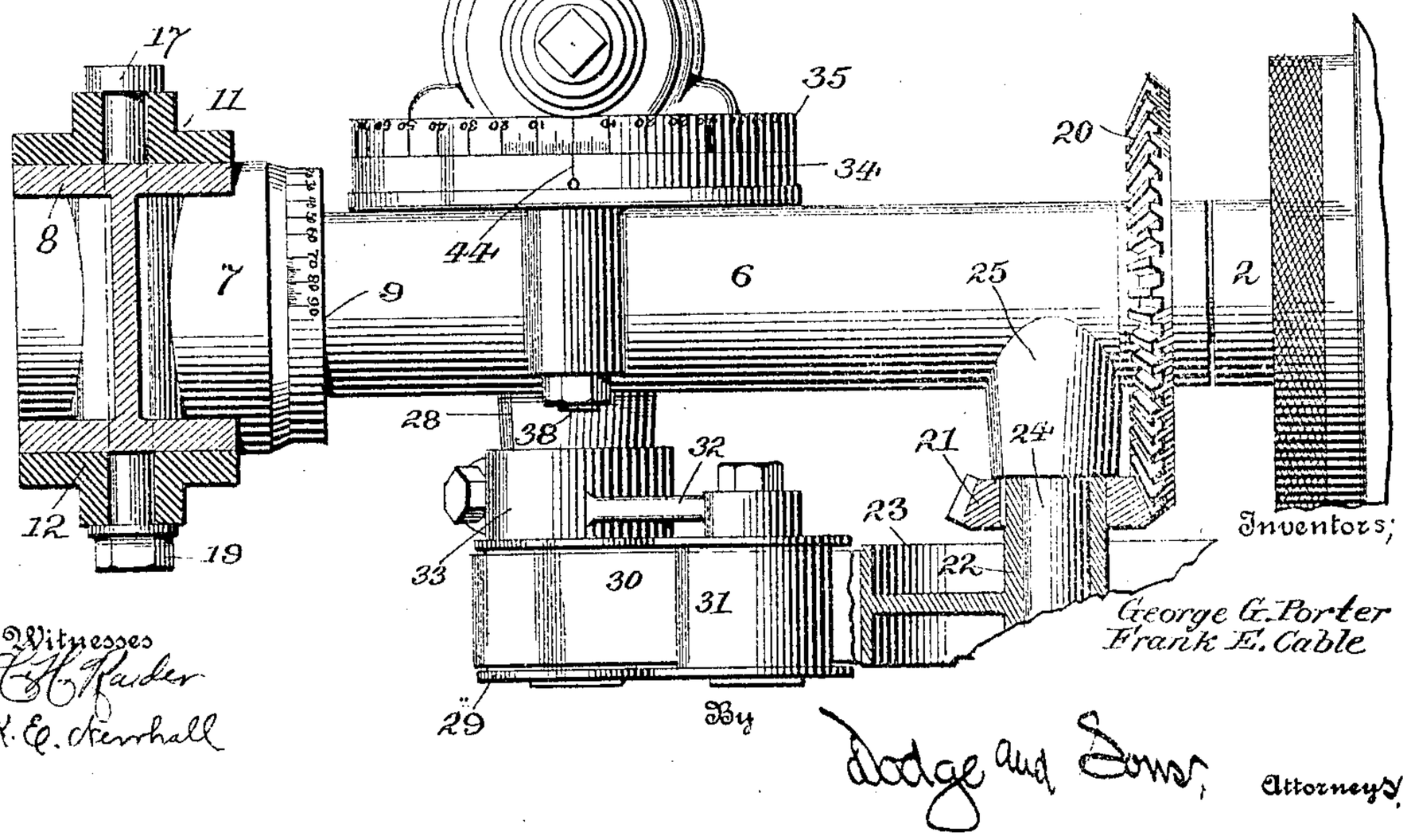


Fig. 2.



