(No Model.) 4 Sheets—Sheet 1.

W. H. WAKEFORD.

ROLLER GRINDING MILL.

No. 310,236. Patented Jan. 6, 1885.

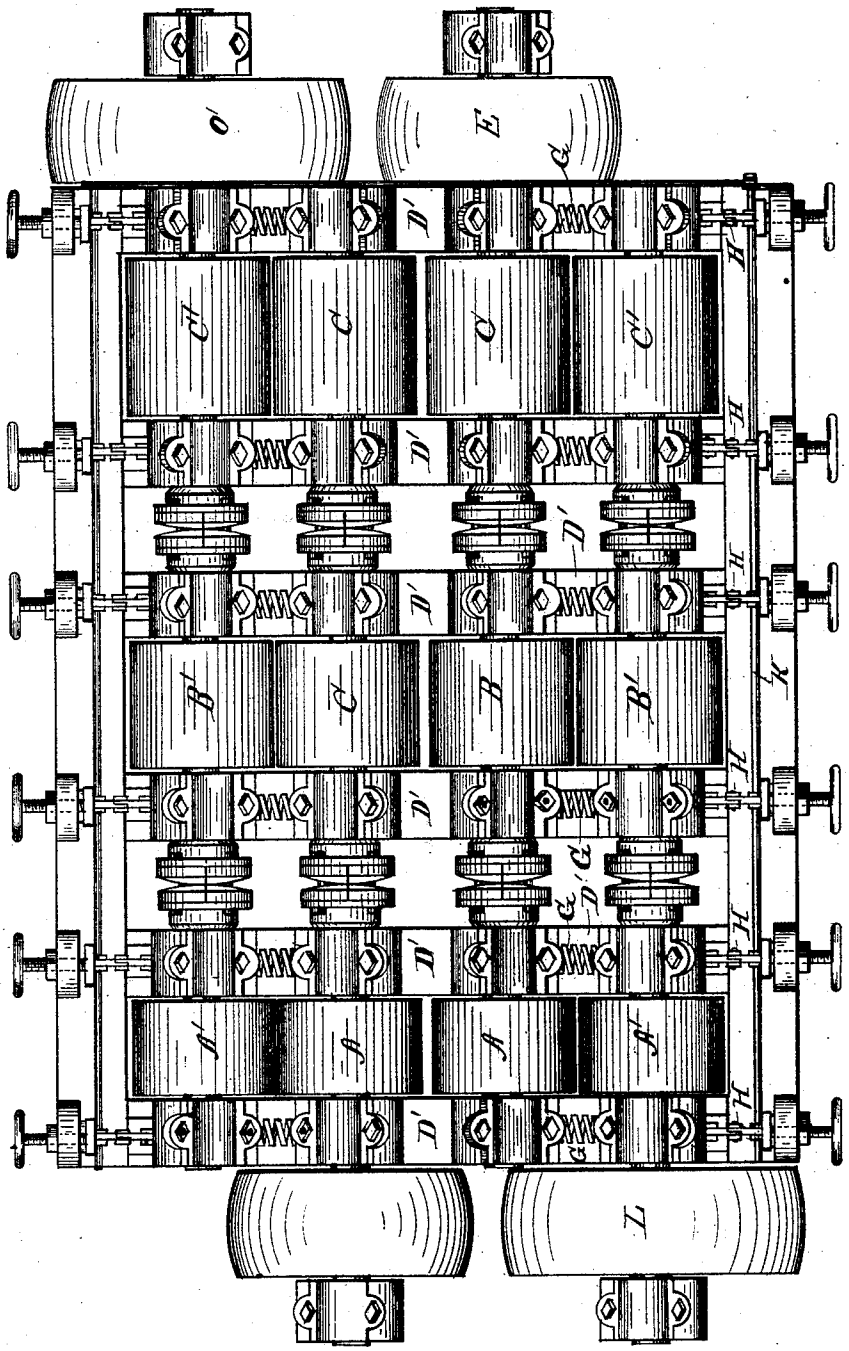


Fig. 1.

Witnesses:
E. F. Walker
W. M. Hannay

Inventor.
William H. Wakeford
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(No Model.) 4 Sheets—Sheet 2.

