(No Model.) 2 Sheets—Sheet 1.

C. H. PHILLIPS.

MILLING MACHINE.

No. 343,846. Patented June 15, 1886.

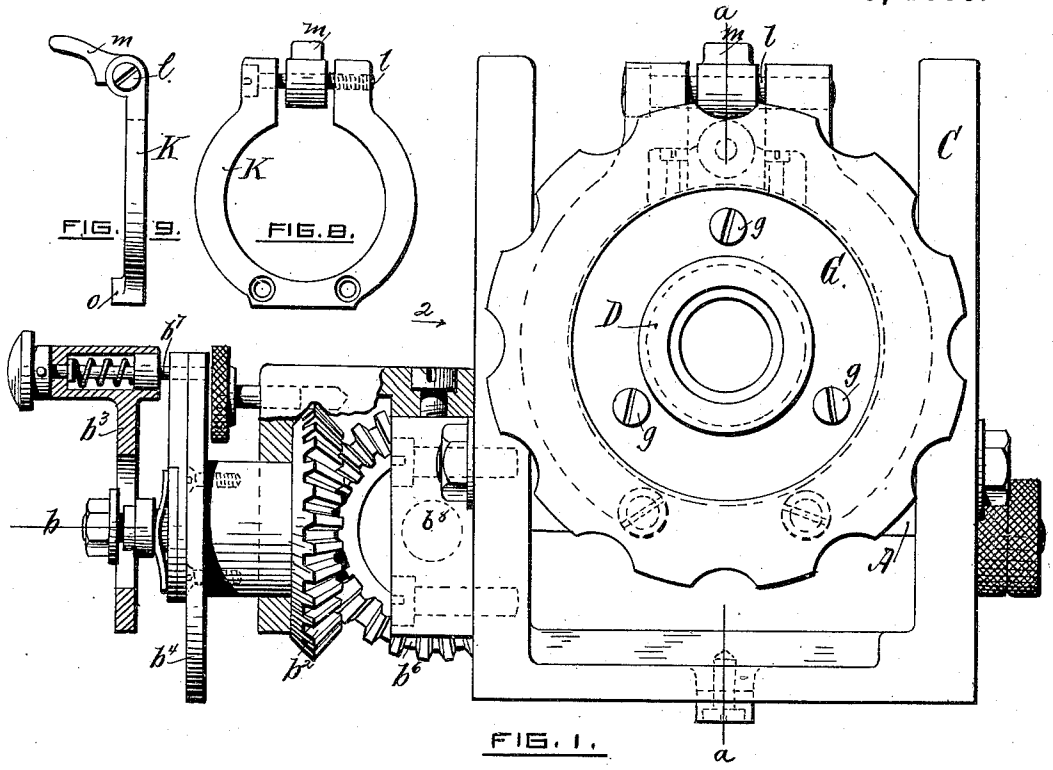


FIG. 1.

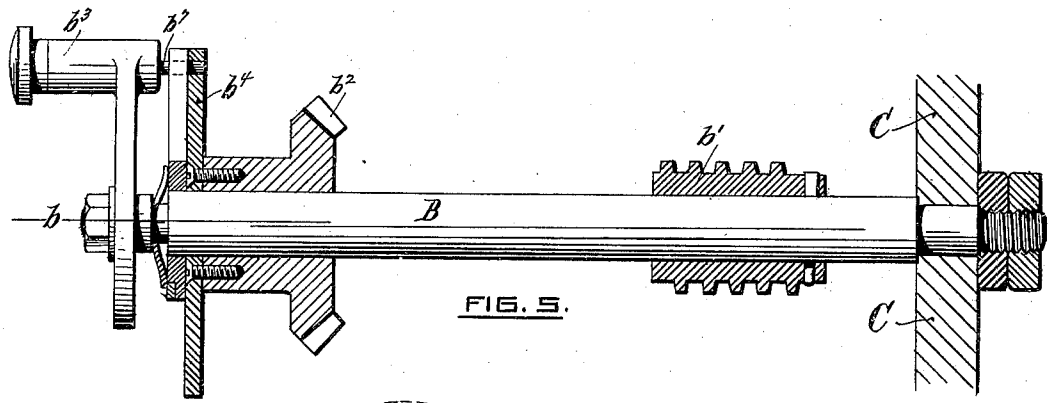


FIG. 5.