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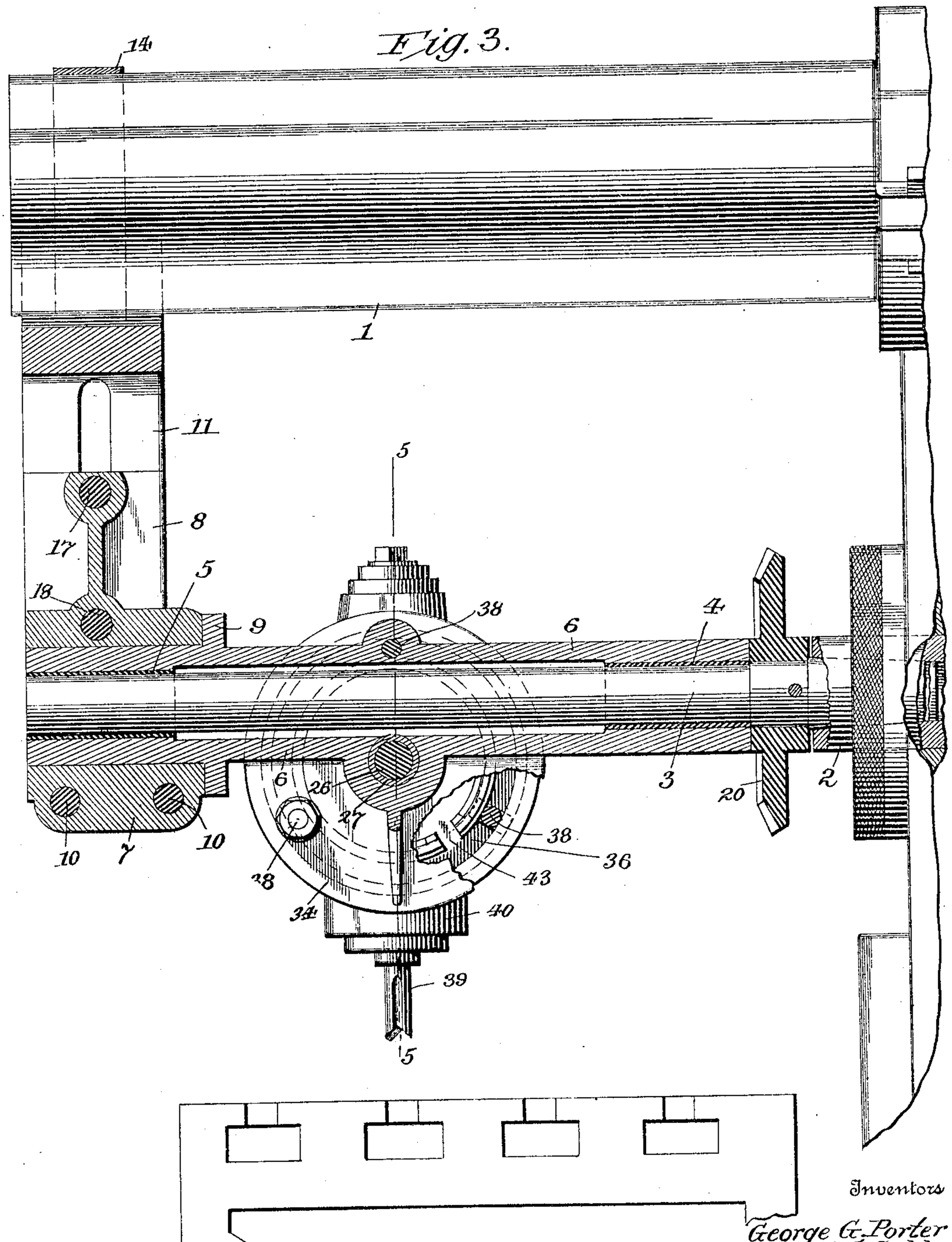
3 SHEETS—SHEET 2.

Fig. 3.



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3 SHEETS—SHEET 3.

Fig. 8.

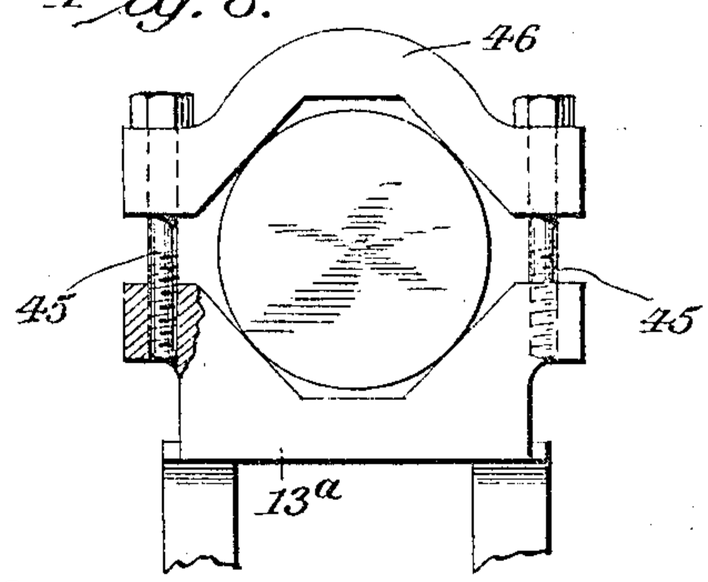


Fig. 4.

