March 14, 1933. S. EINSTEIN ET AL 1,901,290

MILLING MACHINE

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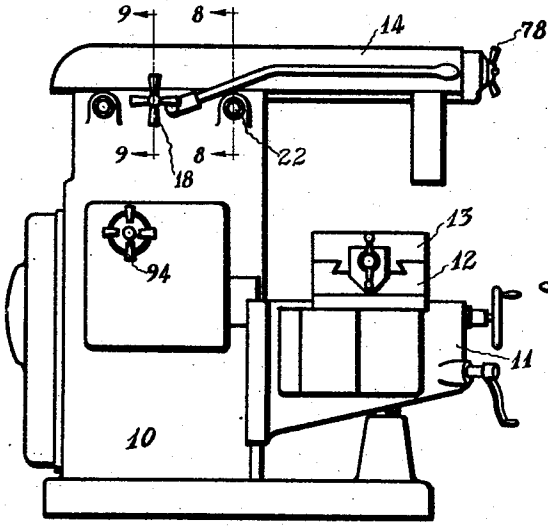


Fig. 1

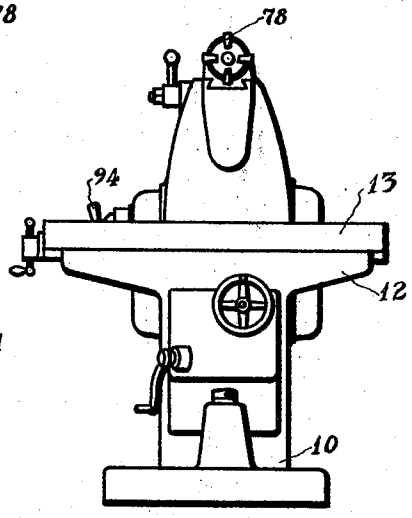


Fig. 2