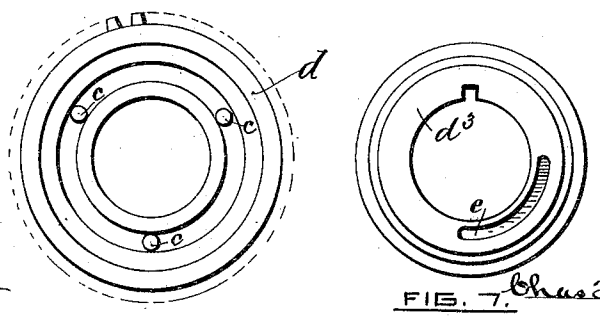


FIG. 6. FIG. 7.

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(No Model.) 2 Sheets—Sheet 2.

C. H. PHILLIPS.

MILLING MACHINE.

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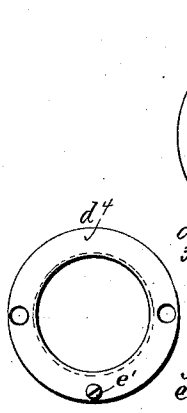


FIG. 4.

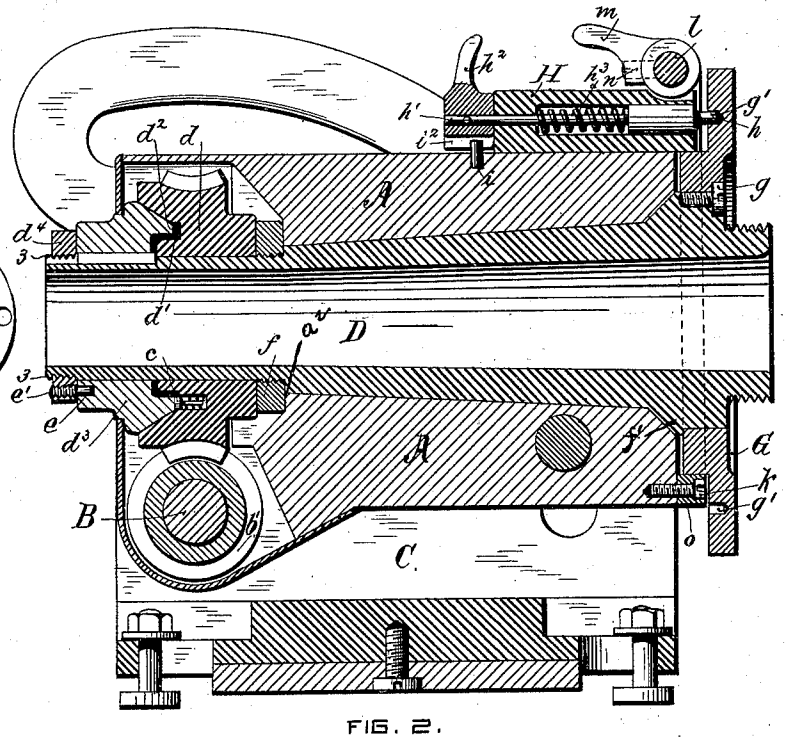


FIG. 2.

