Jan. 2, 1923. 1,440,512.

A. C. WAIS.

COUNTERWEIGHT FOR BORING MILLS.

FILED DEC. 18, 1920.

Fig. 1

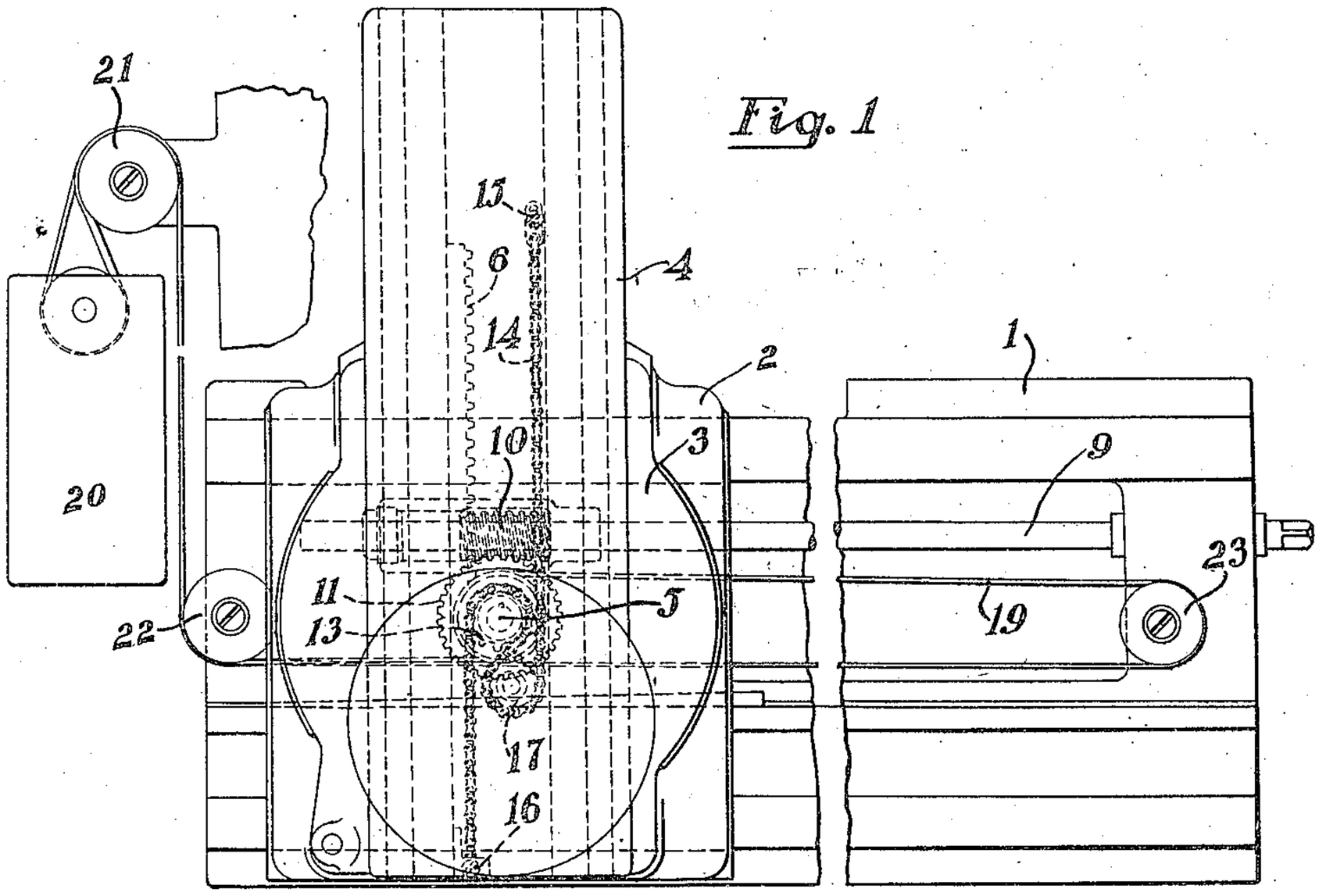


Fig. 2.

