(No Model.) 3 Sheets—Sheet 1.

T. WEBSTER & J. HOWARTH.

MILLING MACHINE.

No. 579,355. Patented Mar. 23, 1897.

FIG 1

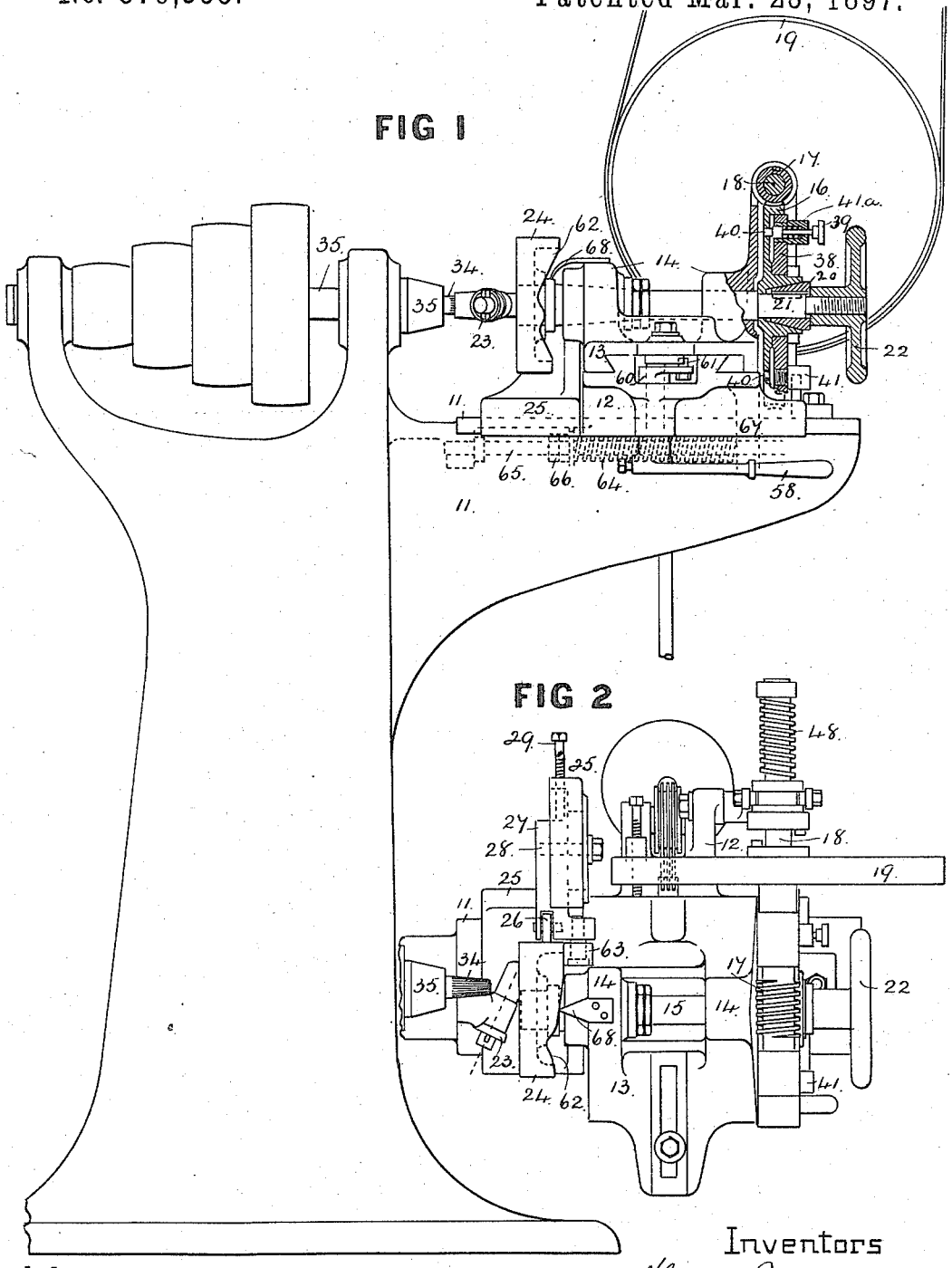

FIG 2

Witnesses

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FIG 3

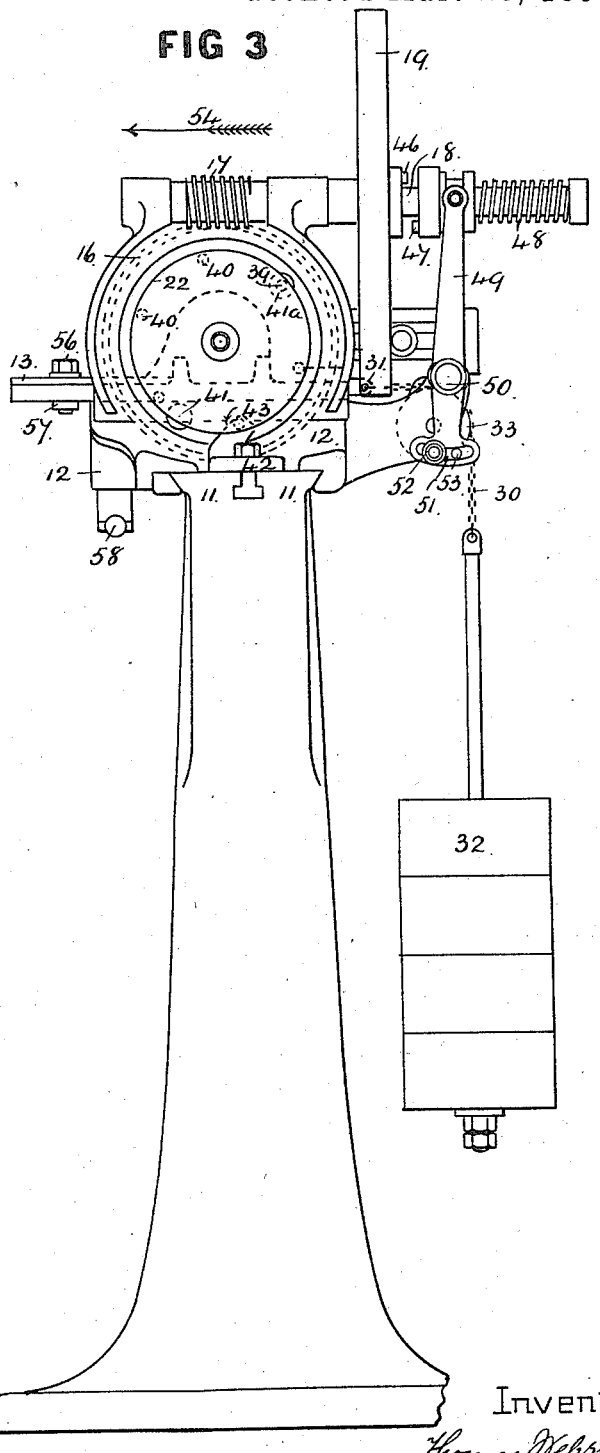

FIG 7

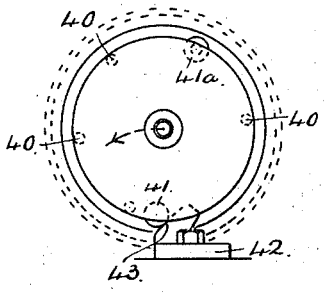

FIG 6

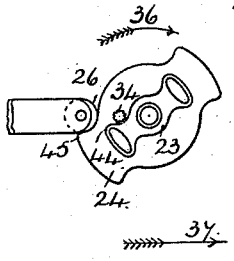

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FIG 4

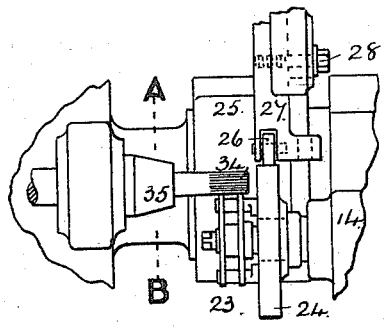


FIG 5

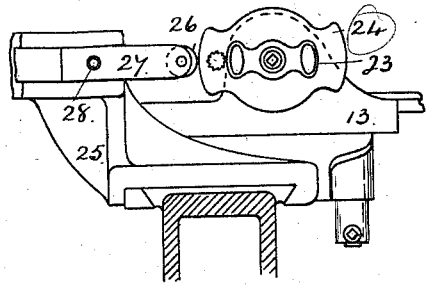
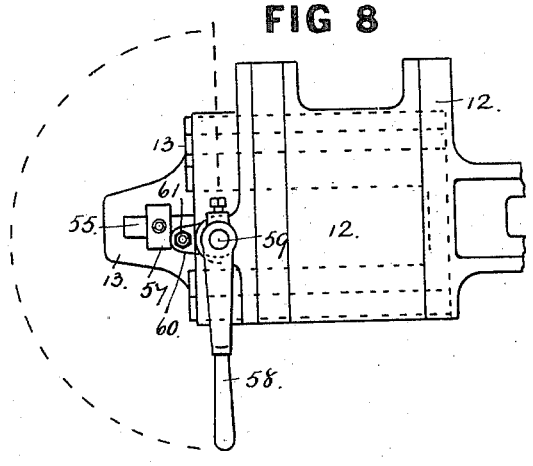


FIG 8



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UNITED STATES PATENT OFFICE.

THOMAS WEBSTER AND JONATHAN HOWARTH, OF COVENTRY, ENGLAND.

MILLING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 579,355, dated March 23, 1897.

Application filed October 10, 1896. Serial No. 608,501. (No model.) Patented in England October 17, 1895, No. 19,486.

To all whom it may concern:

Be it known that we, THOMAS WEBSTER and JONATHAN HOWARTH, subjects of the Queen of Great Britain, and residents of Coventry, England, have invented certain Improvements in Milling-Machines, (for which we have obtained a patent in Great Britain, No. 19,486, bearing date October 17, 1895,) of which the following is a specification.

