G. W. SMITH.

MILLING MACHINE.

APPLICATION FILED MAY 12, 1908.

991,100. **Patented May 2, 1911.**

3 SHEETS—SHEET 1.

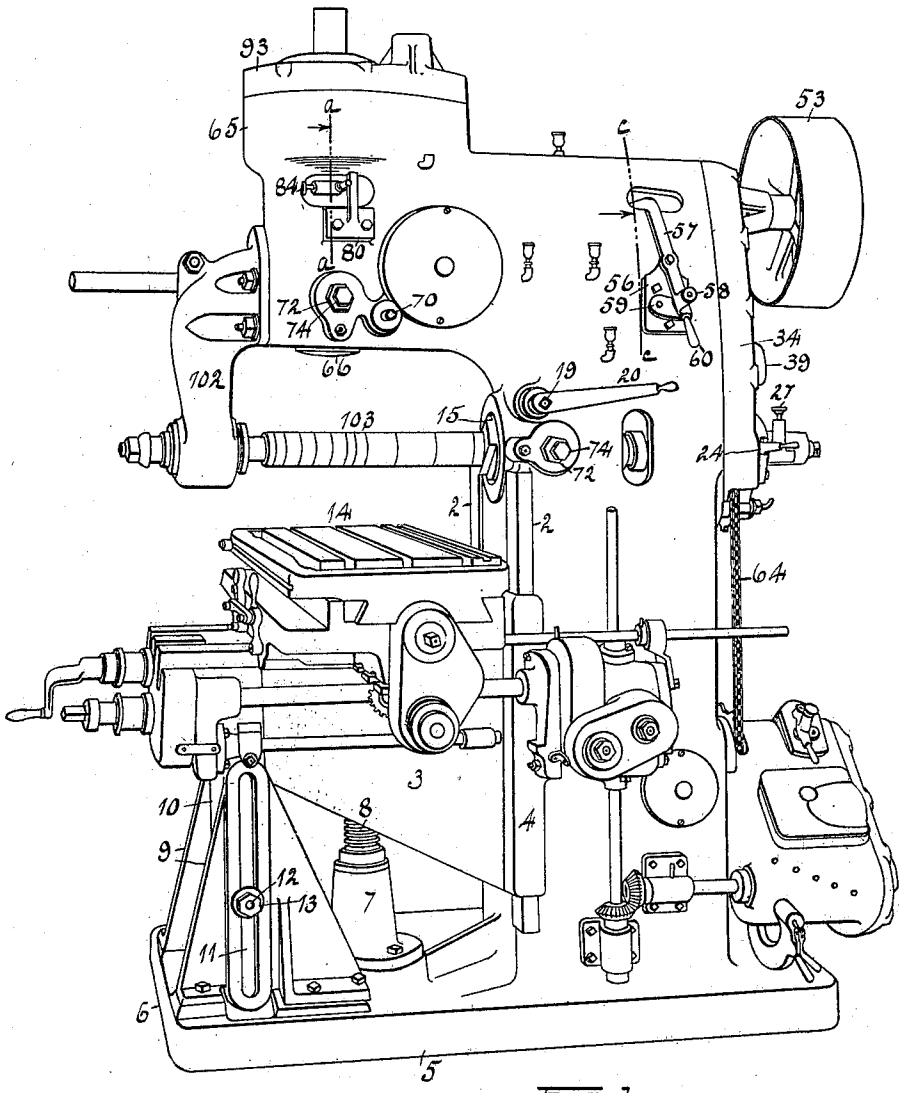

Fig. 1.

