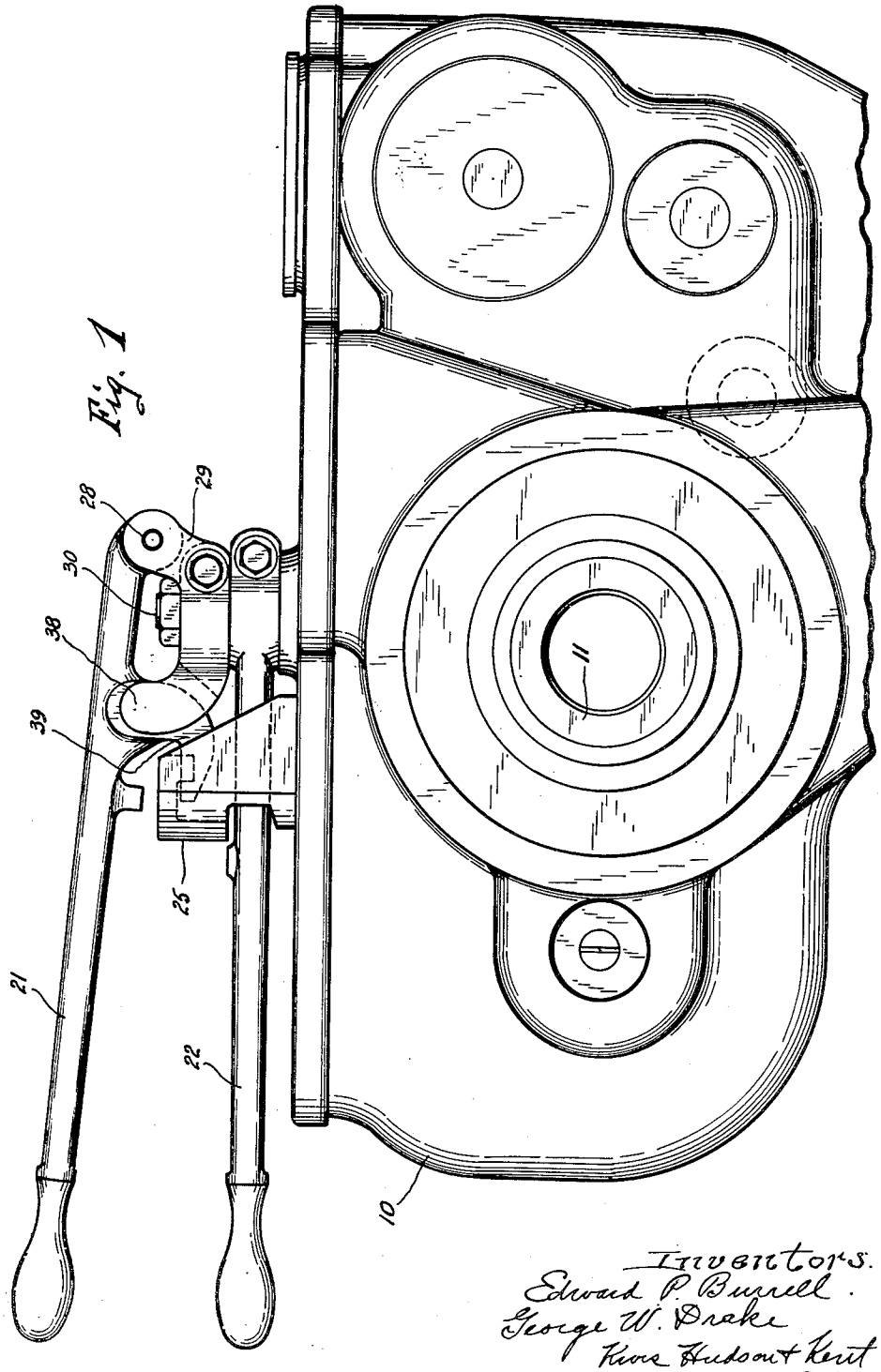
May 16, 1933. E. P. BURRELL ET AL 1,908,885

CONTROL FOR MACHINE TOOLS

Filed Dec. 5, 1928 4 Sheets-Sheet 1

Fig. 1



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Filed Dec. 5, 1928 4 Sheets-Sheet 2

