

J. EDGAR.  
CHANGE FEED MECHANISM.

(Application filed Mar. 6, 1902.)

(No Model.)

2 Sheets—Sheet 1.

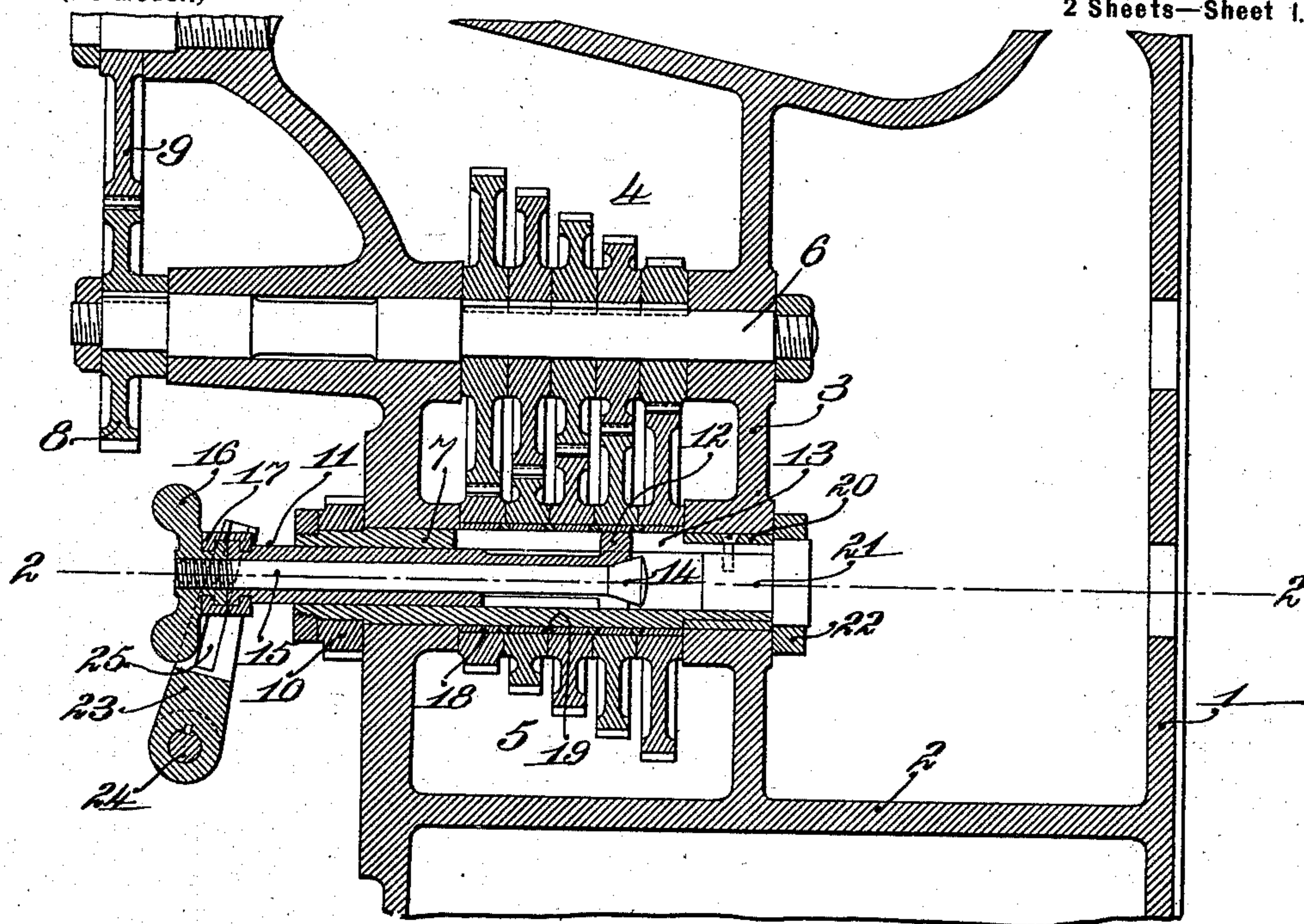


Fig. 1.