W. H. WAKEFORD.

ROLLER GRINDING MILL.

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Fig. 2.

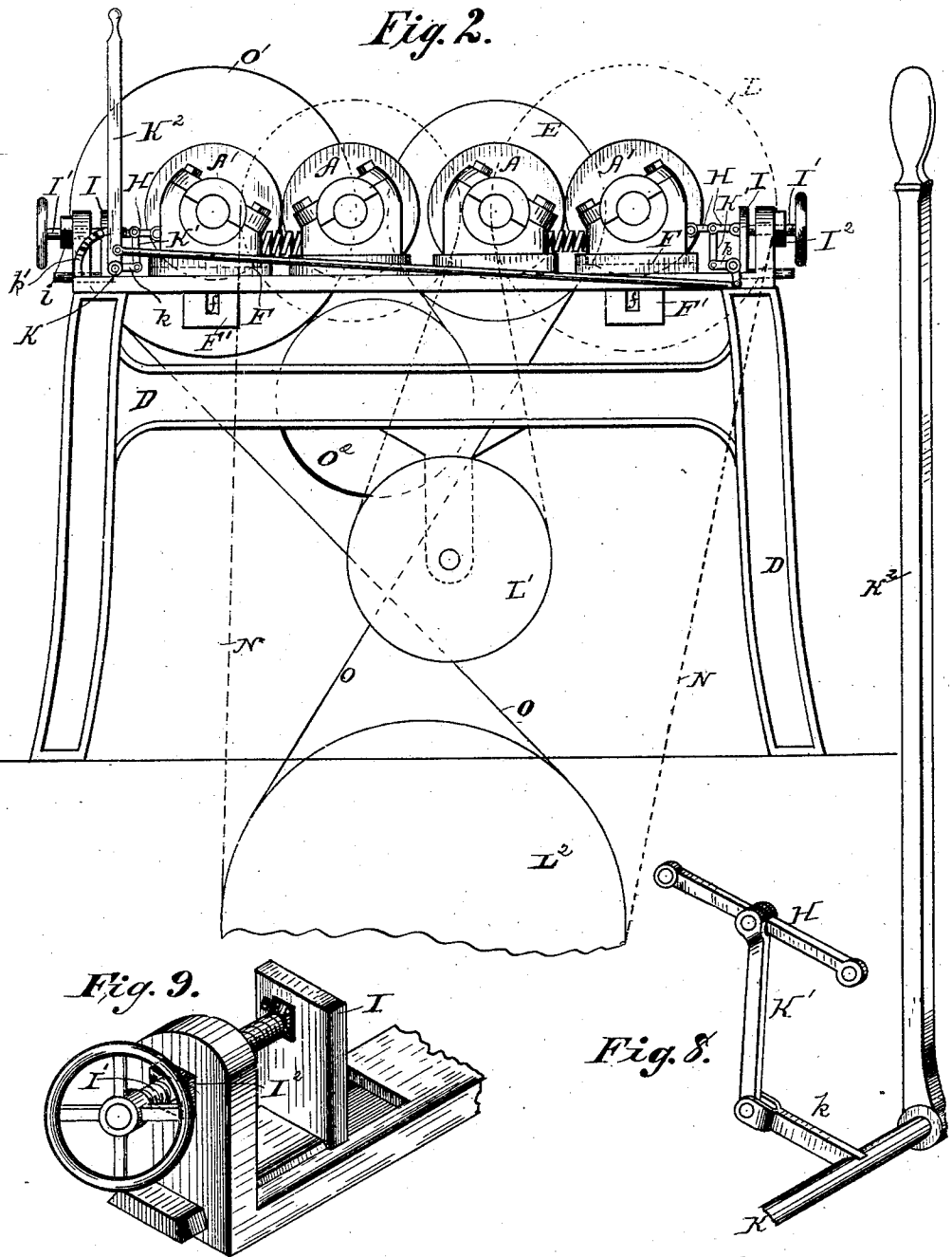


Fig. 9.

Fig. 8.

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(No Model.) 4 Sheets—Sheet 3.

W. H. WAKEFORD.

ROLLER GRINDING MILL.

No. 310,236. Patented Jan. 6, 1885.