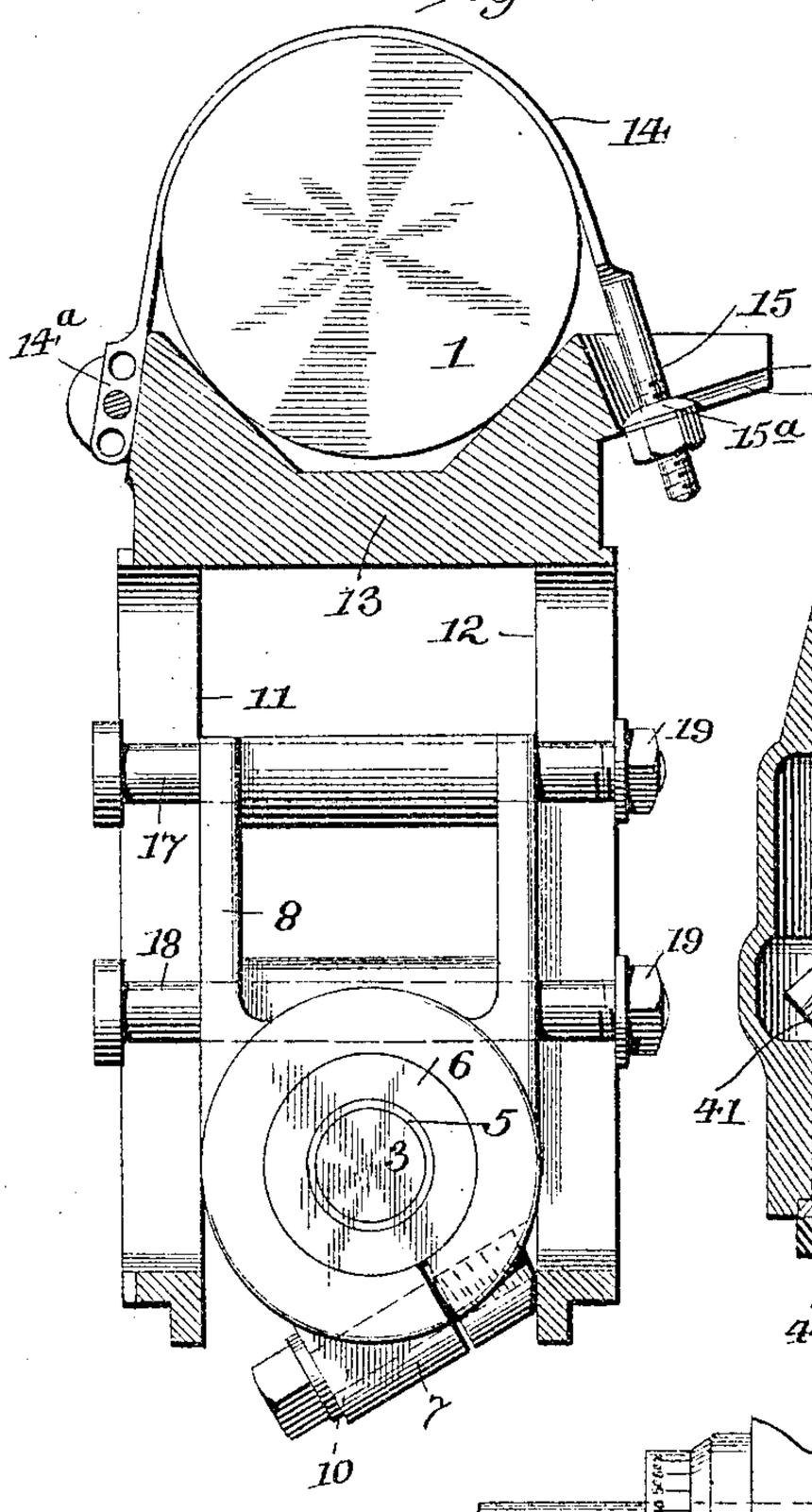


Fig. 5.