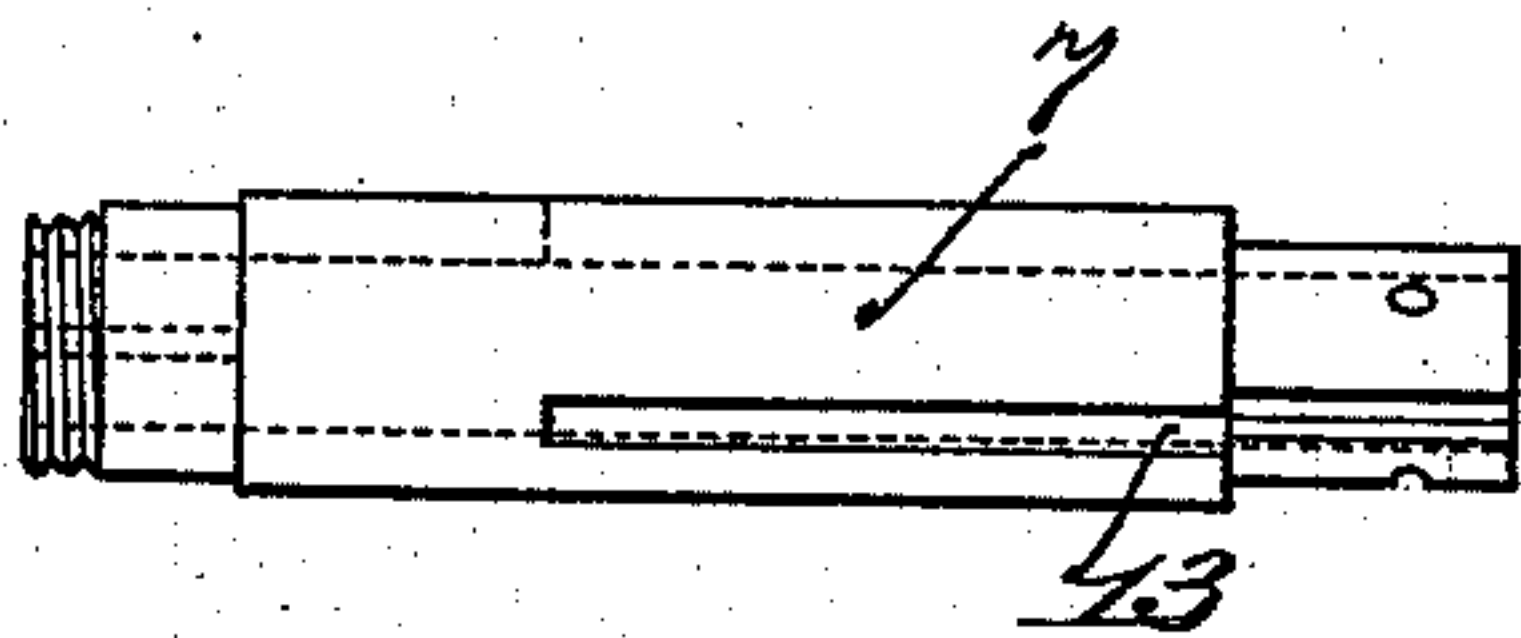


Fig. 4.

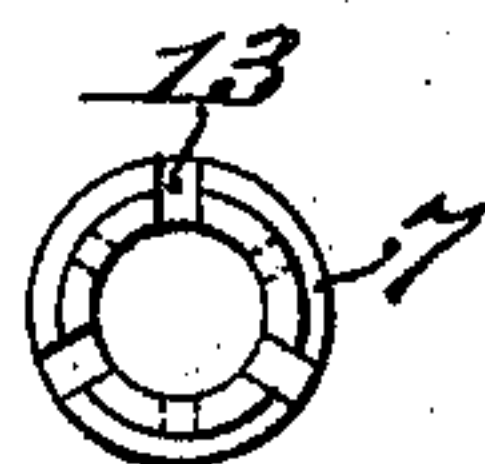


Fig. 5.