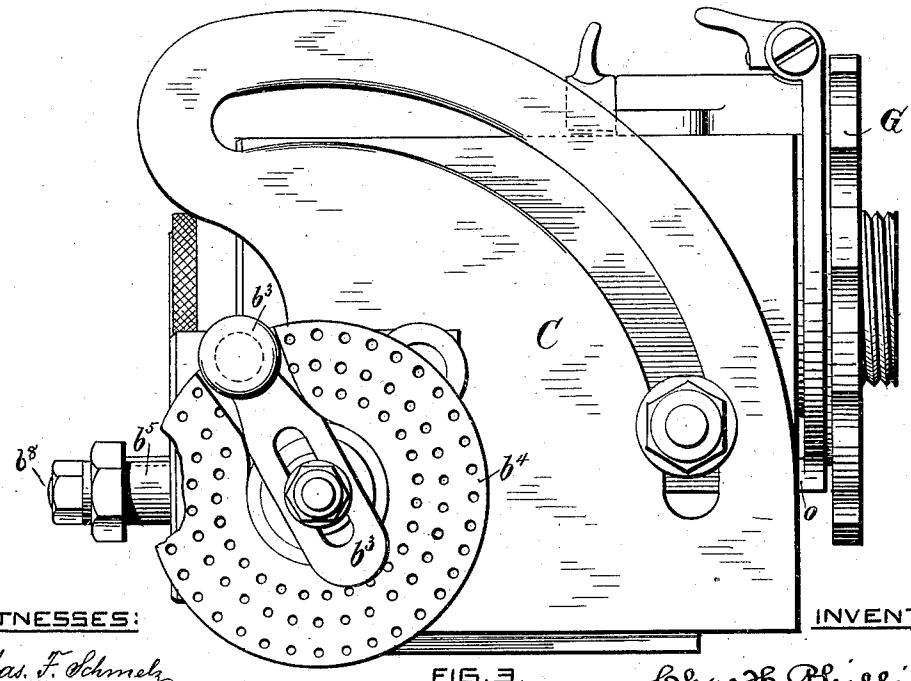


FIG. 3.

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UNITED STATES PATENT OFFICE.

CHARLES H. PHILLIPS, OF PROVIDENCE, RHODE ISLAND, ASSIGNOR TO THE BROWN & SHARPE MANUFACTURING COMPANY, OF SAME PLACE.

MILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 343,846, dated June 15, 1886.

Application filed March 5, 1885. Serial No. 157,740. (No model.)

To all whom it may concern:

Be it known that I, CHARLES H. PHILLIPS, a citizen of the United States, and a resident of the city and county of Providence, and State of Rhode Island, have invented an Improvement in Milling-Machines, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention is an improvement in milling-machines, more especially in that class of milling-machines generally known to those skilled in the art as the "Brown & Sharpe Universal Milling-Machine," for which Letters Patent were granted to Joseph R. Brown, February 21, 1865, numbered 46,521. In that machine the spindle or shell which carries a center chuck, or any other suitable device connected therewith, receives rotary motion from a train of mechanism connecting with the feed-screw by means of a worm and worm-gear, the latter being keyed or otherwise firmly fixed to said spindle or shell. Further, in said machine the index-crank, having a pointer operating in connection with a stationary index-plate, is firmly though adjustably secured to one end of the worm-shaft, so that upon turning the index-crank by hand the spindle or shell is rotated in its bearings through the medium of the worm on said shaft and the worm-gear on the spindle or shell, such rotary motion being given to adjust the spindle or shell for any given graduation in the operation of milling. In adjusting the shell by means of the index-crank the latter must be rotated a number of times to obtain one rotation of the former, (in practice forty to one,) so that the worm and its gear are subjected to a great deal of wear in attaining required adjustments.

As the life of the machine is largely dependent upon the nicety of adjustment of the worm and worm-gear, the great wear of such parts in attaining various adjustments of the shell soon permits play or lost motion between said worm and gear, and thus fatally injures the steady rotation of the spindle or shell and prevents the accomplishment of correct results. Further, a large amount of time is consumed in obtaining these various adjustments of the spindle by means of the index-crank, because of the comparatively great number of times the latter must be rotated to obtain one rotation of the former. Again, no means are provided to firmly hold the spindle or shell as against the lost motion incident to the wear of the worm and its gear; and, further, in the operation of milling, all blows or impacts given to the shell in milling are mainly carried to and borne by the said worm and gear, thus resulting in further wear of such expensive and material parts of the machine.

The object of this my invention is to overcome these defects and to attain an easy and rapid adjustment of the shell independent of the worm and its gear, so as not to subject them to wear when the spindle is adjusted for the ordinary or main part of the work to be done by such machines; secondly, to provide means for firmly holding the shell as against lost motion thereof, caused by wear of the worm and worm-gear, due to the ordinary rotation of the spindle.

To these ends my invention consists, primarily, in the combination, with a shell or spindle having a worm-gear loose thereon and a worm-shaft having a worm, of a clutch having longitudinal movement on the shell and adapted to engage the worm-gear to secure it to the shell and obtain rotation of the latter through the operation of the worm-shaft and worm.