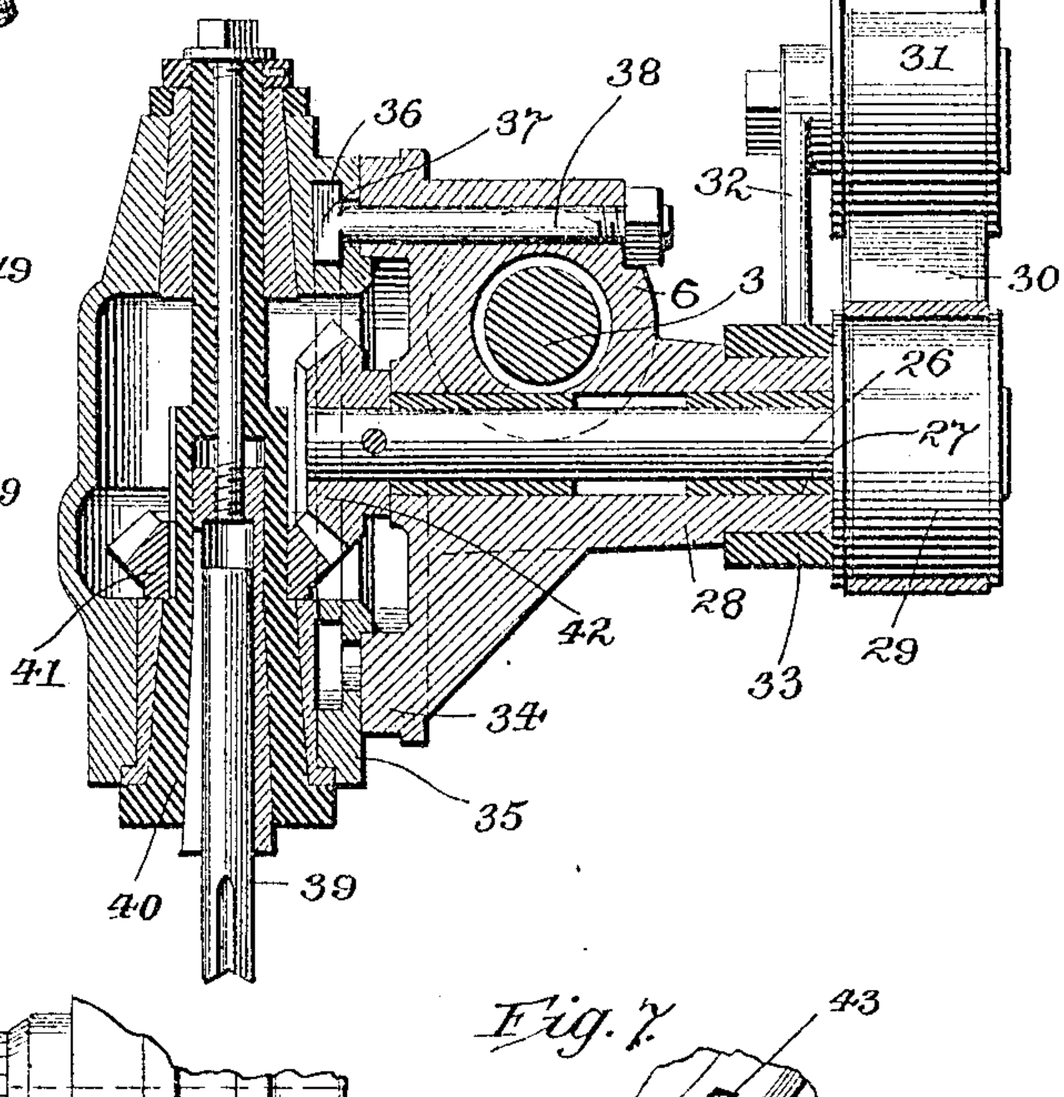


Fig. 6.