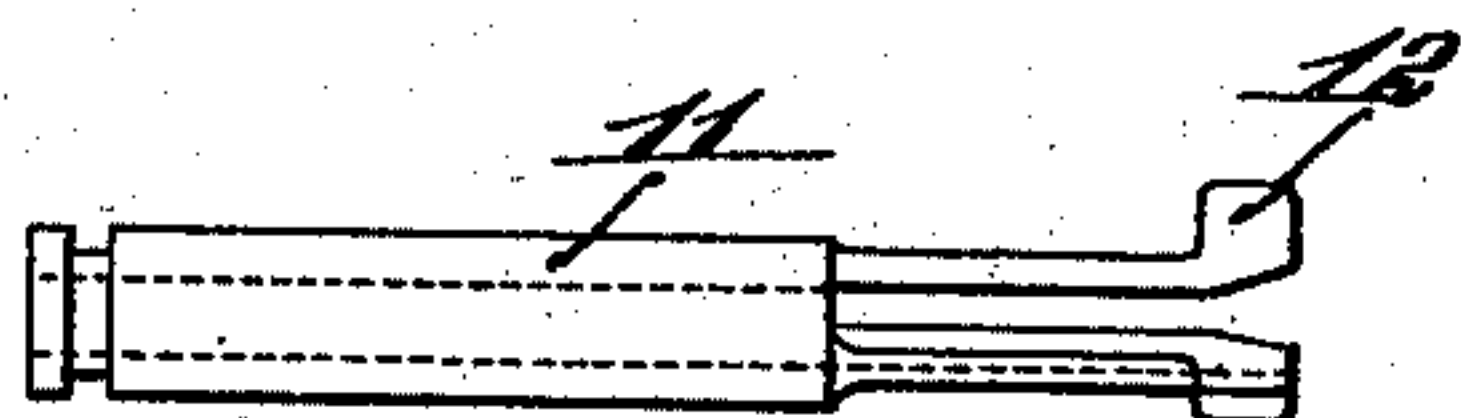


Fig. 6.

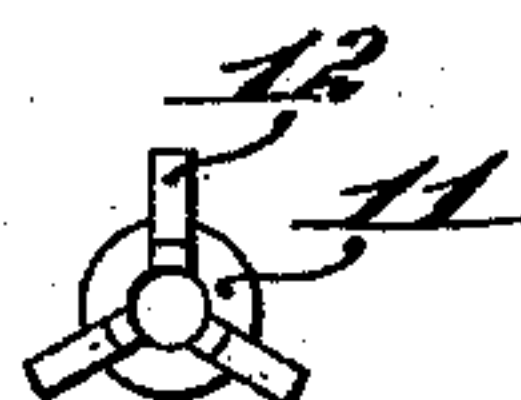


Fig. 7.

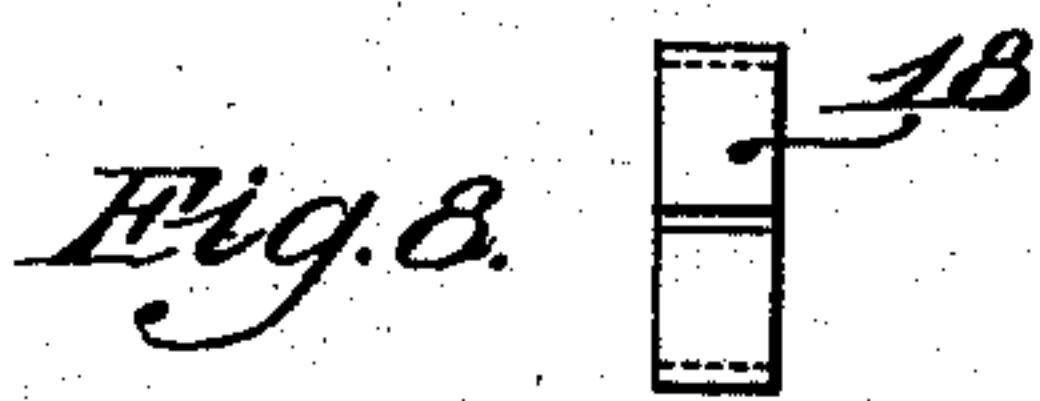


Fig. 8.

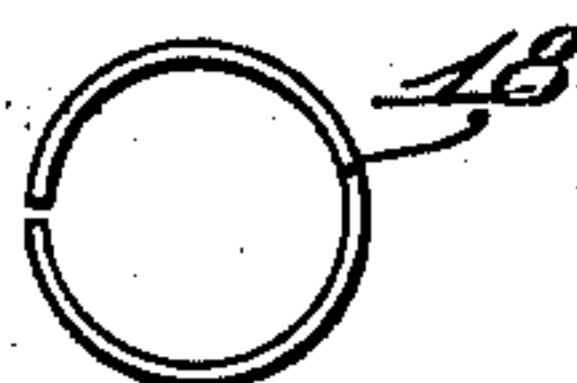


Fig. 9.

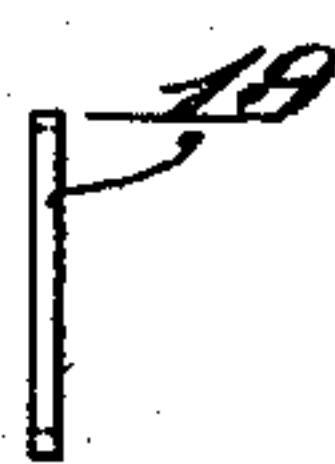


Fig. 10.



Fig. 11.

Witnesses  
Edward S. Day  
Fred C. Fish

Inventor  
John Edgar  
by his Attorney  
Benjamin Phillips



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2 Sheets—Sheet 2.