Our invention comprises mechanism which can be applied to any ordinary turning-lathe (in such case taking the place of the saddle and compound slides) and by the use of which the internal and external curves of objects, such as the fork-crown ball-head lugs and seat-lugs and the like parts of cycles, can be milled or profiled to desired shape automatically. We attain these objects by the mechanism illustrated in the accompanying drawings, in which—

Figure 1 is a side elevation, partly in section, of the invention. Fig. 2 is a plan view of most of the parts of the invention. Fig. 3 is an end view of same. Fig. 4 is a part view in detail showing a differently-shaped body being operated upon from that shown in Figs. 1 and 2. Fig. 5 is an end view on line A B, Fig. 4. Fig. 6 is a detail view showing certain positions in which an accommodating motion of the slide carrying the work takes place, as hereinafter explained. Fig. 7 is a detailed view of the mechanism by which the accommodating motion of the said slide is effected. Fig. 8 is an inverted part plan view of the mechanism by which the slide is drawn back and held in its withdrawn position while the changing of the work, &c., takes place.

This arrangement of mechanism may be used upon an ordinary lathe-bed in conjunction with the ordinary head-stock, but preferably we form the head-stock and bed in one in the manner of what is known as a "profiling" or "milling" machine, and hence we have thus illustrated it for explanation. Upon the frame-bed 11 is mounted the saddle 12, which in some cases (according to the work in hand) is securely bolted at a given position to the bed-frame. Upon this saddle is carried the transverse slide 13, upon which is mounted or formed the head-stock 14, fitted with the spindle 15, which receives its motion by means of the worm-wheel 16, operated by the worm 17 and the spindle 18, which is driven by the pulley 19, the said pulley being belted in the ordinary manner from a counter-shaft. Upon the spindle 15 is placed the cone-clutch 20, which slides upon the feather-key 21. This cone 20 fits into and engages with or is released from the wheel 16 by means of the screw hand-wheel 22. Thus when the said hand-wheel is screwed inward the cone 20 is driven into the wheel 16 and motion is imparted to the spindle 15, while if the said wheel 22 is withdrawn the cone disengages itself from the worm-wheel 16, and the spindle 15 is then idle. To the front end of the spindle 15 is chucked the piece of work 23 which has to be operated upon, and which is illustrated in Figs. 1 and 2 as a ball-head lug and in Figs. 4, 5, and 6 as a double plate crown for cycle-forks. Also on this same spindle is carried the former or cam 24, of a shape or profile similar to the required profile of the body 23 and of a size convenient to admit of chucking the body 23, &c.