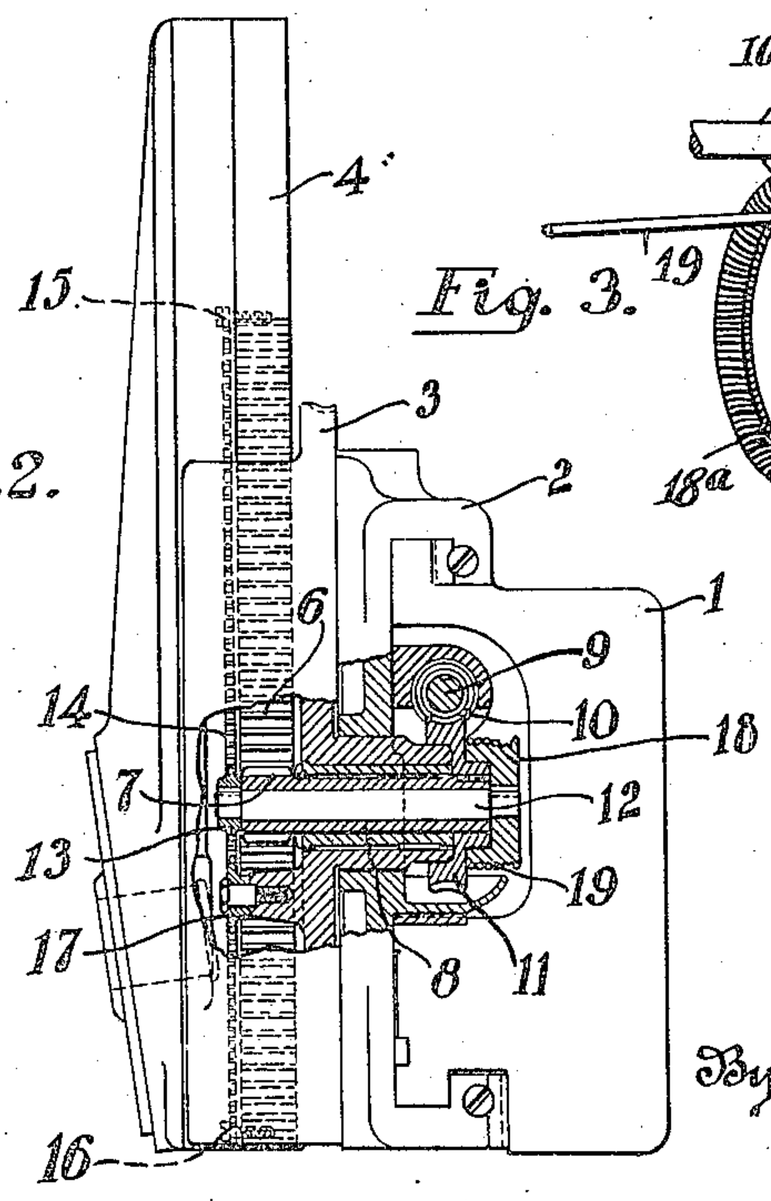
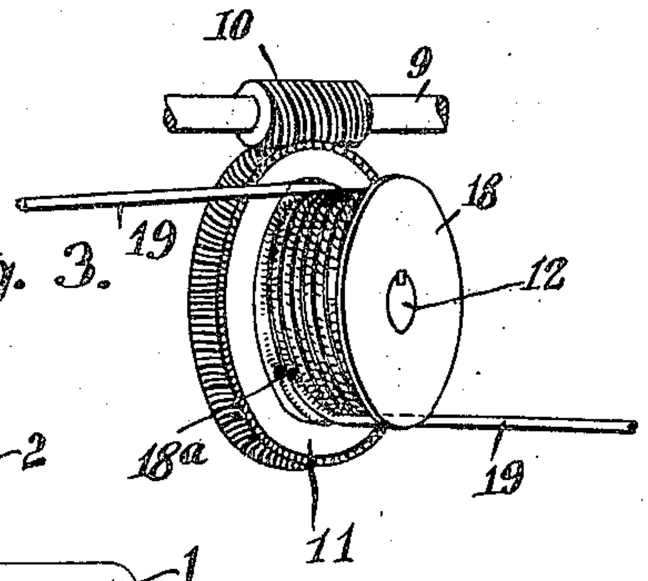


Fig. 3.



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Patented Jan. 2, 1923. 1,440,512

UNITED STATES PATENT OFFICE.

ALBERT CARL WAIS, OF HAMILTON, OHIO, ASSIGNOR TO NILES-BEMENT-POND COMPANY, OF NEW YORK, N. Y., A CORPORATION OF NEW JERSEY.

COUNTERWEIGHT FOR BORING MILLS.

Application filed December 18, 1920. Serial No. 431,592.

To all whom it may concern:

Be it known that I, ALBERT CARL WAIS, a citizen of the United States, residing at Hamilton, in the county of Butler and State of Ohio, have invented certain new and useful Improvements in a Counterweight for Boring Mills, of which the following is a specification.

This invention relates to counterbalancing devices and particularly to such a device adapted to counterbalance the weight of a tool slide, as the boring mill tool slide illustrated in the accompanying drawing. It should be understood, however, that the drawing is merely illustrative of the invention and is not intended to in any way limit the same to use in conjunction with any particular machine, the scope of the invention being defined by the claims appended hereto.