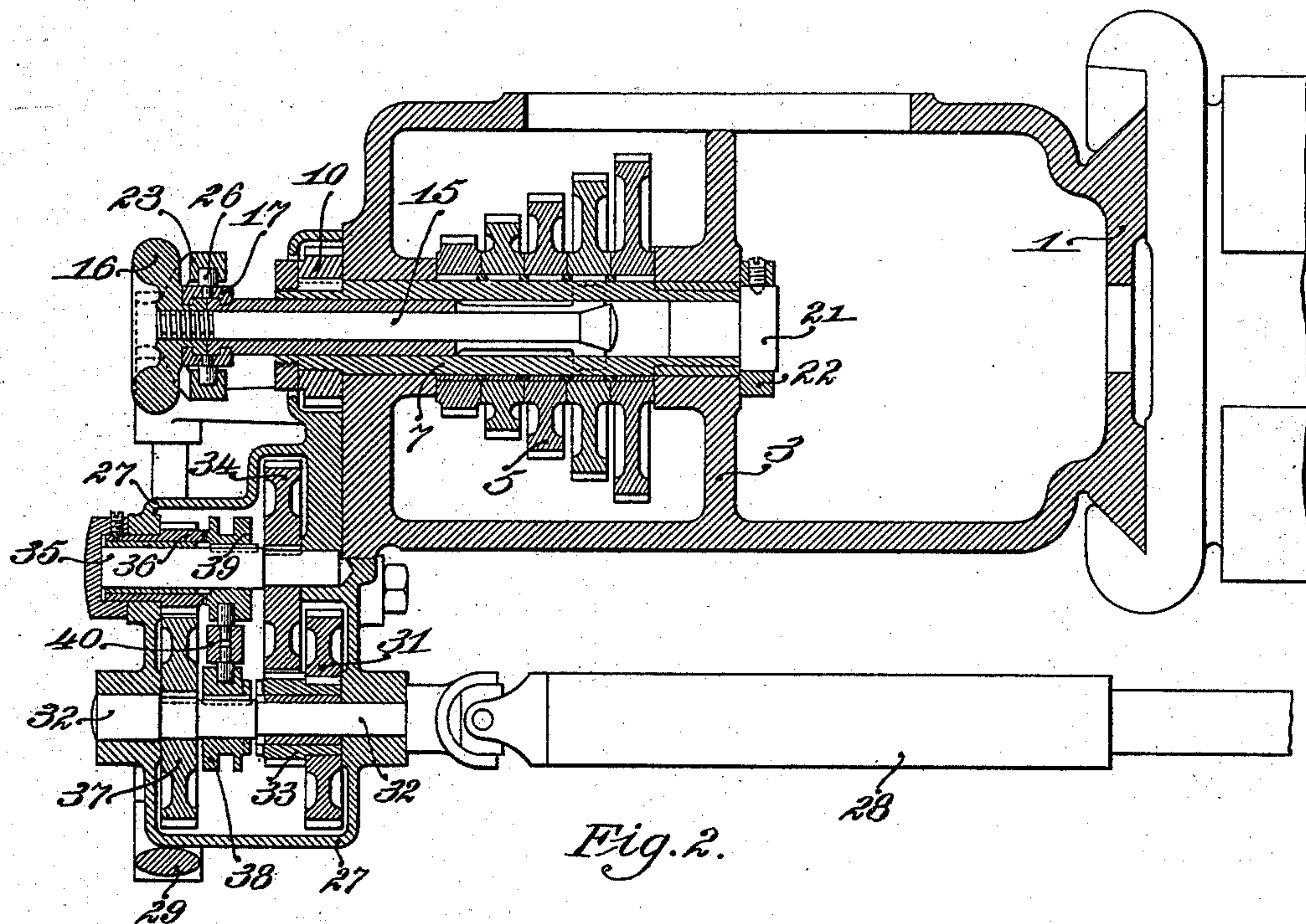


Fig. 2.