My invention further consists in the combination, with the head of a milling-machine having a shell adapted to be rotated therein, of a clamp secured to said head and adapted to engage the shell and firmly hold it in the head.

My invention further consists in the combination, with a head provided with a shell or spindle adapted to rotate in said head and having an index-plate fastened thereon, of a latch or bolt (which I shall designate as the "index-plate lock") affixed to the head and adapted to engage the index-plate and retain the spindle in desired adjusted position in the head.

The invention further consists of certain details of construction, which are fully set forth in the following description, and particularly pointed out in the claims.

Figure 1 is a front elevation, partly in sec-

tion, of the head of a milling-machine of the kind referred to, showing so much of the accompanying parts as will enable my invention, embodied therein, to be undestood; Fig. 2, a longitudinal vertical section on line *a a*, Fig. 1; Fig. 3, a side elevation of Fig. 1 complete, looking in the direction of arrow 2; Fig. 4, an elevation of the nut which forces the clutch into the worm-gear; Fig. 5, a detail of the worm-shaft and accompanying mechanism; Fig. 6, a detail of the worm-gear, showing the spring-actuated push-pins; Fig. 7, a front elevation of the clutch, showing the groove for the check-screw. Figs. 8 and 9 are respectively front and side views of the clamp.

The head A, swiveled on the worm-shaft B in the box C, the said worm-shaft B having fixed worm b', loose bevel-gear b^2, index-crank b^3, having locking-pin b^7, the index-plate b^4, secured to the hub of the bevel-gear b^2, the hub b^5, (see Fig. 3,) secured on stud b^8 and having bevel-gear b^6 (see Fig. 1) meshing with the bevel-gear b^2, are of the construction and operation as described and shown in the said patent to Joseph R. Brown. A pinion (not shown) keyed on the hub b^5 of the bevel-gear b^6 receives, as in that patent, motion from a train of gears connecting with the feed-screw, the said pinion causing the bevel-gear b^6 to move in unison therewith, whereby motion is conveyed through the bevel-gear b^2 (when the locking-pin b^7 of the index-crank b^3 is in engagement with the index-plate b^4) to the worm-shaft B, which, through its worm b', actuates the worm-gear d on the shell D. In the present instance the worm-gear d is loose on the shell D, the latter having bearings, as usual, in the head A, and said worm-gear is provided with an annular beveled groove, d', to receive the beveled end d^2 of a clutch, d^3, keyed to the shell D and adapted to move longitudinally thereon. The clutch d^3 is brought into engagement with the worm-gear d, so as to cause the shell to move in unison with the worm-gear when the latter is rotated by the worm by means of a nut, d^4, engaging the screw-threaded end 3 of the shell, as clearly shown in Fig. 2. The worm-gear d is provided with two or more spring-actuated pins, c, (one only of which is shown in Fig. 2,) which press against the beveled end d^2 of the clutch d^3, so that upon slackening the nut d^4 on the shell D the said spring-actuated pins will force the clutch from the worm-gear, when the latter will be free to be moved or rotated on the shell. The face of the clutch next the nut d^4 is provided with a groove, e, for a part of its circumference, to receive the end of a check-screw, e', (see Fig. 2,) which passes through the nut d^4, the purpose being to limit the movement of said nut when it is desired to free the clutch from the worm-gear, and thus prevent said nut from being unscrewed from the shell. The shell D is provided with a nut, f, screwed thereon at a point between the worm-gear and the shoulder a^2 of the head A, and abutting said shoulder, the said nut preventing the shell from moving forward in the head when the nut d^4 is loosened to release the clutch. The beveled portion f' at the front end of the shell prevents backward movement thereof. An index-plate, G, is, in the present instance, removably secured to the front end of the shell by means of screws g, the sockets for which are formed one-half in the shell and the other half in the plate, as clearly indicated in Fig. 2. This index-plate is provided with a number of holes or sockets, g', to receive one at a time an index-plate lock, consisting in this instance of a spring-actuated bolt, h, sliding in a case, H, mounted on the head A. The bolt has an arm, h', extending backward through the case to receive a thumb-piece, h^2, so as to permit the bolt to be retracted by hand, as against the action of the coiled spring h^3, to free the index-plate and permit its rotation by hand. A pin, i, secured in the head A, projects into a groove, i^2, in the under side of the thumb-piece h^2, to enable the bolt h to be retained in retracted position upon forcing the thumb-piece backward so as to clear the pin i, and then turning or partially rotating the said thumb-piece and bolt to cause the face of the former to bear against the pin, as will be readily understood.