The primary object of the invention is to provide an improved mechanism of the above character which will be very effective and efficient in operation and which will be adapted for general use where such a mechanism is desired and particularly adapted for use in connection with metal working machines, as illustrated.

Other and more specific objects of the invention will appear as the description proceeds.

Referring to the figures of the drawing:

Figure 1 is a front elevation of the counterbalancing mechanism as applied to a boring mill tool slide.

Fig. 2 is a side view thereof partially in section.

Fig. 3 is a rear perspective detail view of the tool slide counterbalancing drum.

In metal working machines, such as boring and planing machines, it is essential that the tool-supporting slide be properly counter balanced in order that the cut may be true however rough or uneven the surface of the work may be. Were the tool slide not properly counterbalanced, the tool would tend by its own weight to drop into any depressions it might encounter in the work surface and thereby make the cut uneven. In the present invention the improved counterbalancing mechanism comprises a rotary element engaging means on and extending along the slide, such means being separate and distinct from the usual adjusting rack on the tool slide and serving to hold the slide upwardly with the rack teeth therein in firm engagement with the teeth of the rack-operating pinion.

In the drawing, 1 indicates the cross rail of a boring machine or planer on which is mounted a saddle 2, a head 3 and a tool-supporting slide 4. These members are of the usual construction, the saddle being horizontally adjustable along the rail, the head being angularly adjustable about a horizontal axis 5 on the saddle and the slide being longitudinally and normally vertically adjustable on the head.

The means for adjusting the slide 4 comprises a rack 6 on the slide engaged by a pinion 7 on a tubular shaft 8 mounted in the head and saddle preferably at the swivel axis thereof. The shaft 8 is operated from a shaft 9 extending along the rail and having a worm 10 splined thereon and engaging a worm wheel 11 keyed to the shaft 8. It will be understood that by rotating the shaft 9 in one direction or the other, the slide 4 may be moved vertically in either direction.

The present invention concerns particularly the following mechanism for counterbalancing the weight of the slide 4. Mounted on a shaft 12 in the head 3 and preferably coaxial with the shaft 8 is a rotary element, as the sprocket wheel 13, engaging a flexible member, as the sprocket chain 14, the ends 15 and 16 of which are secured to the slide 4. An idler sprocket 17 is also provided on the head 3 and the chain passes around the sprockets 13 and 17 as indicated in Fig. 1. It will be seen that rotation of the sprocket 13 in one direction or the other will raise or lower the slide. The shaft 12 is operated from a drum 18 keyed to the rear end thereof. A cord 19 has its opposite ends secured to the drum 18 at 18^a, as illustrated in Fig. 3. One end of this cord passes in one direction off the bottom of the drum and the other end in the opposite direction off the top of the drum. This cord is held taut by means of a counterweight 20 provided with a supporting roller 24 to receive the cord. From the roller 24 the cord passes upwardly over idler rollers 21 on the frame of the machine, then downwardly over idler rollers 22 on the cross rail, and from thence one strand of the cord passes to and is made fast to the bottom of the drum and the other strand

passes around an idler roller 23 at the opposite end of the rail and back to the top of the drum at which point it is made fast. It will be seen therefore that the tendency of the cord and weight is to rotate the drum to the right (Fig. 1), such rotation acting through the shaft 12 to rotate the sprocket 13 and raise the slide 4.

The arrangement of the cord 19 provides for the vertical adjustment of the rail, the horizontal adjustment of the saddle and the angular adjustment of the head on the saddle since none of these adjustments effect the operation of the cord and its cooperating mechanism. By means of the rollers 21, 22, 23 and the roller 24 in the counterweight the cord is free to move along with the drum when the saddle is being adjusted along the rail. The shafts 8 and 12 are coaxial but each operates independently of the other. The weight 20 is normally sufficient to raise the slide 4 and hold the rack teeth 6 thereon upwardly in engagement with the teeth of the adjusting pinion 7 whereby the tool slide is always held firmly by the counterbalancing mechanism and the slide adjusting mechanism operating in opposite directions thereon. It will be clear that the use of such mechanism prevents any looseness of the tool slide and prevents the dropping of the tool into a hole or depression should the same be encountered in the work.

As this holds the slide 4 and its attached parts in their uppermost position permitted by the elevating mechanism there is no tendency for the slide to drop a slight distance when the tool enters a depression in the work. The amount of this upwardly acting force may be varied by increasing or decreasing the excess of weight in the counterbalance over the weight of the slide and attached parts.