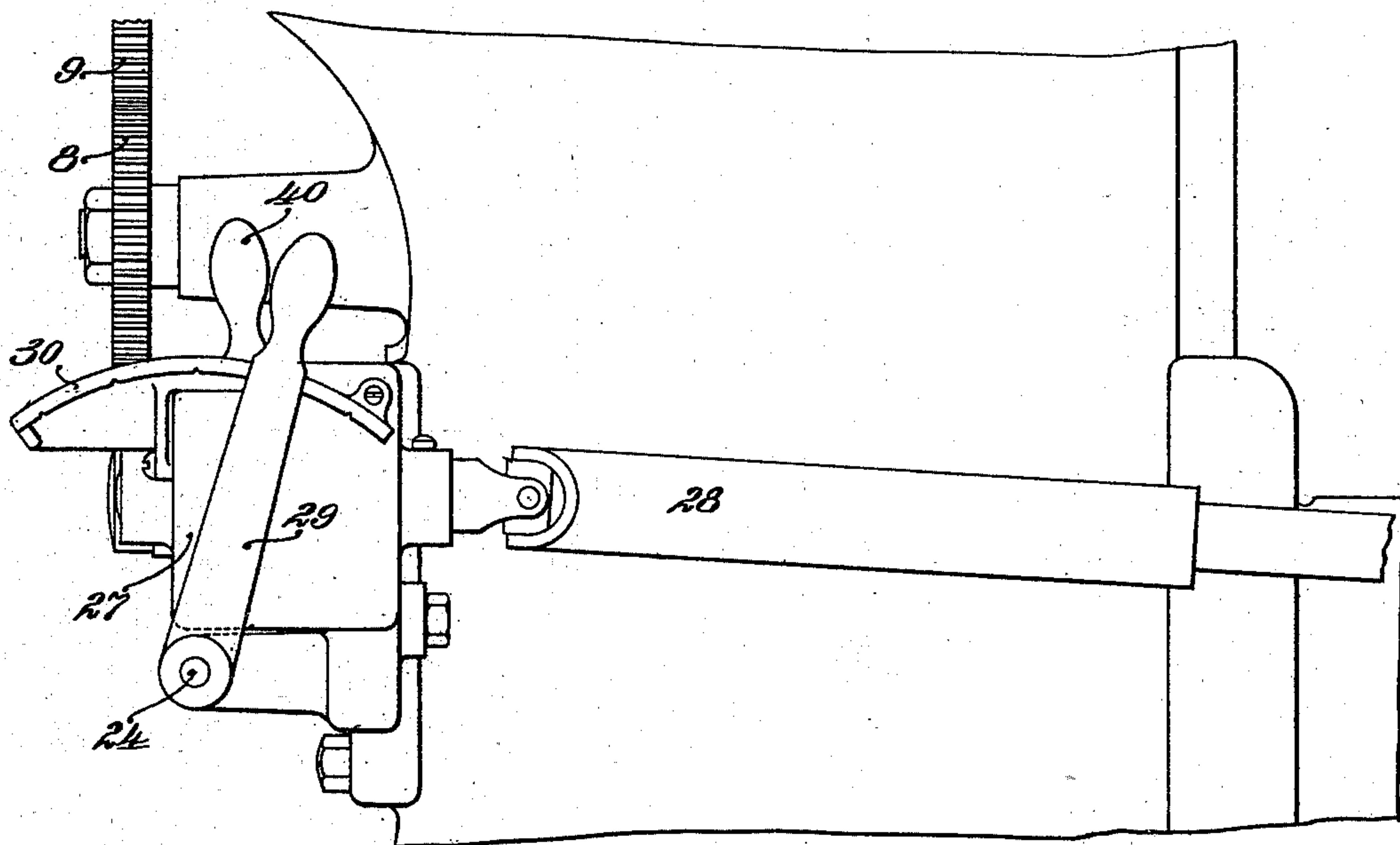


Fig. 3.

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# UNITED STATES PATENT OFFICE.

JOHN EDGAR, OF HYDEPARK, MASSACHUSETTS, ASSIGNOR TO BECKER-BRAINARD MILLING MACHINE COMPANY, OF PORTLAND, MAINE, A CORPORATION OF MAINE.

## CHANGE-FEED MECHANISM.

SPECIFICATION forming part of Letters Patent No. 714,567, dated November 25, 1902.

Application filed March 6, 1902. Serial No. 96,916. (No model.)

*To all whom it may concern:*

Be it known that I, JOHN EDGAR, a subject of the King of the United Kingdom of Great Britain and Ireland, residing at Hydepark, in the county of Norfolk and State of Massachusetts, have invented certain new and useful Improvements in Change-Feed Mechanism; 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.

The present invention relates to an improved change-feed mechanism particularly applicable to vertical and horizontal milling-machines, but which is also adapted for use in other types of machine-tools and in other relations.

More particularly the present invention relates to an improved change-feed mechanism comprising two series of change-speed gears, a shaft upon which the gears of one of said series are mounted to rotate independently of each other, and means for clutching the shaft to each of the gears.

The present invention also relates to an improved arrangement of the change-feed mechanism of a horizontal or vertical milling-machine with reference to the column of the machine.

Among the objects of the present invention is to provide a change-feed mechanism of the type referred to which shall comprise improved means for clutching each of the series of gears which are mounted to rotate independently of each other to the shaft upon which they are mounted.