Upon the frame-bed 11 is rigidly secured the bracket 25, upon which is further mounted the pointer (preferably a roller) 26, which is adjustably secured thereto by means of the bracket 27 and pins 28 and 29. The former 24 is kept firmly up against the roller 26 by means of the chain 30, the one end of which is secured to the transverse slide 13 at 31 (upon which the former, &c., is carried) and the other end to the weight 32, over the pulley 33. By means of the former 24 pressing up against the pointer on rotation of the head-stock spindle 15 the head-stock and its slide are moved in or out (transversely) according to the shape of the former 24 employed, while at the same time the object 23 to be shaped receives a rotary motion by means of the same spindle 15 as before stated, and thus the objects 23 are brought into contact with a revolving mill or cutter 34, chucked to the spindle 35 of the lathe or machine, so that by means of the said cutter, in conjunction with movements of the sliding head-stock 14, &c., the said objects 23 may have the desired shape imparted to them.

In some cases the shapes desired may be such that when passing certain points there may be some danger of breaking the former and the roller and also the mill or cutter, as,

for instance, as illustrated in Fig. 6, where the former, &c., is revolving in the direction of the arrow 36, it will be seen that unless the former 24 and the body 23 were moved somewhat transversely in the direction of the arrow 37 either the spindle 15 could not revolve or the mill or cutter or roller or roller-bracket must be broken. To obviate this, we provide upon the wheel 16 the sleeve-plate 38, having the clutch-pin 39, by which it may be engaged with the said wheel 16 in any of the holes 40. Also on this plate is fixed the stud-pin 41. The diametric stud-pin 41^a forms the carrier for the pin 39. In conjunction with these stud-pins the bracket 42 is also secured to the bed 11, having the inclined path at 43. Hence when the former 24 has reached the position shown in Fig. 6 (as before stated) the pin 41 or 41^a has reached the bracket at 43, (see Fig. 7,) which has a tendency to stop the rotation of the spindle 15. By reason, however, of the persistency of the said spindle 15 to rotate, the pin 41 or 41^a is forced up the path 43, but in doing so the slide 13, with all that is thereon carried, is compelled to yield forward against the pull of the weight 32, and thus the necessary sliding motion, as indicated by the arrow 37, is effected to allow of the tool 34 and roller 26 passing over such parts as 44 and 45. The length of this path 43 is regulated so that immediately the shoulders 44 and 45 are passed the pin 41 or 41^a passes on its usual rotary course. It will therefore be seen that the rotating motion of the spindle 15 is arrested for a short time when passing the point shown in Fig. 6 by the wheel 16 slipping upon the clutch 20 until the parts 44 and 45 have respectively passed the tool 34 and roller 26. Owing to this a certain loss of relative motion of the spindle 15 to the wheel 16 takes place. Hence we provide a number of holes 40, so that when the pin has passed the path 43 sufficiently far we withdraw the clutch-pin 39 and move the plate 38 backward and put the pin 39 into the next hole ready for the next necessary similar operation. Should the pin 41 arrive, however, at the path 43 before the tool 34 arrives at the part 44, the slide would be moved forward, as before stated, and thereby the work be simply removed for the time being from the cutting-tool, but no harm would ensue, while if, on the other hand, the tool 34 should arrive at that point before the pin 41 arrives at the path 43 then the wheel 16 gives way on the clutch 20 (the spindle 15 ceasing to revolve) until the pin 41 commences to climb the path, as aforesaid, but by observing the arrangement shown these contingencies rarely occur.