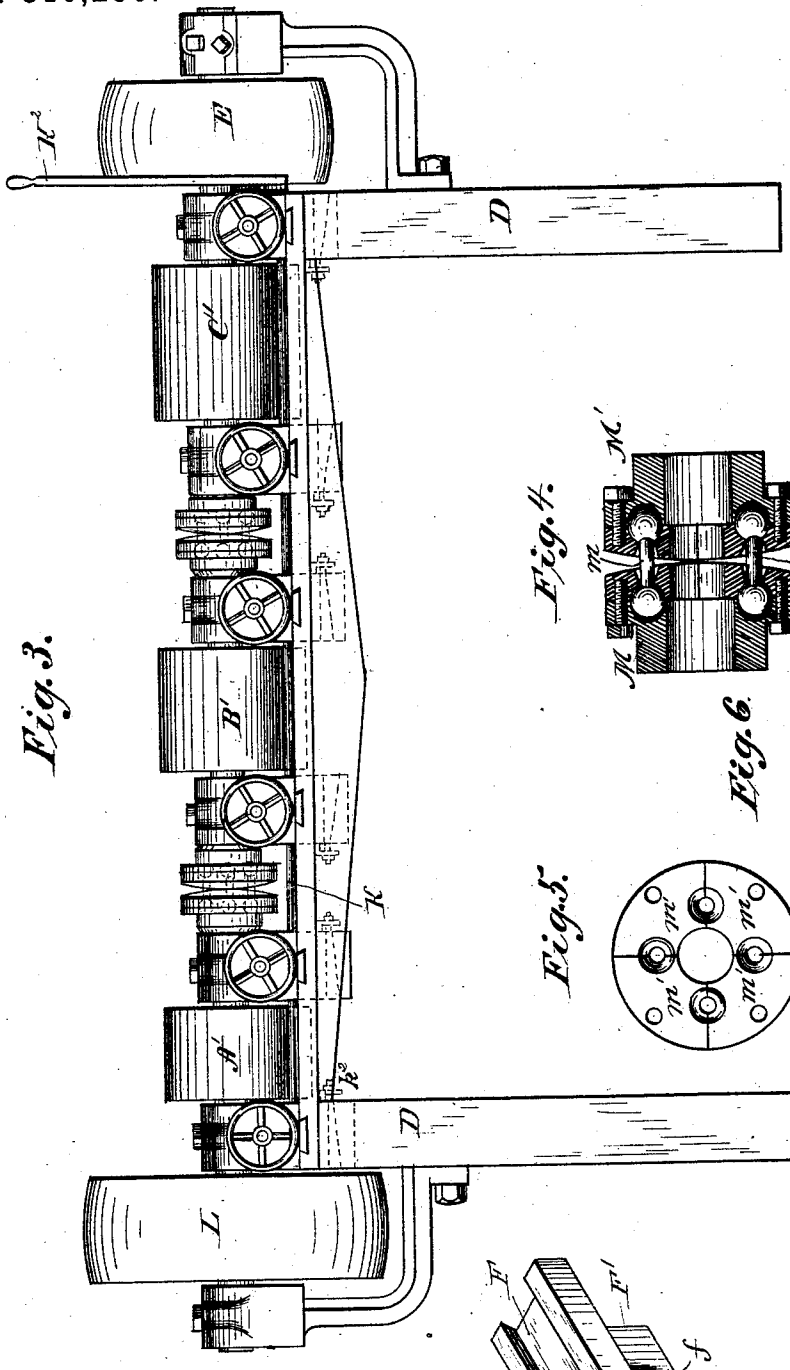


Fig. 3.

Fig. 4.

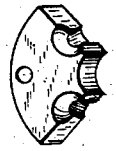


Fig. 6.

Fig. 5.

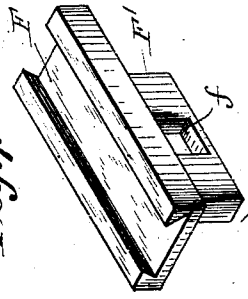


Fig. 7.

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(No Model.) 4 Sheets—Sheet 4.

W. H. WAKEFORD.

ROLLER GRINDING MILL.

No. 310,236. Patented Jan. 6, 1885.