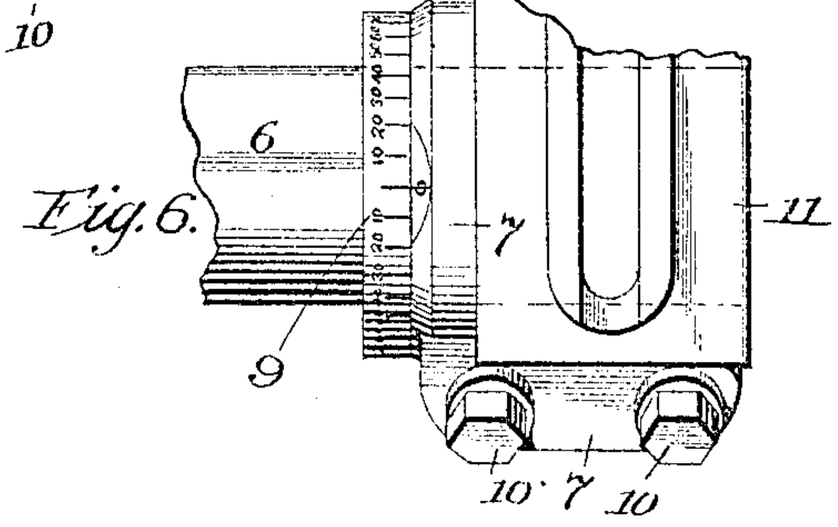
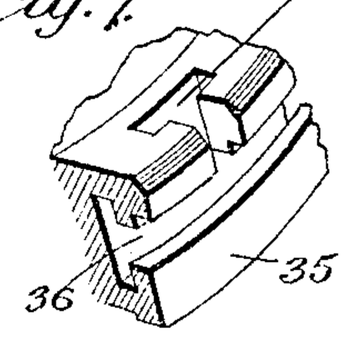


Fig. 7.



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UNITED STATES PATENT OFFICE.

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UNIVERSAL MILLING ATTACHMENT.

943,845. Specification of Letters Patent. **Patented Dec. 21, 1909.**

Application filed March 22, 1909. Serial No. 485,101.

To all whom it may concern:

Be it known that we, GEORGE G. PORTER and FRANK E. CABLE, citizens of the United States, residing at Syracuse, in the county of Onondaga and State of New York, have invented certain new and useful Improvements in Universal Milling Attachments, of which the following is a specification.

Our present invention pertains to universal milling attachments adapted for use in conjunction with the ordinary standard milling machines now upon the market, the construction and advantages of which attachment will be hereinafter set forth, reference being had to the annexed drawings, wherein:

Figure 1 is a side elevation of the attachment shown as applied to a milling machine; Fig. 2 a horizontal sectional view, taken on the line 2—2 of Fig. 1; Fig. 3 a longitudinal vertical sectional view of the device; Fig. 4 a like view, taken on the line 4—4 of Fig. 1; Fig. 5 a similar view, taken on the line 5—5 of Fig. 3; Fig. 6 a detail view of the lower portion of the combined clamping and supporting member which carries the bearing for the outer end of the arbor or shaft; Fig. 7 a detail perspective view of a portion of the head; and Fig. 8 a detail view showing a modified form of the clamping member.

The main object of the invention is to provide a milling attachment which may be secured to any standard milling machine, the attachment permitting the use of small mills which may be operated at a high speed. The construction is such that any angle in the work may be reached and the position of the cutter readily changed and accurately adjusted. The combined supporting and clamping member permits of the attachment being used on different sizes and makes of machines, and furthermore, the fact that the tool is belt-driven prevents breakage of the parts should the tool become cramped and, by reason of the belt-tightener which is employed, permits the belt to be adjusted to the proper tension in accordance with the size and strength of the tool being used. In other words, it provides an adjustable friction drive.

With these and other advantages in view, a detailed description of the invention will be given.

Referring to the construction shown in Figs. 1 to 7, inclusive, 1 denotes the overhanging arm of the usual milling machine and 2 the main driving spindle of said machine which, as shown in Fig. 3, is provided with a tapered socket adapted to receive the tapered end of a driving arbor 3, and to impart motion thereto. Said arbor finds its bearings in sleeves 4 and 5 mounted in a frame or housing 6, the outer end of which passes into a split boss 7 formed upon the lower end of a slide 8. The frame, adjacent to the boss, is formed with a collar 9, and the boss is provided with two bolts 10 by which it may be clamped upon the frame after said frame has been brought to its desired adjusted position with reference to the boss. The slide 8 is mounted between two downwardly-extending arms 11 and 12 which are formed integral with a bearing-block 13 which is provided with a V in its upper face adapted to bear against the overhanging arm 1 when the parts are positioned.