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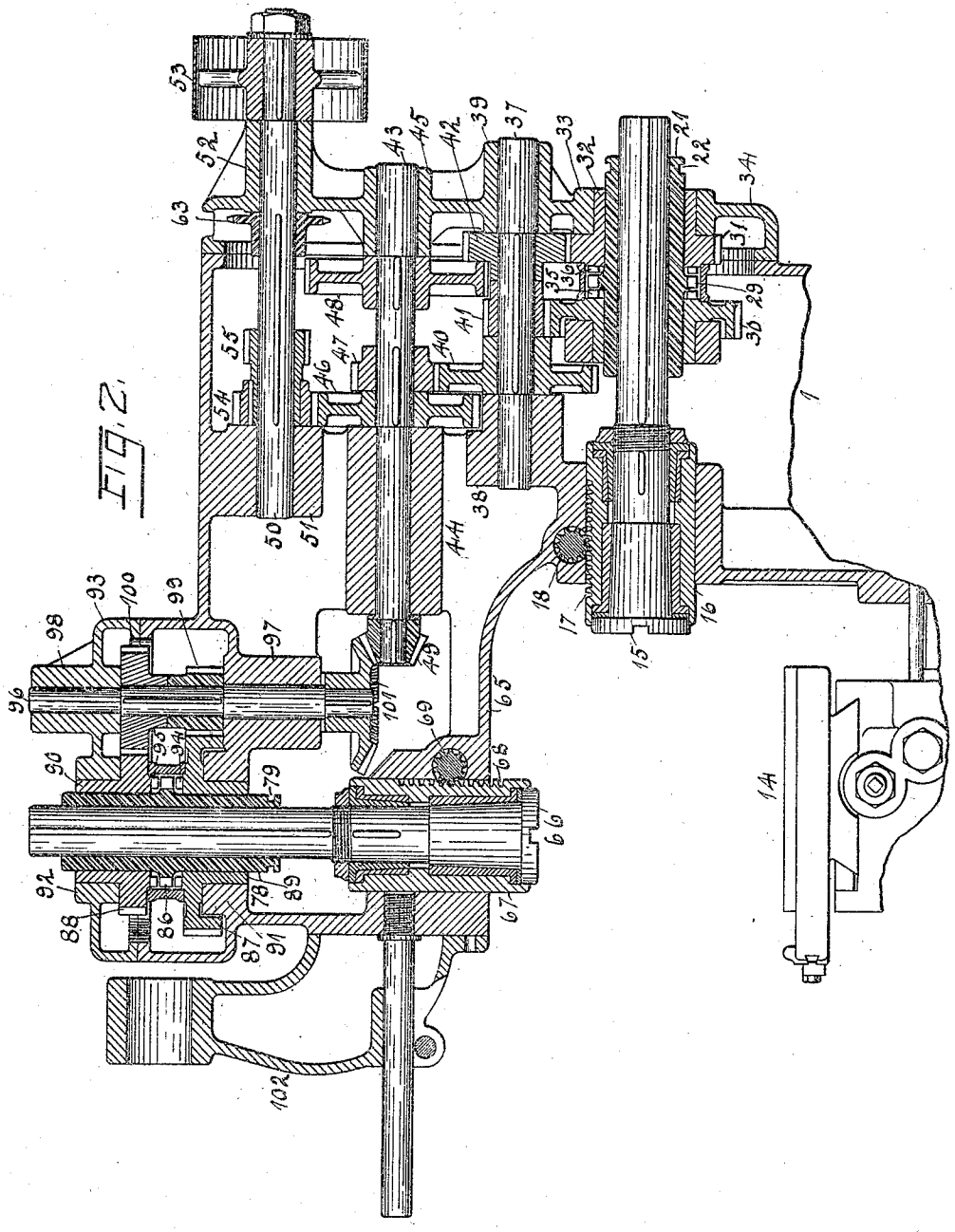

FIG. 2.

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3 SHEETS—SHEET 3.

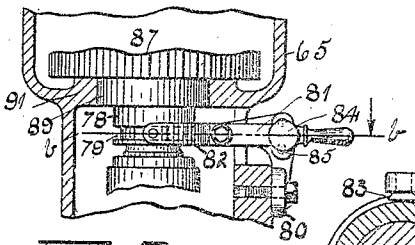


FIG. 3.

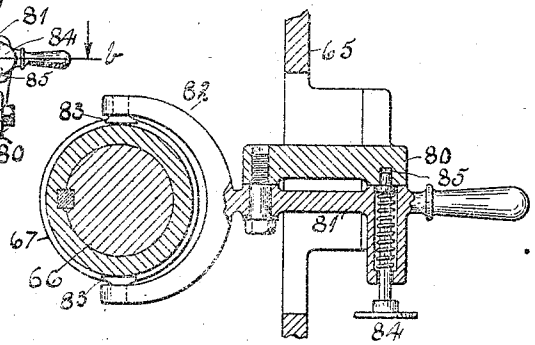


FIG. 4.