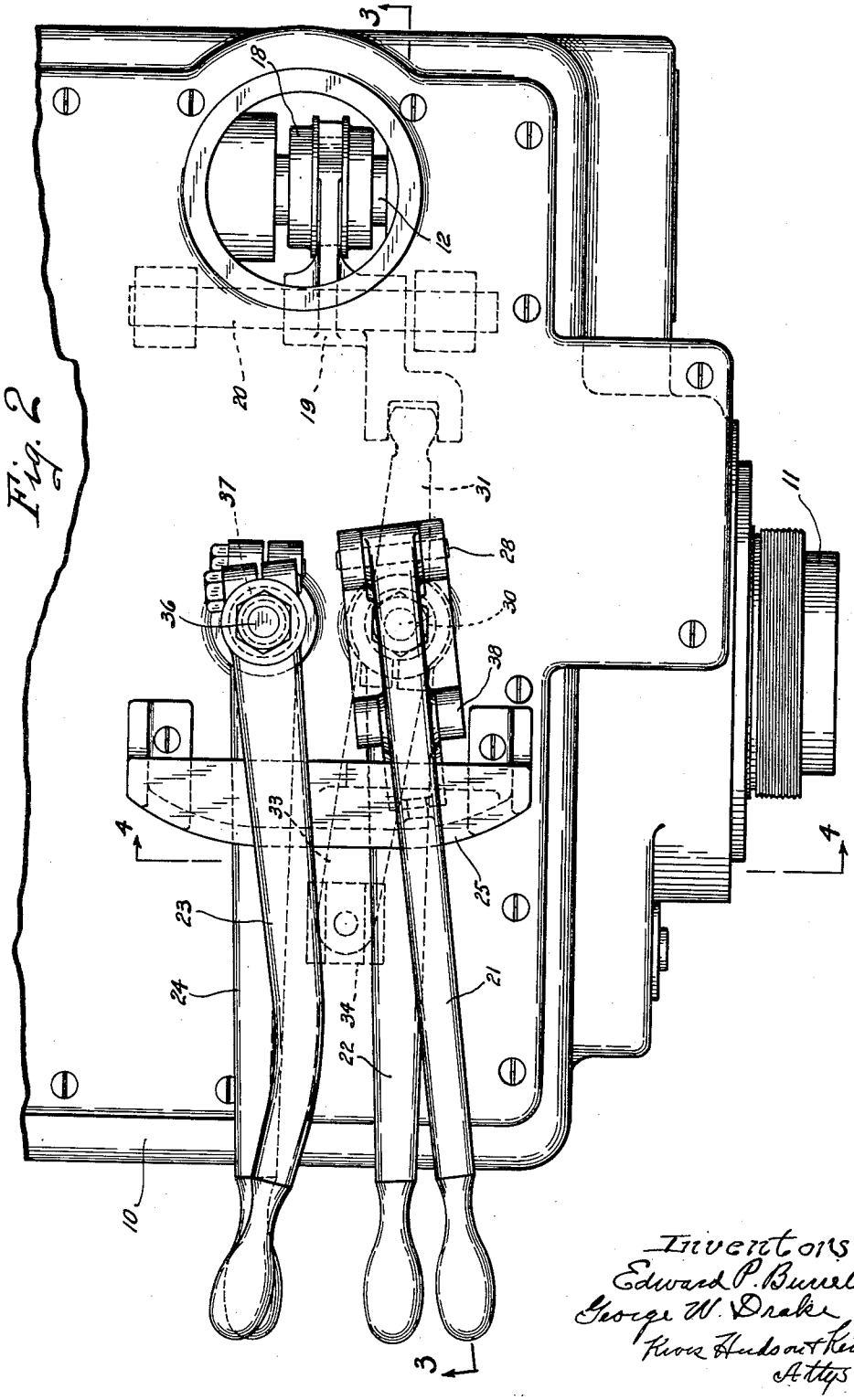

Fig. 2

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Fig. 3