A flexible strap 14, preferably machined from solid, cold-rolled steel, is employed to secure the bearing-block 13 to the overhanging arm 1. Said strap, as will best be seen upon reference to Fig. 4, is provided at one end with a block 14^a through which a series of holes is formed, while the opposite end is provided with a threaded stem 15 which passes between the ears or lugs 16 extending outwardly from the bearing block. A washer 15^a is passed upon the threaded end and a nut underlying said washer forces the washer upwardly into a recess formed in the lugs by the provision of grooves or cut-away portions 16^a. This construction insures the proper seating of the parts. By the employment of the threaded stem 15 and the block 14^a, with the various openings or holes formed therein, the bearing-block 13 may be readily secured to the overhanging arm 1 of any machine, said arms in practice varying with different machines. The construction gives sufficient range to meet the requirements of all commercial machines now in use.

The depending arms 11 and 12 are provided with oppositely disposed slots through which pass bolts 17 and 18, said bolts likewise extending through the slide 8. By tightening the nuts 19, mounted upon the bolts, the slide may be secured in its adjusted position with relation to the arms or to

the supporting frame composed of the arms, the bearing-block and the clamping member or strap 14.

From this it will be seen that this device may be adapted to machines of various sizes in which the center distance between the overhanging arm and the spindle varies, and also to machines wherein the sizes of diameters of the overhanging arms vary.

It will be understood that the arbor 3 is properly alined with the spindle after which the supporting frame is secured in position, thus maintaining such alinement and preventing vibration of the parts.

In Fig. 8 is shown a slightly modified form of the clamp for securing the supporting frame to the overhanging arm. The member 13ª corresponds to the member 13 in the other construction and its ears are threaded and designed to receive the threaded ends of bolts 45, which bolts pass through a yoke 46 which overlies the arm. By tightening up the bolts the parts will be securely clamped to the overhanging arm. This construction does not, however, permit such a wide range of adjustment as may be had with that shown in the other figures, which is the preferred form.

The constructions above set forth form what may be termed an adjustable supporting member.

Secured to the arbor 3 adjacent to the spindle is a bevel-gear 20 which gear in turn meshes with a somewhat smaller gear 21 fixed upon the extended hub 22 of a belt-pulley 23, the hub finding its bearing upon a fixed shaft or arm 24 secured in a lug or boss 25 formed as an integral portion of the frame 6.

A shaft 26, see Fig. 5, finds its bearings in bushings 27 mounted on the frame 6 and a boss or lateral extension 28 thereof, said shaft having secured to its outer end a belt-pulley 29. An endless belt 30 passes around said pulley 29, the pulley 23 and beneath an idler 31, which latter is mounted upon the outer end of an arm 32, said arm extending outwardly from a split bushing 33 which encircles the outer end of the boss or extension 28 and is clamped thereon when brought to such position that the belt 30 is given the desired tension, according to the size of the tool being employed.

The frame 6 is formed with what may be termed a "bearing plate or supporting member" 34, which encircles or surrounds the shaft 26 and is faced off to receive the corresponding face of the head 35 in which latter the socket for the tool is mounted. Said head, as will be seen upon reference to Figs. 3, 5 and 7 is provided with an undercut T-shaped slot 36, adapted to receive the heads 37 of the bolts 38, two of which latter pass through the bearing-plate 34, while the upper or third bolt, as seen upon reference to Fig. 5, passes through the main body of the frame 6. By tightening the nuts upon these bolts the head will be securely clamped to the supporting plate, but the arrangement is such that when the bolts are loosened the head may be rotated with reference to the supporting-plate so as to secure any desired adjustment of the head, and consequently of the milling tool 39 which is mounted in the tool-socket 40 carried by the head. Rotary motion is imparted to the socket by a bevel-gear 41 which is secured to the socket, to which motion is given by a similar gear 42 secured to the inner end of the shaft 26. In order that the T-heads 37 of the bolts may pass into the slot 36, a T-shaped opening 43 (Figs. 3 and 7) is formed in the wall of the head, which opening connects with the slot 36.

The head 35, as will be seen upon reference to Fig. 2, is provided with a series of graduations, from 0 to 90, in opposite directions from a medial point, which graduations may be read in conjunction with a mark 44 upon the frame 6, or the bearing-plate 34 thereof. By loosening the bolts 38 the head may be adjusted in any position about the axis of the shaft 26 in a plane parallel to the main driving arbor, 3.

The collar 9, as will be noted upon reference to Figs. 2 and 6, is likewise provided with a series of graduations from 0 to 90 in each direction and said graduations are adapted to be read in conjunction with a zero mark (see Fig. 6) formed upon the split boss 7.