Fig. 10.

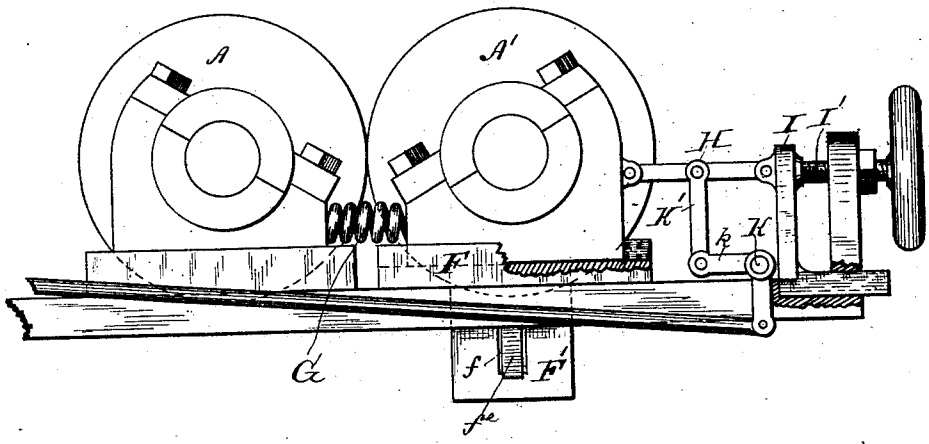
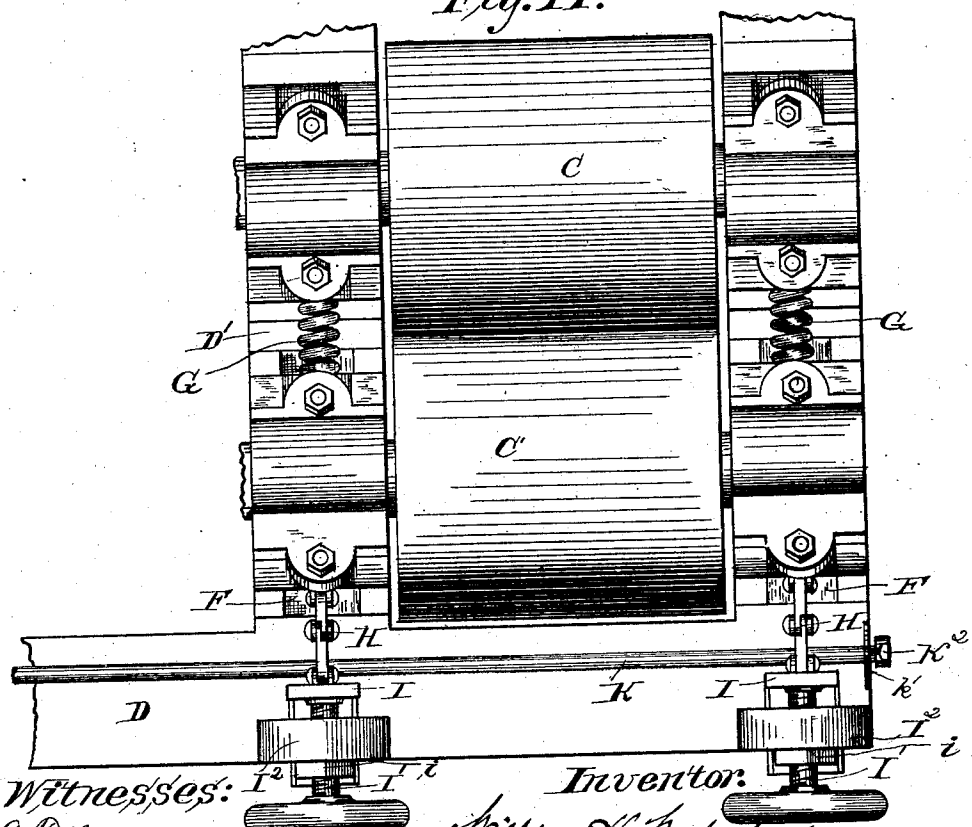


Fig. 11.



Witnesses:
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Inventor:
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UNITED STATES PATENT OFFICE.