What I claim is:

1. A counterbalance comprising the combination of a slide, two independently operated means for moving the slide vertically, one means comprising a rack on the slide and a pinion engaging the rack and the other means comprising a rotary element engaging means other than the rack on and extending along the slide, means for operating one of the first mentioned means for adjusting the slide vertically, and a counterbalancing mechanism for operating the other means to normally counterbalance the weight of the slide.

2. A counterbalance comprising the combination of a slide, two means for moving the slide vertically, one means comprising a rack on the slide and a pinion engaging the rack and the other means comprising a rotary element engaging means other than the rack on and extending along the slide, means for operating the rack-engaging pinion to adjust the slide vertically, and a counterbalance weight for operating the other means to normally counterbalance the weight of the slide.

3. A counterbalance comprising the combination of a slide, a rack on the slide, a pinion engaging the rack, means for operating the pinion to adjust the slide vertically, flexible means extending longitudinally of the slide and having its ends secured thereto, a rotary element engaging the flexible means, and a counterbalance operatively connected to the element for rotating the same to normally counterbalance the weight of the slide.

4. A counterbalance comprising the combination of a slide, a rack on the slide, a pinion engaging the rack, means for operating the pinion to adjust the slide vertically, a chain extending longitudinally of the slide and having its ends secured thereto, a sprocket wheel engaging the chain, and a counterbalancing weight operatively connected to the sprocket wheel for rotating the same to normally counterbalance the weight of the slide.

5. A counterbalance comprising the combination of a slide, a rack on the slide, a pinion engaging the rack, means for operating the pinion to adjust the slide vertically, flexible means extending longitudinally of the slide and having its ends secured thereto, a rotary element mounted coaxially of the pinion and engaging the flexible means, and a counterbalance operatively connected to the element for rotating the same to normally counterbalance the weight of the slide.

6. In a machine of the class described, the combination of a cross rail, a saddle mounted to slide horizontally thereon, a slide mounted to operate vertically on the saddle, a rack on the slide, a pinion engaging the rack, means for operating the pinion to adjust the slide vertically, flexible means extending longitudinally of the slide and having its ends secured thereto, a rotary element engaging the flexible means, and a counterbalancing mechanism operatively connected to the element for rotating the same to normally counterbalance the weight of the slide.

7. In a machine of the class described, the combination of a cross rail, a saddle mounted to slide horizontally thereon, a slide mounted to operate vertically on the saddle, a rack on the slide, a pinion engaging the rack, means for operating the pinion to adjust the slide vertically, a chain extending longitudinally of the slide and having its ends secured thereto, a sprocket wheel engaging the chain, and a counterbalancing weight operatively connected to the sprocket wheel for rotating the same to normally counterbalance the weight of the slide.

8. In a machine of the class described, the combination of a cross rail, a saddle mounted to slide horizontally thereon, a head mounted for angular adjustment about a

horizontal axis on the saddle, a slide mounted to operate vertically on the head, a rack on the slide, a pinion mounted coaxially of the head axis and engaging the rack, means for operating the pinion to adjust the slide vertically, flexible means extending longitudinally of the slide and having its ends secured thereto, a rotary element mounted coaxially of the pinion and engaging the flexible means, and a counterbalancing mechanism operatively connected to the element for rotating the same to normally counterbalance the weight of the slide.

9. In a machine of the class described, the combination of a cross rail, a saddle mounted to slide horizontally thereon, a slide mounted to operate vertically on the saddle, a rack on the slide, a pinion engaging the rack, means for operating the pinion to adjust the slide vertically, flexible means extending longitudinally of the slide and having its ends secured thereto, a rotary element engaging the flexible means, a drum mounted coaxially of and operatively secured to the said element, a flexible cord extending along the rail and about the drum, and a counterbalancing weight hung to the cord for placing tension on the same to rotate the drum to counterbalance the weight of the slide.

10. In a machine of the class described, the combination of a cross rail, a saddle mounted to slide horizontally thereon, a head mounted for angular adjustment about a horizontal axis on the saddle, a slide mounted to operate vertically on the head, a rack on the slide, a pinion mounted coaxially of the head axis and engaging the rack, means for operating the pinion to adjust the slide vertically, flexible means extending longitudinally of the slide and having its ends secured thereto, a rotary element mounted coaxially of the pinion and engaging the flexible means, a drum mounted coaxially of and operatively secured to the said element, a flexible cord extending along the rail and about the drum, and a counterbalancing weight hung to the cord adjacent one end of the rail for placing tension on the cord to rotate the drum to counterbalance the weight of the slide.

In testimony whereof, I hereto affix my signature.

ALBERT CARL WAIS.