By loosening the bolts 10 the frame 6 may be swung about the main driving arbor 3 and the milling tool brought to any position or relation desired with reference to said arbor or to the work. By having these two adjustments in planes at right angles to each other, a universal adjustment of the tool may be effected and the tool brought to any desired or necessary position and there clamped, and this without in any manner affecting the driving mechanism which, as will be noted, is carried by the main frame 6, with the exception of the bevel-gear 20, which is secured to the arbor 3, and with which the bevel-gear 21 will always mesh.

It will, of course, be understood that when placing the machine upon the market the tapered end of the arbor 3 will be formed to meet any special requirement, or the taper will be made of a standard size and the connection between the spindle and the arbor effected by tapered bushings, which are commonly employed in machines of this character.

It will be noted that with the gearing as shown the tool may be driven at a very high speed, which speed, of course, may be varied by substituting gears or pulleys of different sizes.

Should the tool become bound or cramp in the work, it will, as before noted, simply come to rest and the belt will slip, so that none of the parts will be subjected to undue strain and consequently no breakage will take place.

Having thus described our invention, what we claim is:

1. In combination with a frame; an arbor rotatably mounted therein and provided at one end with means to connect it to or with the spindle of a milling machine; an adjustable member adapted to be secured to the overhanging arm of the machine for supporting the frame aforesaid; a tool-holder carried by the frame; and a driving mechanism for said tool-holder.

2. In combination with a frame; an arbor rotatably mounted therein and provided at one end with means to connect it to or with the spindle of a milling machine; an adjustable supporting and clamping member at the outer end of the frame adapted to be secured to the overhanging arm of the milling machine and to hold said frame in its adjusted position; a tool-holder supported by the frame; and means carried by the frame for imparting motion from the arbor to the tool-holder.

3. In combination with a frame; an arbor rotatably mounted therein and provided at one end with means to connect it to or with the spindle of a milling machine; an adjustable supporting member for the frame adapted to be secured to the overhanging arm of the machine, said frame being adjustable about its axis within the supporting member; a tool-holder supported by the frame; and means carried by the frame for imparting motion from the arbor to the tool-holder.

4. In combination with a frame; an arbor rotatably mounted therein and adapted to be connected to the spindle of a milling machine; an extensible supporting member for one end of the frame; means for clamping the same to the overhanging arm of the milling machine; a tool-holder; means for securing a universal adjustment of the same; and means for rotating the tool-holder.

5. In combination with a frame; an arbor rotatably mounted therein and adapted to be connected to the spindle of a milling machine; an adjustable supporting member for the outer end of the frame, the frame being adjustable about its axis in said member; adjustable means for securing the supporting member to the overhanging arm of the milling machine; a tool-holder adjustably mounted on the frame; the plane through which the adjustment may be made being at right angles to the axial adjustment of the frame; and means actuated from the arbor for rotating the tool-holder.

6. In combination with a frame; an arbor rotatably mounted therein and adapted to be connected at one end to the spindle of a milling machine; adjustable means for supporting the outer end of the frame; a head adjustably mounted on the frame; a tool-holder rotatably mounted in said head; and means for rotating said holder from the arbor.

7. In combination with a frame; an arbor rotatably mounted therein and adapted to be connected at one end to the spindle of a milling machine; a tool supported by the frame and having a universal adjustment; and frictionally-actuated driving mechanism between the shaft and the tool.

8. In combination with a frame; an arbor rotatably mounted therein and adapted to be connected at one end to the spindle of a milling machine; an extensible supporting member adjustably secured to the outer end of the frame; means for securing said member to the overhanging arm of the milling machine; a countershaft carried by the frame; a head adjustably mounted upon the frame in line with the countershaft; a tool-holder mounted in the head; gearing interposed between the countershaft and the tool-holder; and belt-actuated driving mechanism between the arbor and countershaft.

9. In combination with a frame; an arbor rotatably mounted therein and adapted to be connected at one end to the spindle of a milling machine; a slide provided with a split bushing in which the frame is held and may be rotated to secure axial adjustment; means for clamping the bushing on the frame; a member adapted to be clamped to the overhanging arm of the milling machine; means for securing said member to the slide; a bearing plate formed upon the frame; a head adjustably secured upon the plate; a tool-holder mounted in the head; a countershaft mounted in the frame; gearing interposed between one end of said shaft and the tool-holder; a belt-pulley mounted upon the opposite end of the shaft; a second belt pulley mounted on the frame; gearing actuated by the arbor for rotating said second pulley; a belt passing about the pulleys; and a tension device acting on the belt.