WILLIAM H. WAKEFORD, OF BALTIMORE, MARYLAND.

ROLLER GRINDING-MILL.

SPECIFICATION forming part of Letters Patent No. 310,236, dated January 6, 1885.

Application filed January 15, 1884. (No model.)

To all whom it may concern:

Be it known that I, WM. H. WAKEFORD, a citizen of the United States, residing at Baltimore, in the county of Baltimore and State of Maryland, have invented certain new and useful Improvements in Roller Grinding-Mills; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to a roller-mill composed of two corresponding lines of two or more rollers each, the respective rollers of each line being connected and driven one from the other by universal-joint couplings, so that each roller is independent of every other roller so far as removal or adjustment is concerned.

My improvement consists of certain novel combinations for adjusting and spreading the adjustable rollers, which combinations are specifically pointed out in the claims at the close of the specification.

In order that my invention may be clearly understood, I have illustrated in the annexed drawings and will proceed to describe a practicable form thereof.

Figure 1 is a plan view of a roller-mill containing four parallel lines of rollers and constituting a duplex roller-mill embodying my invention. Fig. 2 is an end view of said duplex roller-mill. Fig. 3 is a side view of the same. Figs. 4 to 11 illustrate details of the roller-mill.

The same letters of reference indicate identical parts in all the figures.

The essential parts being simply duplicated it is only necessary, to a full understanding of the construction of the duplex roller-mill, to describe in detail one half or one side thereof, constituting a single roller-mill of my construction, and the ensuing description will be confined to that way.

As usual, each pair of rollers consists of a non-adjustable roller and an adjustable roller. I have shown a line of three non-adjustable rollers, marked A, B, and C, respectively, and a corresponding line of three adjustable rollers, marked A′, B′, and C′, respectively. The rollers are made of increasing length, the rollers A A′, which constitute the first break, being the shortest.

I deem it unnecessary to illustrate the dresses of the respective breaks; but the dress is made of increasing fineness from the first break to the last break, as usual. The non-adjustable rollers are journaled in fixed bearings suitably secured upon cross-bars D′ of the main frame D. The non-adjustable rollers are independent of one another; but the adjacent journals of the rollers are detachably connected together by a suitable coupling capable of transmitting the motion of one to the next.

I prefer to use a universal-joint coupling for connecting the journals of the non-adjustable rollers, the same as I use for connecting the journals of the adjustable rollers, one form of which will be presently described in connection with the description of the mode of arranging and coupling the adjustable rollers.

The use of universal-joint couplings for connecting the non-adjustable rollers is preferable to the use of an ordinary coupling, because it admits of slight divergences from perfect alignment of the rollers. The line of these non-adjustable rollers is driven by a pulley, E, keyed or secured to the journal of roller C. Each adjustable roller is journaled in a pair of boxes seated, respectively, in dovetailed ways of a pair of bed-plates, F. (Shown in detail in Fig. 7.) Stiff spiral springs G are interposed between the boxes of the non-adjustable rollers and the boxes of the adjustable rollers, tending to push the boxes of the adjustable rollers away from the boxes of the non-adjustable rollers. At the other side, each box of each adjustable roller is connected by toggle-joint H to a knee, I, which is constructed with a foot fitting in a dovetailed groove or way on the top bar of the main frame. The knee I is swivelingly connected to one end of a screw, I′, which turns in a nut, I², rigidly secured to or formed on the main frame. The toggle-joint H is always held straight between the adjustable boxes and the knee I, except at times when the rollers are separated, so that by turning the screw I′ and thus moving the knee I the adjustable box may be slid on its bed-plate for the purpose of properly adjusting the adjustable roller with reference

to the non-adjustable roller. The screw I′ carries a jam-nut, *i*, for the purpose of locking the screw after the proper adjustment has been made. The screw I′ is provided with a suitable hand-wheel for turning it.