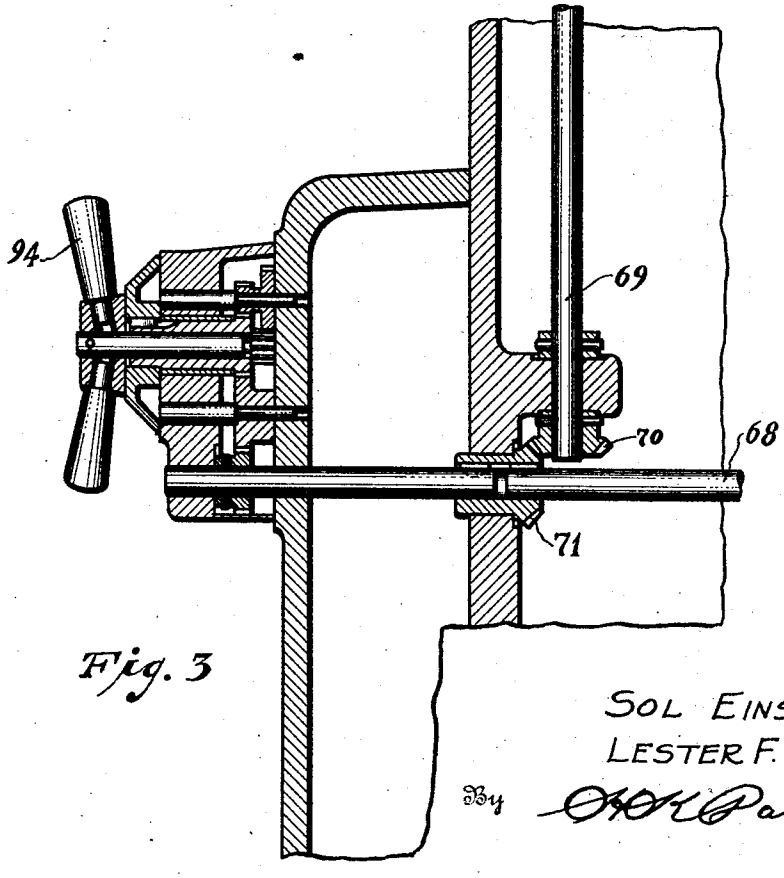


Fig. 3

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MILLING MACHINE

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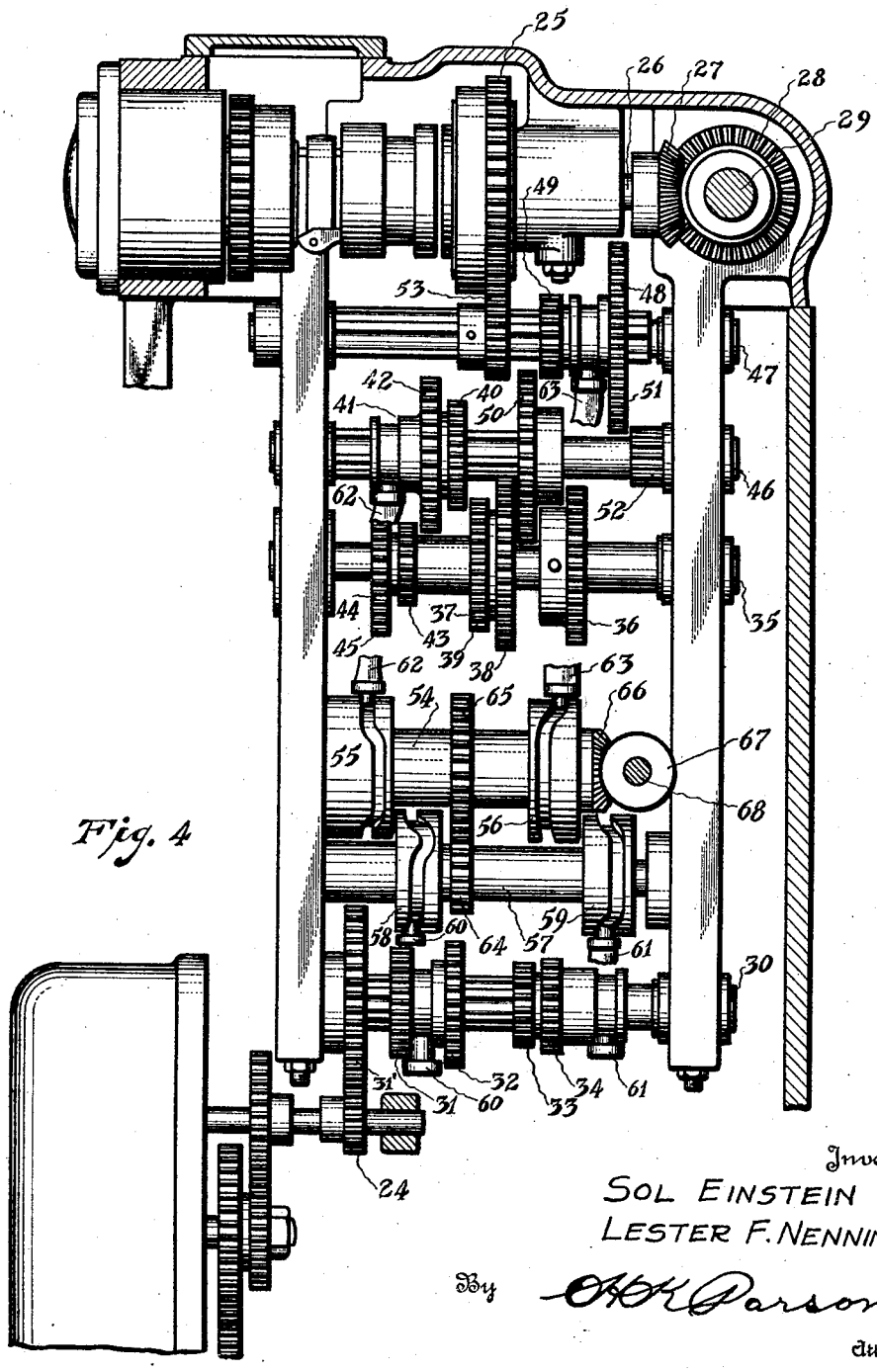