10. In combination with a frame; an arbor rotatably mounted therein and provided with means for connecting the same with or to the spindle of a milling machine; a tool supported by the frame; driving connections between said tool and the arbor; a supporting member for the outer end of the frame; and a flexible strap adjustably secured to the upper portion of the frame and adapted to embrace the overhanging arm of the milling machine and to clamp the frame thereto.

11. In combination with a frame; an arbor rotatably mounted therein and adapted to be connected at one end to the spindle of a milling machine; an adjustable supporting mem-

ber at the outer end of the frame; a flexible strap provided with a head having a series of holes therein and at its opposite end with a threaded stem; means for connecting the head to one side of the adjustable supporting member; means for securing the threaded stem to the opposite side of said member, whereby the strap may be caused to embrace the overhanging arm of the milling machine and to clamp the supporting member thereto; a tool-holder supported by the frame; and means for imparting motion to said tool-holder.

12. In combination with a frame; an arbor rotatably mounted therein and adapted to be connected at one end to the spindle of a milling machine; a tool-holder carried by the frame; means for imparting motion to said tool-holder; an adjustable supporting member at the outer end of the frame adapted to bear at its upper end against the under face of the overhanging arm of the milling machine; a pair of ears extending outwardly from one side of said member, the under face of said ears being recessed; a flexible strap provided with a head at one end, having a series of openings therein; a bolt passing through one of said openings and connecting the head to the upper portion of the supporting member; a threaded stem formed upon the opposite end of the strap, said stem being adapted to pass between the ears aforesaid; a spherical washer mounted upon the stem and adapted, when the strap is drawn tightly around the overhanging arm of the milling machine, to bear in the recessed portion of the ears; and a nut mounted upon the threaded portion below the washer.

13. In a machine of the character specified, the combination of a driving shaft; means for securing a driving connection between the shaft and the spindle of a milling machine; a supporting frame for said shaft, said frame being axially adjustable about the shaft; means for supporting said frame in its axially adjusted position and holding the driving shaft in alinement with the spindle; a tool-holder adjustably mounted on the frame, the plane of adjustment being at right angles to the axis of the driving shaft, whereby a universal adjustment of the tool may be had; and driving connections between said shaft and the tool-holder.

14. In a machine of the character specified, the combination of a driving shaft or arbor; means for securing a driving connection between the shaft and the spindle of a milling machine; a supporting frame for said shaft, the frame being axially adjustable about the shaft; means for supporting said frame in its axially adjusted position and holding the driving shaft in alinement with the spindle; a tool-holder mounted upon the frame, said holder being adjustable in a plane at right angles to the axis of the driving shaft, whereby a universal adjustment of the tool may be had; a gear mounted upon the driving shaft and rotatable at all times therewith; and driving connections between said gear and the tool, said connections being carried by the frame and movable therewith.

15. In a machine of the character specified, the combination of an arbor; means for effecting a driving connection between said arbor and the spindle of a milling machine; a frame for supporting said arbor, the frame being rotatable for adjustment about the axis of the arbor; means for holding and supporting said frame in its axially adjusted position; a tool-holder carried by the frame; and means for driving the tool-holder.

16. In a machine of the character specified, the combination of an arbor; means for effecting a driving connection between said arbor and the spindle of a milling machine; a frame for supporting said arbor, the frame being rotatable for adjustment about the axis of the arbor; means for holding and supporting said frame in its axially adjusted position; a tool-holder carried by the frame; a gear secured to and driven by the arbor; a second gear mounted upon the frame and meshing with the gear aforesaid; and an adjustable friction drive interposed between the gear upon the frame and the tool-holder.

17. In a machine of the character specified, the combination of an arbor; means for effecting a driving connection between said arbor and the spindle of a milling machine; a frame for supporting said arbor, the frame being rotatable for adjustment about the axis of the arbor; means for holding and supporting said frame in its axially adjusted position; a tool-holder carried by the frame, said holder being adjustable in a plane parallel with the axis of the arbor; a gear secured to and driven by the arbor; a second gear mounted upon the frame and meshing with the gear aforesaid; and an adjustable friction drive interposed between the gear upon the frame and the tool-holder.

In testimony whereof we have signed our names to this specification in the presence of two subscribing witnesses.

GEORGE G. PORTER.
FRANK E. CABLE.

Witnesses:
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