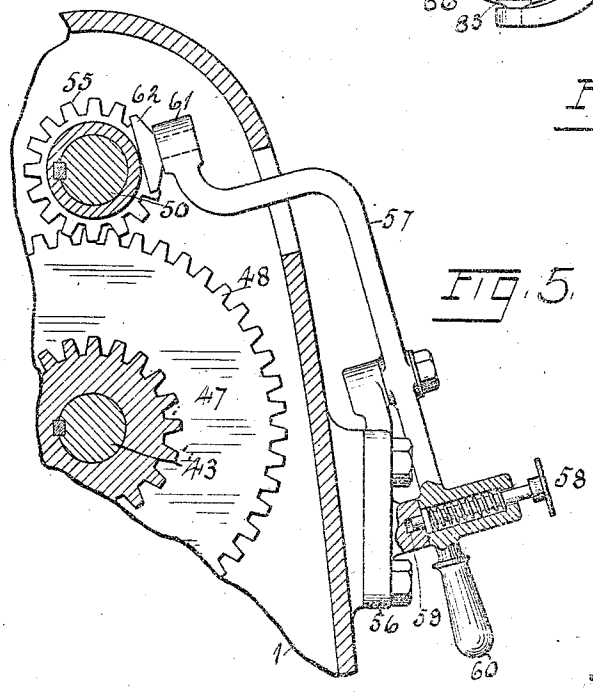
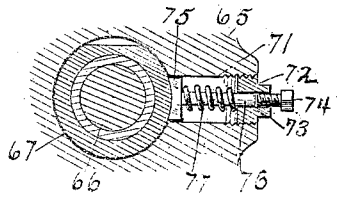


FIG. 5.

FIG. 7.



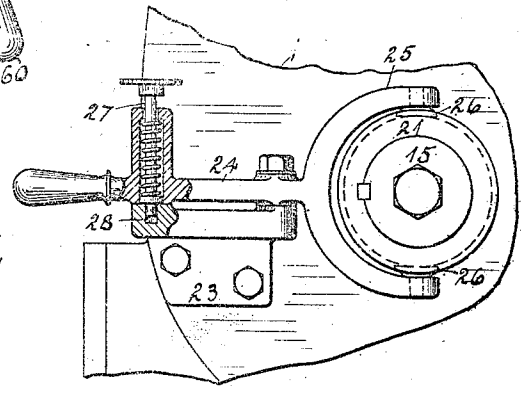


FIG. 6.

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UNITED STATES PATENT OFFICE.

GEORGE W. SMITH, OF ROCKFORD, ILLINOIS, ASSIGNOR TO THE INGERSOLL MILLING MACHINE COMPANY, OF ROCKFORD, ILLINOIS, A CORPORATION.

MILLING-MACHINE.

991,100. Specification of Letters Patent. Patented May 2, 1911.

Application filed May 12, 1908. Serial No. 432,513.

To all whom it may concern:

Be it known that I, GEORGE W. SMITH, a citizen of the United States, residing at Rockford, in the county of Winnebago and State of Illinois, have invented certain new and useful Improvements in Milling-Machines, of which the following is a specification.

The object of this invention is to construct a milling machine having a vertical spindle and a horizontal spindle adapted to be rotated independently and together.

The further object of this invention is to form a brace for the knee.

In the accompanying drawings, Figure 1 is a perspective view of my improved milling machine. Fig. 2 is a vertical central section of the upper portion of the housing and gearing. Fig. 3 is a vertical section on dotted line *a a* Fig. 1 showing the clutch lever for the vertical spindle. Fig. 4 is a section on dotted line *b b* Fig. 5. Fig. 5 is a section on dotted line *c c* Fig. 1, showing the shifter lever for the back gear. Fig. 6 is an end view partly in section of the clutch lever for the horizontal spindle. Fig. 7 is a section of the frictional brake controlling the movements of the spindles.

In the drawings at Fig. 1 I have shown in perspective a complete milling machine, and the parts imparting movement to the table forming no part of this application will not be specifically described or shown in detail, but such parts are located in the main housing 1 on the front face of which are formed vertical guide-ways 2. A knee 3 is formed with guides 4 which slide in connection with the guide-ways 2.

The main housing 1 is supported by the base 5 which has a portion 6 extending beneath the knee 3. To the base 6 beneath the knee 3 is secured a bracket 7 which supports a screw 8, the upper end of which bears against the underface of the knee 3, and supports the central portion of the knee. By turning this screw 8 the knee will be raised and guided by the guide-ways 2. To the base 6 are secured two braces 9 one located each side of the depending arms 10 of the free end of the knee. These braces are formed with vertical slots 11, through which bolts 12 pass, the bolts being supported by the lower ends of the arms 10, and receive nuts 13 on their projecting ends.

After the knee has been adjusted to bring the table 14 supported thereby to the proper height, the nuts 13 are tightened on the bolts 12 thereby binding the arms 10 of the knee to the braces 9 to hold the knee in a rigid manner in conjunction with the screw.