Fig. 4

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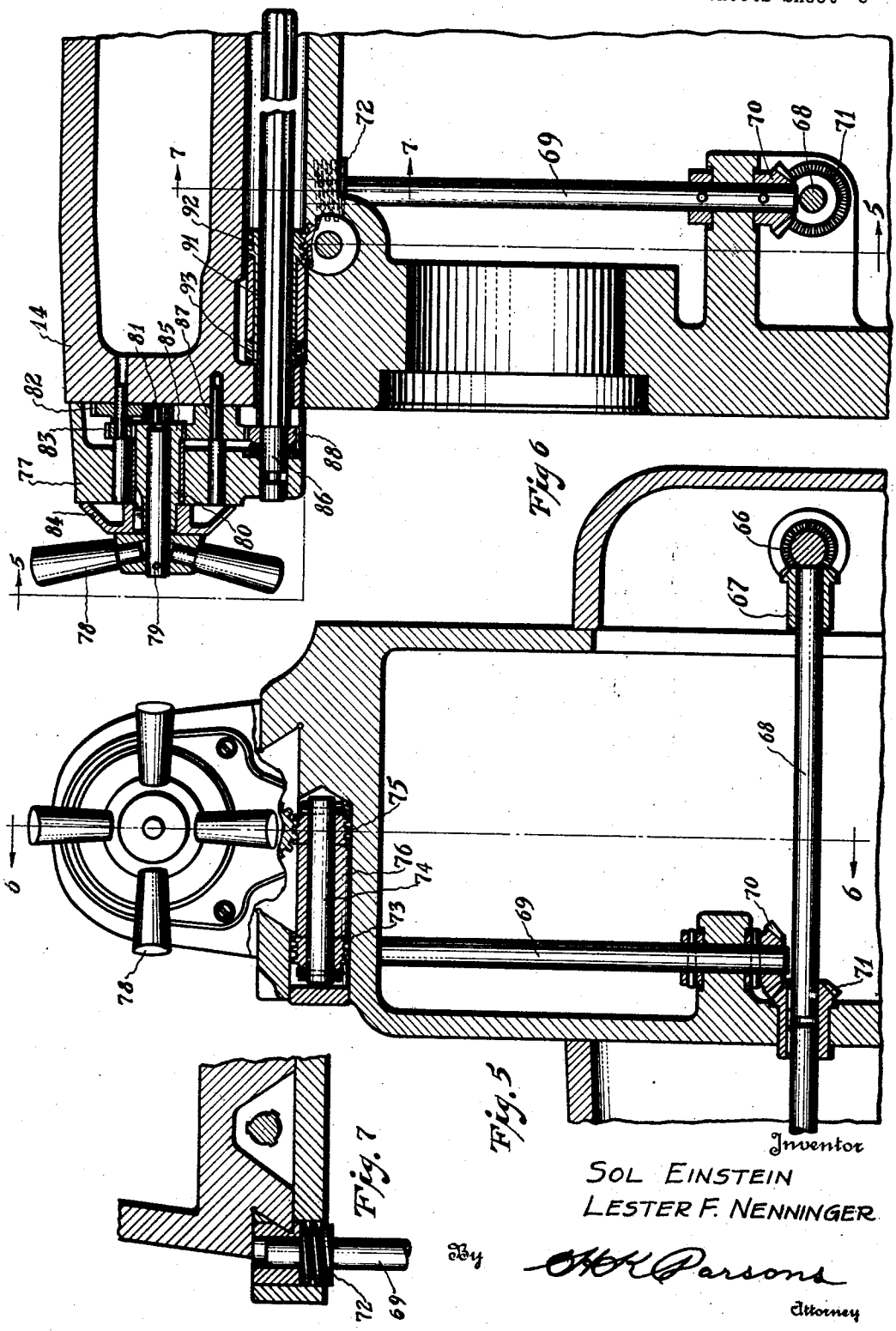
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MILLING MACHINE