The clamp for firmly holding the shell from movement or rotation in the head is composed of a bifurcated ring, K, fastened, as with screws k, to the head A, and extending up around or embracing the hub of the index-plate G, the ends of said ring being enlarged to receive an adjusting-screw, l, which passes laterally through both said arms, and which, upon being tightened, causes the latter to clasp or bind the hub of the index-plate and firmly secure the shell in the head. A thumb-piece, m, is attached to the adjusting-screw between the ends of the ring by means of a set-screw, n, to enable the adjusting-screw to be readily operated by hand. That portion of the clamp which receives the holding-screws k has a boss or enlargement, o, to provide suitable clearance between the clamp and head, so that the movement of the arms of the former will not be interfered with.

Without departing from the spirit of my invention the clamp may embrace and bind the shell itself, instead of through the medium of the hub of the index-plate G.

When it is desired to rotate the shell to attain any desired adjustment thereof for the purpose of milling, the nut d^4 is slackened on the shell D, when the spring-actuated pins c in the worm-gear d will force the clutch away from said gear to free the latter, or, in other words, to permit the shell to be moved without affecting the worm, whereupon the said shell may be readily rotated in its bearing by turning its attached index-plate G by hand, the index-plate lock h having first been disengaged from said plate. As soon as the shell is adjusted the index-plate lock is again made to engage the index-plate G and the clamp made to bind the hub of the said plate

to thoroughly and firmly retain the shell in the head.

When the shell is to be rotated by means of the worm, the bolt or index-plate lock is retracted and held in retracted position by the pin *i*, the clamp released, and the nut d^4 tightened to cause the clutch to engage the worm-gear, and thus bring the worm and worm-gear into action to rotate the shell. The index-plate lock *h*, besides holding the index-plate and shell in adjusted position, also serves as an index-pointer.

It is to be understood that I do not herein claim, broadly, a milling-machine head provided with a secondary supplementary indexing mechanism. Neither do I claim, broadly, a spindle provided with a worm-gear loose thereon, in combination with devices for securing the worm-gear to the spindle; nor the same in combination with an index-plate attached to the spindle and an index-plate pawl or catch.

I claim—

1. The combination, with a shell provided with a worm gear loose thereon and a worm-shaft having a worm, of a clutch, as d^3, having longitudinal movement on the shell to engage the worm-gear, and operating substantially as and for the purpose specified.

2. The head having bearings for a shell and provided with the shoulder a^2, a shell having a worm-gear loose thereon, and a clutch, as d^3, having longitudinal movement on said shell, combined with a nut secured to the shell between the shoulder a^2 and the worm-gear, for the purpose specified.

3. The combination, with a shell having a worm-gear loose thereon and a locking-clutch, as d^3, as specified, of an index-plate attached to the shell, and a worm-shaft and worm, as and for the purpose set forth.

4. The head provided with a shell adapted to rotate therein, combined with a clamp secured to the head and adapted to engage the shell, for the purpose specified.

5. The head provided with a shell adapted to rotate therein, and having a worm-gear loose thereon, and a locking-clutch, as d^3, combined with an index-plate secured to the shell, and an index-plate lock attached to the head and adapted to engage the index-plate, for the purpose specified.

6. The shell provided with a worm-gear loose thereon, having the spring-actuated pins *c*, combined with a clutch having longitudinal movement on the shell, and means for forcing the clutch into engagement with the loose worm-gear, as and for the purpose set forth.

7. The combination, with the head A, having a pin, *i*, of the case H, provided with a spring-actuated bolt, and an attached thumb-piece having a groove in its under side for the reception of the pin, as described.

8. The combination, with a rotating shell or spindle and its head, of the bifurcated clamp K, secured to said head and embracing the shell or spindle, and provided at its bifurcated end with an adjusting-screw, and a thumb-piece secured thereto to operate the same to clasp and release said rotating shell or spindle, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CHARLES H. PHILLIPS.

Witnesses:
CHAS. F. SCHMELZ,
JAS. H. LANGE.