In some cases, when the body 23 has reached a certain point in rotation, such as in part circular bodies, it is desirable that such rotation should cease. This we effect as follows: Upon the pulley 19 we provide a clutch 46 to engage the sliding clutch 47, which latter is made to slide upon a feather-key upon the spindle 18, the said pulley 19 being loose upon the said spindle. The clutch 47 is kept up to its work by the spring 48. This clutch is further operated by the fork-lever 49, pivoted to the saddle at 50. At the lower part of this lever is formed the slot-hole 51, in which is an adjustable screw-pin 52, which may be secured in any desirable position along the said slot. Upon the saddle is further secured the fixed stud 53, whose projecting part lies in the slot 51. It will now be seen that at any point in the revolution of the spindle 15, where it is desirable that the rotation should cease, it will be only necessary that the screw-pin 52 be adjusted to come in contact with the fixed stud 53 at the right time by reason of the shape of the former 24 being so arranged as to force forward the slide 13, which carries the spindle 18 and pulley 19. In so doing the clutch 46 is drawn forward in the direction of the arrow 54, Fig. 3. At the commencement of the transverse motion the clutch 47 follows the clutch 46 by reason of the spring 48 turning the lever 49 upon its fulcrum 50 until the pin 52 is arrested in its motion by the fixed stud 53 and the movement of the clutch 47 ceases. By reason of the continued motion, however, of the clutch 46 the latter is withdrawn clear of the clutch 47, and the motion of the worm 17 and spindle 15 is thereby stopped.

It is further desirable to provide that the work may be taken from the machine at any desirable position of the cutter. To effect this, we provide the slot 55 in the slide 13, in which is secured the adjustable pin 56, having the underneath plate 57. Fig. 8 shows an inverted plan of these parts. Upon the saddle 12 is fulcrumed the lever 58, upon the vertical spindle 59, at whose upper end is also keyed the cam-like lever 60, having the stud 61. It will therefore be seen that when the plate 57 is secured in a given position by turning the lever 58 through one hundred and eighty degrees, or thereabout, the stud 61 is brought against the plate 57 and forces it (together with the slide 13 and all that is carried thereon) in the direction of the arrow 54, (see Fig. 3,) so that the work 23 is thereby quite free of the mill or cutter 34 and may then be removed, &c. As seen in Fig. 8, the position of the stud 61 is such that the slide, &c., would be supported in its extended position until the lever 58 was intentionally removed.

Reverting to the former 24, as seen in Figs. 1 and 2, it will be seen that to meet the requirements of varying shapes of work to be operated upon the said former may not only be variously shaped upon its periphery, but may also be so shaped upon its rear side, as shown at 62, which surface then acts in combination with the fixed roller or point 63, which is carried upon the bracket 27. The roller 63 is of the necessary length to prevent the cam on the rear side of the former being pushed backward by the spring 64 on the withdrawal of the slide 13. One or both of

the rollers 26 and 63 may be used, if desired, fixed.

During the operation of edge-milling (the periphery-cam 24 acting on roller 26) the saddle 12 may be securely fastened to the bed and roller 63 removed, as shown in Fig. 4. When, on the other hand, the rear surface of the former 24 is acting on the roller 63, the saddle 12 is not fixed to the bed 11, but is permitted the required freedom of longitudinal motion, in which case the rear surface of the former 24 is kept backward against the roller 63 by means of the spring 64, carried on the rod 65 and lying between the adjustable nuts or collars 66 and the depending bracket 67 upon the under side of saddle 12, and the roller 26 acts on the periphery of the former 24, (the periphery in this case may be truly circular or otherwise,) as shown in Fig. 2.

At 68 is a pointer which facilitates the fixing of the position of the former 24 and work 23 relative to the wheel 16 and plate 38.

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

1. In apparatus for milling profiles the combination with the frame or bed 11, head-stock spindle 35 carrying tool 34, of the transverse slide 13, carried upon the saddle 12, and having mounted thereon the spindle 15, with former 24, and wheel 16, worm 17, and driving-pulley 19, and bracket 25, carrying rollers 26 and 63, all arranged and operating substantially as set forth and shown upon the drawings.

2. In an apparatus for milling profiles the combination with the saddle the movable slide 13, thereon, the spindle 15, the clutch 20, adjustably secured thereto, of the wheel 16, worm 17, and the plate 38 having the clutch-pin 39, taking into holes 40, and the stud-pins 41, with the bracket 42, all substantially as set forth and shown.

3. In an apparatus for milling profiles the combination with the saddle, the movable slide 13 thereon, clutch 46, of the lever 49, having the slot 51, adjustably-fixed pin 52, and stud 53, with clutch 47 and spring 48, all substantially as set forth and shown.

4. In an apparatus for milling profiles the combination with the saddle, the movable slide 13 thereon, the under plate 57, adjustably secured to the slide and the cam-like lever 60 pivoted to the saddle and engaging said under plate, substantially as set forth and shown.

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