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MILLING MACHINE

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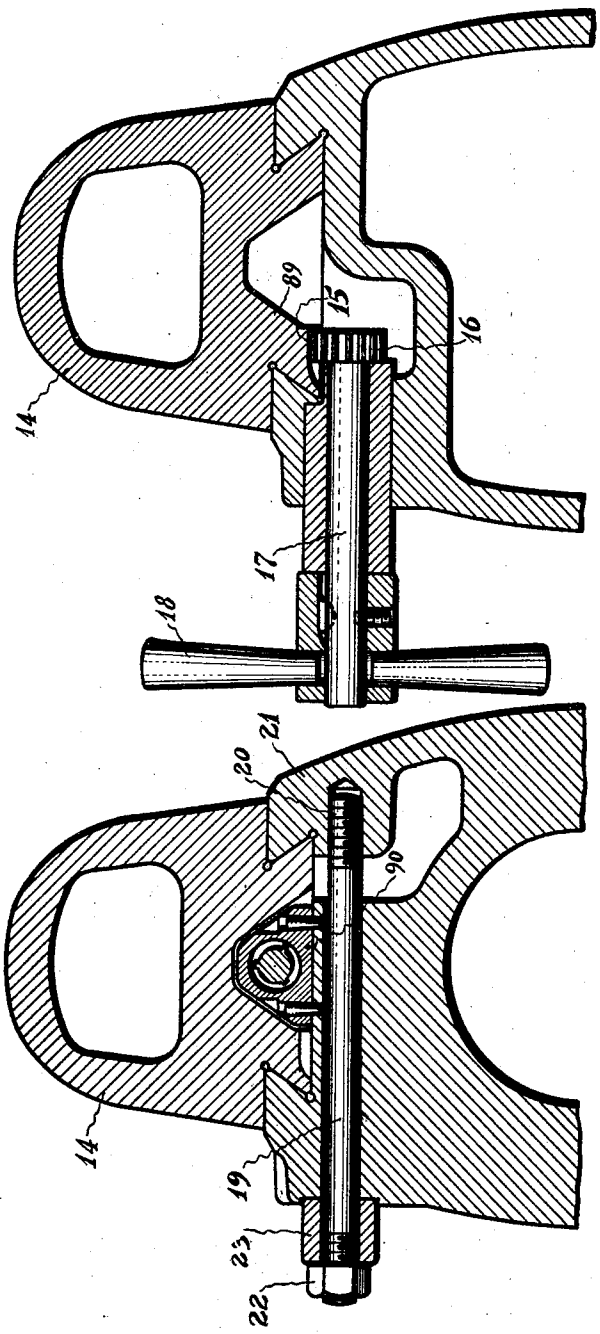


Fig. 9

Fig. 8

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Patented Mar. 14, 1933 1,901,290

UNITED STATES PATENT OFFICE

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MILLING MACHINE

Application filed February 13, 1930. Serial No. 428,178.

This invention relates to milling machines and more particularly to an improved control mechanism therefor.

It is common practice to provide milling machines having translatable work carrying elements with mechanism for translating these elements at various rates of speed, and it is an object of this invention to provide improved control means for effecting these rate changes in such mechanism that may be more easily manipulated and more conveniently located.

Another object of this invention is to provide a rate change mechanism for a variable speed transmission with a remote control which may be operated from the end of the over-arm at the front of the machine or from the side of the column when the machine is being operated from a position at the rear of the work table.

A further object of this invention is to provide a controlling lever and a dial on the end of an over-arm at the front of the machine for controlling the rate change mechanism so that the dial which indicates the present setting of the rate change mechanism may be more easily read by the operator.