With these objects in view a feature of my invention consists in providing a change-feed mechanism comprising two series of change-speed gears and a shaft upon which the gears of one of said series are mounted to rotate independently of each other with clutch mechanism comprising clutch members movable into operative relation to each of the gears which are mounted to rotate independently of each other and means for positively forcing said members outward to clutch any one of said gears to the shaft. By providing outwardly-movable clutching members and

means for positively operating the same the clutch members can be moved into operative relation to any one of the gears without connecting any of the gears to the shaft and can thereafter be operated to clutch the gear to the shaft. By providing means for positively forcing the clutch members outward the gear with which the clutch members have been brought into operative relation can be firmly and securely clutched to the shaft, and any liability of the gear being disconnected from the shaft or of the clutch members being accidentally shifted from one gear to another is avoided. In the preferred form of my invention the gears are clutched to the shaft by friction, as thereby the gears can be clutched to the shaft at any point in the revolution of the gears on the shaft and a change in the clutching means from one gear to another can be made more quickly than is the case where the clutching means comprises a member or members which enter a keyway or slot in the gears. Broadly considered, however, my invention is not limited to frictional clutching means, but comprises any clutching means provided with members which are positively forced outward to clutch the gears to the shaft. In carrying out this feature of my invention the clutch members may be mounted in any desired manner, so as to be movable into operative relation with each of the gears. I prefer, however, to support the shaft upon which the gears are mounted in its bearings so as to be held from longitudinal movement and to mount the clutch members so as to be movable longitudinally of the shaft.

Another feature of my invention consists in providing a change-feed mechanism comprising two series of gears and a shaft upon which the gears of one of said series are mounted to rotate independently of each other with a clutch mechanism comprising split rings interposed between the gears and the shaft, members movable into operative relation to each ring, and means for actuating said members to expand a ring when brought into operative relation thereto. This feature of my invention is embodied in its preferred form in a construction in which the members are



positively actuated to expand a ring; but it is to be understood that considered in its broadest aspects it may be embodied in constructions in which the members are otherwise operated.

In the preferred construction, embodying either or both of the features of invention above referred to, separator-rings are provided for preventing the clutch members from being actuated when in a position to cause two of the gears to be clutched to the shaft simultaneously.

Other features of my invention consist in the devices and combinations of devices hereinafter described and claimed, the advantages of which will be obvious from the following description.

A preferred form of my invention is illustrated in the accompanying drawings, in which—

Figure 1 is a longitudinal sectional view of a portion of a horizontal milling-machine provided with my improved change-feed mechanism. Fig. 2 is a sectional plan view on the line 2-2 of Fig. 1. Fig. 3 is a view in side elevation of that portion of the milling-machine illustrated in Fig. 1. Fig. 4 is a view in side elevation of the shaft or sleeve upon which one of the series of change-speed gears is mounted. Fig. 5 is an end view thereof. Fig. 6 is a view in side elevation of the hollow rod upon which the clutch members are mounted. Fig. 7 is an end view thereof. Figs. 8 and 9 are views in side and end elevation of one of the split rings, and Figs. 10 and 11 are similar views of one of the separator-rings.

Referring to the drawings, 1 indicates a hollow column of a horizontal milling-machine provided with a horizontal partition 2 and a vertical partition 3, connecting the partition 2 and the upper wall of the column.

4 and 5 indicate two series of change-speed gears, the gears of series 4 being secured to a shaft 6, journaled in bearings in the rear wall of the column and in the partition 3, and the gears of series 5 being mounted to rotate loosely and independently upon a hollow shaft or sleeve 7, also mounted in bearings in the rear wall of the column and in the partition 3. To the rear end of the shaft 6 is secured a gear 8, meshing with a gear 9, driven from the main driving-shaft of the machine. The gears of series 4, which are secured to the shaft 6, rotate therewith in unison, and the gears of series 5 are driven therefrom at different speeds. To the rear end of the sleeve 7 a pinion 10 is secured, by means of which the feed-shaft of the machine is driven through suitable gearing to be hereinafter described. The gears of series 5 are connected to the sleeve 7 to cause the sleeve and the pinion 10, secured thereto, to rotate at different speeds by means of the following mechanism: Mounted to slide longitudinally in the sleeve 7 is a hollow rod 11, the inner end of which is slightly reduced in size and split into three parts, as clearly shown in Figs. 6 and 7.