The main housing 1 supports a horizontal spindle 15 around which is located a sleeve 16 provided with a toothed rack 17. A pinion 18 meshes with the toothed rack 17 and has a projection 19 extending through the main housing 1 with which a crank 20 engages for the purpose of turning the pinion thereby extending or withdrawing the horizontal spindle. A clutch sleeve 21 has a splined connection with the horizontal spindle 15, and is adapted to slide in the lengthwise direction of the spindle. The projecting end of this sleeve 21 is formed with an annular groove 22. To the end of the main housing is secured a bracket 23 to which is pivoted a lever 24 having one end 25 in yoke form, and its other end in handle form. The yoke 25 supports two blocks 26 which are located in the annular groove 22 of the sleeve 21. This lever 24 supports a spring actuated plunger 27 which is adapted to enter holes 23 in the bracket thereby locking the lever to the bracket, and by means of this lever, the sleeve 21 can be moved in the lengthwise direction of the spindle 15. The center portion of this sleeve 15 is formed with radially extending projections 29.

On the sleeve 21 are mounted two spur gears 30 and 31 of varying diameters in a manner to turn freely thereon. The hub 32 of the gear 31 is supported in a bearing 33 in the back cover 34 for the main housing. The gears 30 and 31 are formed with facing projections 35 and 36 respectively, forming clutch sections, and are located so that the projections 29 of the sleeve 21 may enter between them, thereby forming a driving connection between either of the gears and the sleeve, and through the sleeve with the horizontal spindle 15.

A horizontal drive shaft 37 is supported in bearings 38 and 39 formed in the main housing 1 and in the back cap 34 for the housing respectively. To this drive shaft 37 are splined spur gears 40, 41 and 42 of varying diameters. The gear 41 meshes with the gear 30, and the gear 42 meshes with the gear 31. A back gear shaft 43 is supported in bearings 44 and 45, and has three spur gears 46, 47, and 48, splined to it. The

gear 47 on this back gear shaft meshes with the gear 40 on the horizontal drive shaft 37. To the inner end of this back gear shaft 43 is fixedly secured a bevel-pinion 49. A drive pulley shaft 50 is supported in bearings 51 and 52, and a pulley 53 has a fixed connection with this shaft. On this shaft is splined the double spur gear comprising the two sections 54 and 55 of varying diameters, and are capable of being moved in the lengthwise direction of the shaft.

A bracket 56 is secured to the main housing, and to it is pivoted a back gear shifter lever 57 having a spring actuated plunger 58 fitted to enter the holes 59 in the bracket so as to hold the lever from movement. One end of the lever is formed with the handle 60 and the other end 61 supports a block 62 which is located between the gear sections 54 and 55. By means of this lever, the gear sections 54 and 55 can be shifted along the shaft 50 so as to hold the gear sections 54 in engagement with the gear wheel 46, or the gear section 55 in engagement with the gear wheel 48. With the gear section 54 in engagement with the gear 46, the gear 47 in engagement with the gear 40, the gear 41 in engagement with the gear 30, and the projections 29 of the sleeve 21 in engagement with the gear 30, a connection will then be made with the spindle 15. If the projections 29 of the sleeve 15 be moved into engagement with the gear 31, a different speed will be imparted to the spindle. By moving the gear section 55 into engagement with the gear 48 different speeds will be imparted to the gears 30 and 31, and by placing the sleeve 21 into engagement alternately with the gears 30 and 31 two other speeds will be imparted to the horizontal spindle thus making four different speeds that can be imparted to the horizontal spindle 15.

To the pulley shaft 50 is secured a sprocket wheel 63 and a chain belt, 64 connects this wheel with the mechanism for imparting various movements to the table 14, which forms no part of this application.

From the upper end of the main housing 1 projects an overhanging housing 65 which is some distance above and over the table 14, and above the horizontal spindle 15 thereby leaving sufficient space for work to be placed on the table. This overhanging housing 65 supports a vertical spindle 66 around which is located a sleeve 67 provided with a toothed rack 68. A pinion 69 meshes with the toothed rack and has a projection 70 extending through the overhanging housing 1 with which the crank 20 may be placed in engagement for the purpose of turning the pinion, thereby raising or lowering the vertical spindle 66.

At Fig. 7 is shown a sectional view of the frictional brake for the sleeve of both spindles; like reference numerals will be applied to both. The housing is formed with a screw-threaded opening 71 within which is screw-threaded a plug 72 which has a central screw-threaded opening 73 within which is turned a plug 74. A brake shoe 75 is fitted to the outer face of the sleeve 67 and has a rod 76 extending within the central opening 73 of the plug 72. A spring 77 surrounds this rod, one end bearing against the plug 72 and its other end against the shoe 75. The action of this spring is to hold the shoe against the sleeve with sufficient force to prevent its accidental movement. By turning in the plug 74 its inner end will rest against the end of the rod 76, and will seat the shoe 75 firmly against the sleeve, thereby locking the sleeve against movement.