Other objects and advantages of the present invention should be readily apparent by reference to the following specification, considered in conjunction with the accompanying drawings illustrative of one embodiment thereof and it will be understood that we may make any modifications in the specific structural details hereinafter disclosed within the scope of the appended claims without departing from or exceeding the spirit of the invention.

In the drawings in which like reference numerals indicate like parts, Figure 1 is a side elevation of a milling machine showing one embodiment of this invention.

Figure 2 is an end view of the machine.

Figure 3 is a vertical section showing the rate change control lever on the side of the column.

Figure 4 is a developed view of the variable speed transmission and the rate change control mechanism therefor.

Figure 5 is a partial vertical section on the line 5—5 of Figure 6.

Figure 6 is a vertical section on the line 6—6 of Figure 5.

Figure 7 is a detail section on line 7—7 of Figure 6.

Figure 8 is a detailed section on the line 8—8 of Figure 7.

Figure 9 is a detail section on the line 9—9 of Figure 1.

Referring to Figures 1 and 2 the reference numeral 10 represents the column of the machine having slidably mounted thereon for vertical movement, the knee 11 which carries the saddle 12 for cross-wise movement and the table 13 reciprocably mounted on the saddle 12.

Mounted on the top of the column for horizontal adjustment is the over-arm 14 which has the rack portion 15 on the lower part thereof for engagement by the gear 16 mounted on the end of the shaft 17 journaled in the column, the shaft having the operating handle 18 keyed on the other end. The bolt 19 is provided for clamping the over-arm in its adjusted position and has the threaded end 20 for engaging the resilient portion 21 of the column.

By means of the nut 22 acting against the sleeve 23 the resilient portion 21 is drawn to the left as shown in Figure 8 to clamp the overarm after it has been adjusted by handle 18.

The variable speed transmission shown in Figure 4 is mounted in the column of the machine and driven by a motor or other prime mover, not shown, mounted in the base of the machine. The prime mover through reduction gearing drives the gear 24 which in turn by means of the variable speed transmission drives the gear 25 mounted on the shaft 26 having bevel gear 27 on the end thereof for driving the saddle, table and knee through the bevel gear 28 mounted on shaft 29. The variable speed transmission consists of the shaft 30 driven from the gear 24 by means of the gear 31. Shaft 30 is splined to receive the gear couplet 31, 32 and the second gear couplet 33 and 34. Disposed adjacent the shaft 30 is a second shaft

35 having keyed thereto the gear member 36 for acuation by the gear 34.

A second gear unit 37 has a portion 38 for alternative engagement with the gear 33 of shaft 30 and a portion 39 engageable by gear 40 of sliding unit 41 having a second portion 42 alternatively engageable with pinions 43 of the couplet 44 fixed on the shaft 35 and having enlarged gear 45 for engagement with gear 31 of shaft 30. It will thus be seen that by translation of the units 31 and 32, and 33 and 34 shaft 35 may be actuated at 4 different speeds and these may be communicated in turn through unit 41 to drive shaft 46 at 8 different speeds.

Disposed adjacent shaft 46 is the 4th transmission shaft 47 bearing a sliding couplet 48, having pinion gear 49 for engagement with gear 50 on shaft 46 and a large gear 51 for engagement with pinion 52 on shaft 46, thereby shaft 47 may be actuated at 16 different speeds on the relative positioning of the several sliding units. Shaft 47 has the gear 53 which drives gear 25 previously explained.

A rate change mechanism is provided for shifting the various shiftable units of the variable speed transmission and comprises the shaft 54 having integrally mounted thereon cam drum 55 and 56. Journaled in the column of the shaft 54 is a second shaft 57 having the cam drums 58 and 59. Cam drum 58 controls the shiftable unit 31 and 32 through the pivoted gear shift lever 60 which has one end engaged in the groove of the cam 58 and the other end in the spool of the gear couplet. In a similar manner cam 59 controls the gear couplet 33 and 34 through the gear shift lever 61. Cam drums 55 and 56 control respectively gear couplet 41 and 48 through gear shift levers 62 and 63. The grooves in these cam drums are so arranged that they will effect the various speeds of the transmission in progressive order.