For the purpose of spreading all the rollers simultaneously, I provide the following means, namely: A rock-shaft, K, mounted in fixed bearings in front of the line of adjustable rollers, and provided with as many horizontally-projecting arms *k* as there are adjustable boxes and toggle-joints, each arm *k* being connected by a link, K′, with the pivot-pin which connects the two bars of the toggle-joint. The rock-shaft K is provided with a suitable hand-lever, K^2, adapted to be locked to a fixed rack, *k′*. By rocking shaft K in one direction the toggle-joints may be collapsed to the required extent, so as to allow the adjustable boxes and rollers to recede from the non-adjustable boxes and rollers under the spreading action of the spiral springs G; and by rocking said shaft in the other direction and returning the toggle-joints to their condition of straightness all the adjustable rollers can be returned to the same position which they occupied before spreading.

In order that the adjustable rollers may be leveled, I provide the bed-plates F of their boxes with downwardly-projecting tongues F′, snugly fitting in holes in the cross-bars of the main frame, and apply a gib and key, f^2, through a hole, *f*, of tongue F′ beneath the said cross-bars for the purpose of vertically adjusting said bed-plates. After proper adjustment of the bed-plates F they are securely bolted to their supporting cross-bars of the main frame. Each adjustable roller can, by the means described, be separately adjusted with reference to its fellow non-adjustable roller. Like the line of non-adjustable rollers, the line of adjustable rollers is driven by a single pulley, L, secured to one of the journals of the roller A′, and in order that the remaining rollers B′ and C′ may be properly driven from the roller A′, whatever the adjustments of the respective rollers, I connect the adjacent journals of said rollers by universal-joint driving-couplings.

The coupling illustrated consists of a pair of flanged sleeves, M M′, secured to the roller-journals, and a series of bars, *m*, constructed with a ball at each end, as shown in Fig. 4, for connecting the sleeves, the ball ends of said bars being connected to the respective sleeves by two series of segmental caps, *m′*, bolted to the flanges of the sleeves. Suitable sockets are formed partly in the sleeves and partly in the caps for the reception of the balls of the bars *m*, such sockets and the holes in the caps being made sufficiently large to admit of such play of the bars *m* as is required to permit of the independent adjustment of the rollers. To the same end the adjacent surfaces of the caps are made rounding.

It is obvious that any known slip-joint universal driving-coupling may be used in place of the coupling described.

In the duplex mill illustrated I have shown the rock-shafts used for spreading the rollers of the two lines of breaks as connected by a link, so that the rollers of the two lines of breaks may be simultaneously spread. The adjustable rolls of one series of breaks and the non-adjustable rolls of the other series of breaks may be driven by a single belt running from a driving-pulley, as shown in Fig. 2. The belt N (shown in dotted lines in Fig. 2) extends from driving-pulley L^2 over pulley L, secured to the journal of one of the adjustable rolls of the first series of breaks around an idler, L′; thence over a pulley secured to the journal of one of the non-adjustable rolls of the other series of breaks, and thence back to driver L^2, while the belt O (shown in full lines) extends from a pulley secured to the opposite end of the driving-shaft, over a pulley, O′, secured to the journal of one of the adjustable rolls of the second series of breaks, around an idler, O^2; thence over a pulley, E, secured to the journal of one of the non-adjustable rolls of the first series of breaks; thence back to the driver, the belt being crossed; but it is obvious that all the rollers of one series of breaks may be driven independently of the rollers of the other series of breaks of such a duplex roller-mill. Cog-gearing may be used instead of belt-gearing for driving the rolls.

This roller-mill is to be provided with suitable hoppers and feed-regulating devices; also with suitable means for separating the meal after each break; also with suitable means for transferring the tailings from the separator of one break to the hopper of the next break. All these means may be of well-known construction and applied in the usual way.

What I claim as my invention is—

1. The combination, substantially as before set forth, of an adjustable box, an adjustable knee, and a toggle-joint for connecting said box to said knee.

2. The combination, substantially as before set forth, of an adjustable box, an adjustable knee, a toggle-joint for connecting said box to said knee, and a screw for holding and adjusting the knee.

3. The combination, substantially as before set forth, of the adjustable boxes of an adjustable roller, an adjustable knee for each box, toggle-joints for connecting the boxes to the knees, a rock-shaft provided with arms, and links for connecting the arms of the rock-shafts with the toggle-joints.

In testimony whereof I affix my signature in presence of two witnesses.

WILLIAM H. WAKEFORD.

Witnesses:
F. UEBEL,
E. A. HEINZ.