Each of these parts is provided with a projection 12, which extends into a longitudinal slot 13, formed in the sleeve 7. These projections constitute clutch members, by means of which any one of the gears of series 5 can be clutched to the sleeve 7. The projections 12 are forced outwardly through the slots in the sleeve 7 by means of the cone-shaped or tapered portion 14 of a rod 15, mounted to slide longitudinally in the hollow rod 11. The outer end of the rod 15 is screw-threaded and has a screw-threaded engagement with the hub of a wheel 16, journaled in a block 17, mounted upon the outer end of the hollow rod 11. The rod 15 and the hollow rod 11 are thus connected together, so that by moving the hollow rod 11 the clutch members 12 can be brought into operative relation with any one of the gears, and thereafter the rod 15 can be moved with relation to the hollow rod 11 by rotating the wheel 16 and the tapered portion 14 of the rod caused to force the clutch members 12 outward through the slots in the sleeve 7. A split ring 18 (shown separately in Figs. 8 and 9) is interposed between each gear and the sleeve 7, so that the clutch members 12 when forced outwardly contact with the ring and expand the ring to cause it to press against the inner surface of the hub of the gear instead of engaging the inner surface of the hub of the gear directly. Preferably the split rings 18 are free to rotate upon the sleeve 7, as illustrated in the drawings, so that the clutch members 12 when forced outwardly clutch one of the rings to the shaft and expand the ring against the inner surface of the hub of the gear. In order to prevent the clutch members from being forced outwardly when in a position to cause the sleeve 7 to clutch two of the gears simultaneously, separator-rings 19, one of which is shown separately in Figs. 10 and 11, are interposed between the split rings.

By means of the construction above described it will be seen that the clutch members 12 can be moved longitudinally of the sleeve 7 into operative relation with any one of the gears of the series 5 and that during such movement none of the gears will be connected to the sleeve 7 and that thereafter the clutch members can be positively forced outwardly to clutch the gear to the sleeve. It will also be seen that the gears can be clutched to the sleeve 7 at any point in their revolution, as the gears are clutched to the sleeve by the friction between the gears and the split rings 18 and between the split rings 18 and the clutch members 12. The clutch members can therefore be easily and quickly shifted into a position to clutch any one of the gears to the sleeve and then forced outwardly, and these operations may be performed while the gears are rotating and without disconnecting any portion of the feed mechanism or of the gearing for imparting motion thereto. The tapered portion 14 of the rod 15 locks the clutch members in their outward position, and



thereby prevents the gear which has been clutched to the shaft from being disconnected therefrom or the clutch members from being moved longitudinally of the shaft until the rod 15 is moved to cause the tapered portion 14 to release the clutch members.

In the construction shown in the drawings the inner end of the sleeve 7 is reduced in size and is provided with a bearing-sleeve 20, secured thereto by means of suitable screws, which screws also secure a headed pin 21, which closes the inner end of the sleeve. The sleeve 7 is held from longitudinal movement in its bearings by means of the pinion 10 and by means of a collar 22, surrounding and secured to the head of the pin 21.

As a means for moving the hollow rod 11 longitudinally to bring the clutch members 12 into operative relation with the several gears of series 5 a forked lever 23, secured to a rock-shaft 24, is provided. This forked lever is provided with suitable slots 25, with which pins 26, projecting from the block 17 on the end of the hollow rod 11, engage. The rock-shaft 24 is journaled in projections from the base-plate of the casing 27, which incloses the pinion 10 and the gears for transmitting the motion of the pinion to the telescoping feed-shaft 28. A hand-lever 29 is also secured to the rock-shaft 24, the upper end of which extends into proximity to a segmental indicating-plate 30, secured to or formed on the casing 27.

The mechanism for transmitting the movement of the pinion 10 to the feed-shaft 28, which mechanism, however, forms no part of the present invention, is illustrated in Fig. 2. Referring to this figure, 31 indicates a gear secured to a sleeve mounted to rotate loosely upon a shaft 32, connected, by means of a universal joint, to the feed-shaft 28. This gear is rotated from the pinion 10 by means of suitable gears. (Not shown.) The sleeve to which the gear 31 is secured is provided with a pinion 33, which meshes with a gear 34, secured to a shaft 35. Upon this shaft a pinion 36 is mounted to rotate loosely, which pinion meshes with a gear 37, secured to the shaft 32. This construction is such that when the sleeve to which the gear 31 is secured is connected to the shaft 32 and the pinion 36 is disconnected from the shaft 35 the shaft 32 and the feed-shaft 28 are driven directly by the gear 31, and when the sleeve to which the gear 31 is secured is disconnected from the shaft 32 and the pinion 36 is connected to the shaft 35 the shaft 32 and the feed-shaft 28 are driven through a train of gears comprising the gear 31, pinion 33, gear 34, pinion 36, and gear 37. For connecting the sleeve to which the gear 31 is secured and the pinion 36 to the shafts 32 and 35, respectively, and for disconnecting them therefrom clutch members 38 and 39 are splined upon the shafts 32 and 35, and a lever 40, pivoted to the casing 27 and provided with pins engaging grooves in the clutch members 38 and 39, is provided, by

means of which the clutch members can be moved into engagement with cooperating clutch members formed on the sleeve to which the gear 31 is secured and upon the hub of pinion 36, the arrangement being such that a movement of the lever in one direction clutches the sleeve to which the gear 31 is secured to the shaft 32 and disconnects the pinion 36 from the shaft 35, and a movement of the lever in the opposite direction disconnects the sleeve to which the gear 31 is secured from the shaft 32 and connects the pinion 36 to the shaft 35.