Shafts 54 and 57 are connected for operation by means of gears 64 and 65. The shaft 54 drives the shaft 57 and is in turn driven by means of the bevel gears 66 and 67 of the shaft 68.

Referring to Figures 3 and 5 it will be seen that the shaft 68 may be operated from either one of two branches. One branch extends to the side of the column as shown in Figure 3; the other branch extends to the top of the column as shown in Figures 5 and 6. The vertical shaft 69 journaled in the upper part of the column has mounted upon one end the bevel gear 70 for operating the shaft 68 through the bevel gear 71. It has mounted upon the other end the helical worm gear 72 for engagement with the gear 73. The gear 73 is fixed on one end of the shaft 74 which has the gear 75 fixed upon the other end and a sleeve 76 mounted thereon between the two gears. The sleeve 76 is flat on top so that when the overarm is in place the flat side of the overarm will engage the flat side of the sleeve and prevent rotation thereof.

There is provided on the end of the overarm 14 a housing 77 in which is journaled the operating lever 78. The shaft 79 is mounted for free rotation in the sleeve 80 but drives the sleeve 80 through the reduction gears 81, 82 and 83. The sleeve 80 has keyed thereon the indicator 84 and in this case the reduction gearing has a four to one ratio so that the operating handle must make four revolutions to effect one complete revolution of the indicator 84. The sleeve 80 has the integral gear 85 on one end which operates spline shaft 86 through the idler gear 87 and the gear 88 keyed therewith.

The under side of the overarm is cut out as shown at 89 in Figures 8 and 9 to permit mounting of the bearing 90 on the top of the column and to allow space for the spline shaft 86 to project therein. The bearing 90 has journaled therein the sleeve 91 having the integral gear 92 on one end and the collar 93 on the other end to prevent longitudinal movement of the gear.

The sleeve 91 is splined to receive the splined shaft 86 which in turn through gear 92 operates the gear 75.

It is thus seen that by rotation of the handle 78 any one of the 16 speeds of the variable speed transmission may be effected, and simultaneously therewith the speed effected is registered on the indicator 84 so that the operator at all times knows the setting of the transmission.

Referring to Figure 3 it will be seen that the shaft 68 is extended to project from the side of the machine to be operated by the handle 94. The drive between the handle 94 and the shaft 68 and the indicator means connected therewith are similar in construction to that of the overarm so the description thereof need not be repeated.

The operation of the mechanism should be clear from the foregoing description. Attention is called to the fact that when one control handle is being operated it simultaneously operates the other and the worm gears used are of such construction that this is possible.

We claim:

1. In a milling machine having a column, a work table slidably mounted thereon, a variable speed transmission for the table supported by the column, said column having an overarm projecting over said table, means to adjust the overarm relative to the column, speed change control means for said transmission mounted on the end of the overarm and additional speed change control means for said transmission on the side of the column, indicating means with each

control means, and means to interconnect said control means in all positions of adjustment of the overarm whereby operation of one will simultaneously operate the other.

2. In a machine tool having a variable speed transmission mounted in the bed thereof, an overarm slidably mounted on the bed and having adjusting means therefor, a rate change control means for said transmission, carried by the overarm and comprising an operating lever and rate indicating dial, reduction gearing actuating the dial from the lever, and actuating means operated by said dial to vary the speed of the transmission in any position of adjustment of said overarm.

3. A milling machine having a column, a variable speed transmission mounted in the column and having a rate change control mechanism therefor, an overarm slidably mounted on the column and having a control lever in the end therefor, a shaft journaled in said overarm and actuated by said lever, a gear having a splined connection with said shaft and mounted in said column, means to connect said gear with said mechanism whereby the latter may be remotely controlled by said lever in any position of adjustment of said overarm.

In testimony whereof we affix our signatures.

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