A clutch sleeve 78, has a splined connection with the vertical spindle, and is adapted to slide in the lengthwise direction of the spindle. The lower projecting end of the sleeve 78 is formed with an annular groove 79. To the overhanging housing is secured a bracket 80 to which is pivoted a lever 81 having one end 82 in yoke form, and its other end in handle form. The yoke 82 supports two blocks 83 which are located in the annular groove 79 of the sleeve 78. This lever 81 supports a spring actuated plunger 84 which is adapted to enter holes 85 in the bracket 80, thereby locking the lever to the bracket, and by means of this lever, the sleeve 78 can be moved in the lengthwise direction of the spindle 66. The center portion of this sleeve 79 is formed with radially extending projections 86.

On the sleeve 78 are mounted two spur gears 87 and 88 of varying diameters in a manner to turn freely thereon. The hubs 89 and 90 of the gears 87 and 88 respectively are located in bearings 91 and 92 formed in the overhanging housing and the cap 93 for the housing respectively. The gears 87 and 88 are formed with facing projections 94 and 95 respectively, forming clutch sections, and are located so that the projections 86 of the sleeve 78 may enter between them, thereby forming a driving connection between either of the gears and the sleeve, and through the sleeve with the vertical spindle.

A vertical drive shaft 96 is supported in bearings 97 and 98 formed in the overhanging housing 65 and in the cap 93 for this housing respectively. To this drive shaft 96 are splined two spur gears 99 and 100 of varying diameters. The gear 99 meshes with the gear 87 and the gear 100 meshes with the gear 88. This vertical drive shaft 96 has a bevel gear 101 secured to its lower end, and meshes with the bevel pinion 49 secured to the back gear shaft 43.

As before explained the back gear shaft 43 is given two different speeds by the engagement of the gear sections 46 and 48 with

the spur gears 54 and 55 respectively, and these two speeds will be transmitted to the vertical drive shaft 96 through the bevel pinion 49 and bevel gear 101.

As the gears 87 and 88 are driven at different speeds, and the sleeve 78 is capable of being placed in engagement with either gear, the vertical spindle 66 will be driven at two different speeds, and by changing the positions of the gear sections 54 and 55 with relation to the spur gears 46 and 48 two other speeds will be imparted to the vertical spindle. The four movements of the vertical spindle are the same as the four movements of the horizontal spindle 15. These spindles are adapted to support cutters which operate upon two sides of work placed on the table 14.

At Fig. 1 is shown an arbor support 102 in its connection with the overhanging housing 65, and an arbor 103 is held in working position by the support and the horizontal spindle 15.

By means of the slidable sleeves 21 and 78 the horizontal and vertical spindles 15 and 66 respectively can be held out of action without stopping the rotations of the gearing connecting the spindles with the drive pulley 53 and either spindle can be thrown into action, or both spindles can be in action at one time.

I claim as my invention:

1. In a milling machine, the combination with a frame, of a horizontal spindle journaled therein, a vertical spindle journaled therein, a shaft, means for driving the shaft at different speeds, and changeable speed gearing for transmitting motion from the shaft to either spindle independently of the other.

2. In a milling machine, the combination with a frame, of a horizontal spindle journaled therein, a vertical spindle journaled in the frame, a shaft, and different sets of gears for transmitting motion from the shaft to the respective spindles, said gears including clutches by which either or both spindles may be operated from said shaft.

3. In a milling machine, the combination with a frame, of a horizontal spindle journaled therein, a vertical spindle journaled therein, a shaft, means for driving the shaft at different speeds, and separate sets of changeable speed gearing for transmitting motion from the shaft to the respective spindles, said sets including clutches by which either or both spindles may be operated from said shaft.

4. In a milling machine, the combination with a frame having an overhanging portion, of a horizontal spindle journaled in the frame, a vertical spindle journaled in the overhanging portion, a back shaft, a main driving shaft, changeable speed gearing for transmitting motion from the main driving shaft to the back shaft, a set of changeable speed gearing for transmitting motion from the back shaft to the horizontal spindle, a vertical shaft geared to the back shaft, and changeable speed gearing for transmitting motion from the vertical shaft to the vertical spindle.

5. In a milling machine, the combination with a frame, of a vertical spindle journaled therein, a horizontal spindle journaled therein, driving means, and separate sets of changeable speed gearing for transmitting motion from the driving means to the respective spindles to permit said spindles to be operated either separately or simultaneously and either spindle to be driven at a faster or slower speed than the other.

In testimony whereof I have hereunto set my hand in presence of two subscribing witnesses.

GEORGE W. SMITH.

Witnesses:
A. O. BEHEL,
E. D. E. N. BEHEL.