It will be seen that the two series of gears 4 and 5 are located within the hollow column of the machine and are inclosed and protected by the walls of the column. The series of gears are thus protected from dust and dirt, and at the same time the machine is rendered more compact and of more attractive appearance than machines in which the change-feed mechanism is placed outside of the column of the machine.

Having thus described my invention, I claim as new and desire to secure by Letters Patent of the United States—

1. A change-feed mechanism, having, in combination, two series of change-speed gears, a shaft upon which the gears of one of said series are mounted, means for clutching each of said gears to said shaft comprising clutch members movable into operative relation to each of the gears, and means for positively forcing said members outward, substantially as described.

2. A change-feed mechanism, having, in combination, two series of change-speed gears, a shaft upon which the gears of one of said series are mounted, a rod mounted to slide longitudinally of said shaft provided with clutch members, and means for positively forcing said clutch members outward, substantially as described.

3. A change-feed mechanism, having, in combination, two series of change-speed gears, a shaft upon which the gears of one of said series are mounted, a split ring interposed between each gear and the shaft, ring-expanding members movable into operative relation to each ring, and means for actuating said members to expand a ring when brought into operative relation thereto, substantially as described.

4. A change-feed mechanism, having, in combination, two series of change-speed gears, a shaft upon which the gears of one of said series are mounted, a split ring interposed between each gear and the shaft, separator-rings interposed between the split rings, ring-expanding members movable into operative relation to each split ring, and means for actuating said members to expand a split ring when brought into operative relation thereto, substantially as described.

5. A change-feed mechanism, having, in combination, two series of change-speed gears, a shaft upon which the gears of one of said



series are mounted, a split ring interposed between each gear and the shaft, separator-rings interposed between the split rings, and means mounted on the shaft to expand each split ring, substantially as described.

6. A change-feed mechanism, having, in combination, two series of change-speed gears, a shaft upon which the gears of one of said series are mounted, a split ring interposed between each gear and the shaft, and means mounted on the shaft to clutch each ring to the shaft and to expand the ring, substantially as described.

7. A change-feed mechanism, having, in combination, two series of change-speed gears, a slotted rotatable sleeve upon which the gears of one of said series are mounted, a rod mounted to slide longitudinally in said sleeve provided with projections extending into the slots in the sleeve, and means mounted on the rod to positively force said projections outward through the slots in the sleeve, substantially as described.

8. A change-feed mechanism, having, in combination, two series of change-speed gears, a slotted rotatable sleeve upon which the gears of one of said series are mounted, split rings interposed between the gears and the sleeve, a hollow rod mounted to slide longitudinally in said sleeve provided with projections extending into the slots in the sleeve, and means mounted on the hollow rod to force said projections outward through the slots in the sleeve, substantially as described.

9. A change-feed mechanism, having, in combination, two series of change-speed gears, a slotted rotatable sleeve upon which the gears of one of said series are mounted, split rings

interposed between the gears and the sleeve, separator-rings interposed between the split rings, a hollow rod mounted to slide longitudinally in said sleeve provided with projections extending into the slots in the sleeve, and means mounted on the hollow rod to force said projections outward through the slots in the sleeve, substantially as described.

10. A change-feed mechanism, having, in combination, two series of change-speed gears, a slotted rotatable sleeve upon which the gears of one of said series are mounted, a hollow rod mounted to slide longitudinally in said sleeve having a split end provided with projections extending into the slots in the sleeve, and a rod mounted to slide in said hollow rod provided with a tapered portion to expand the split end of the hollow rod, substantially as described.

11. A change-feed mechanism, having, in combination, two series of change-speed gears, a slotted rotatable sleeve upon which the gears of one of said series are mounted, a hollow rod mounted to slide longitudinally in said sleeve having a split end provided with projections extending into the slots of the sleeve, a rod mounted to slide in said hollow rod provided with a tapered portion to expand the split end of the hollow rod and a nut having a screw-threaded engagement with said rod mounted upon the hollow rod, substantially as described.

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

JOHN EDGAR.

Witnesses:

L. E. HARPER,  
A. L. LOVEJOY.