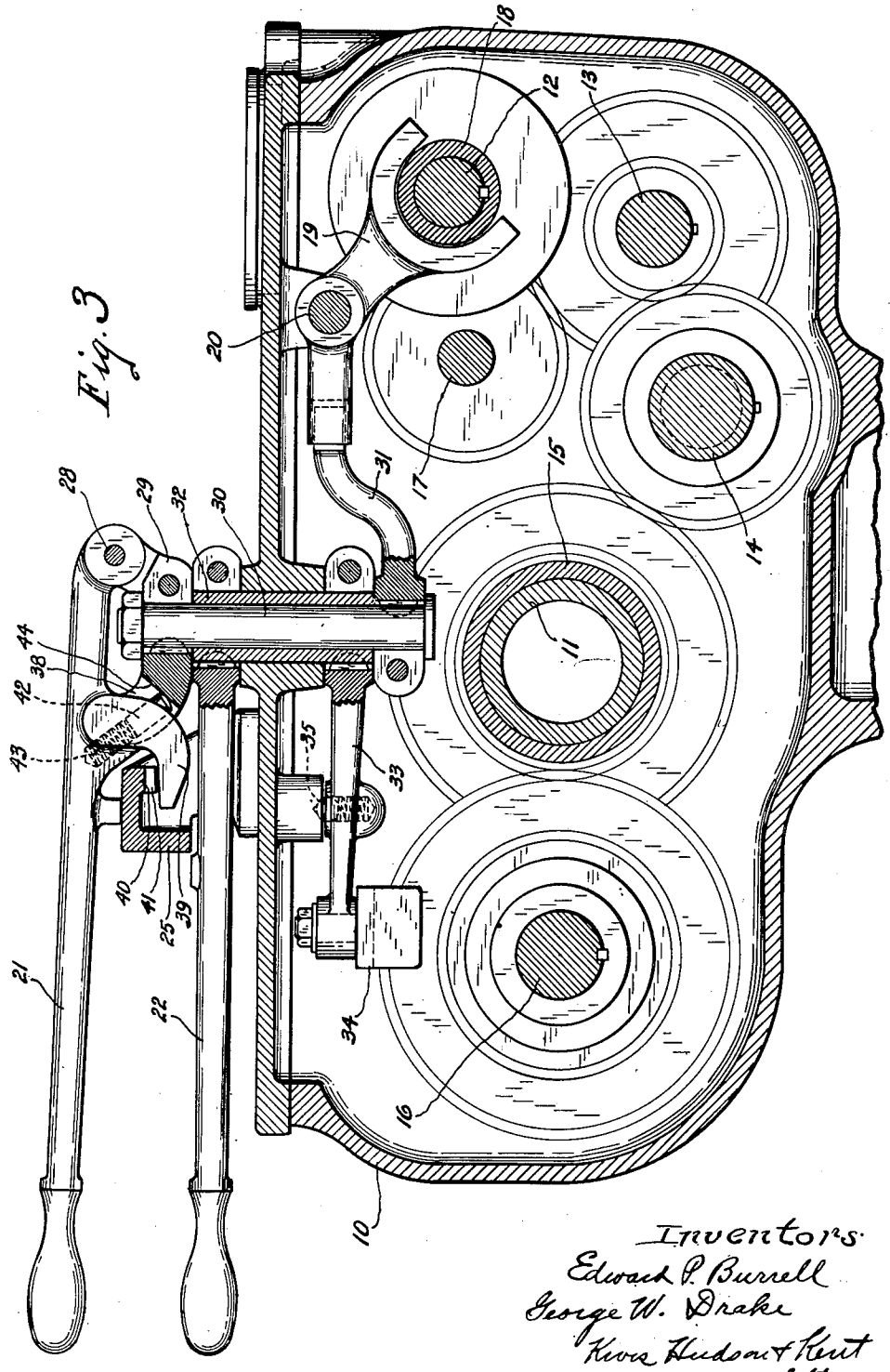

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Fig. 4

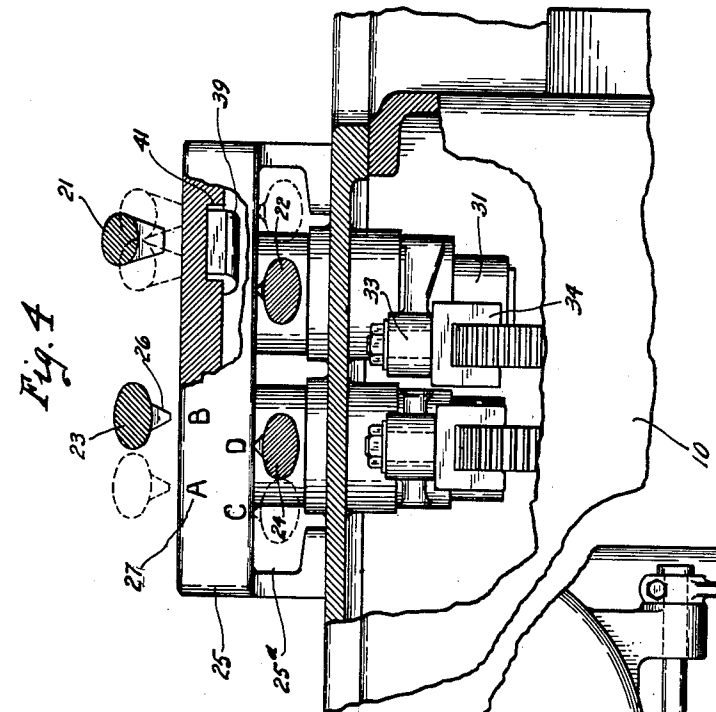
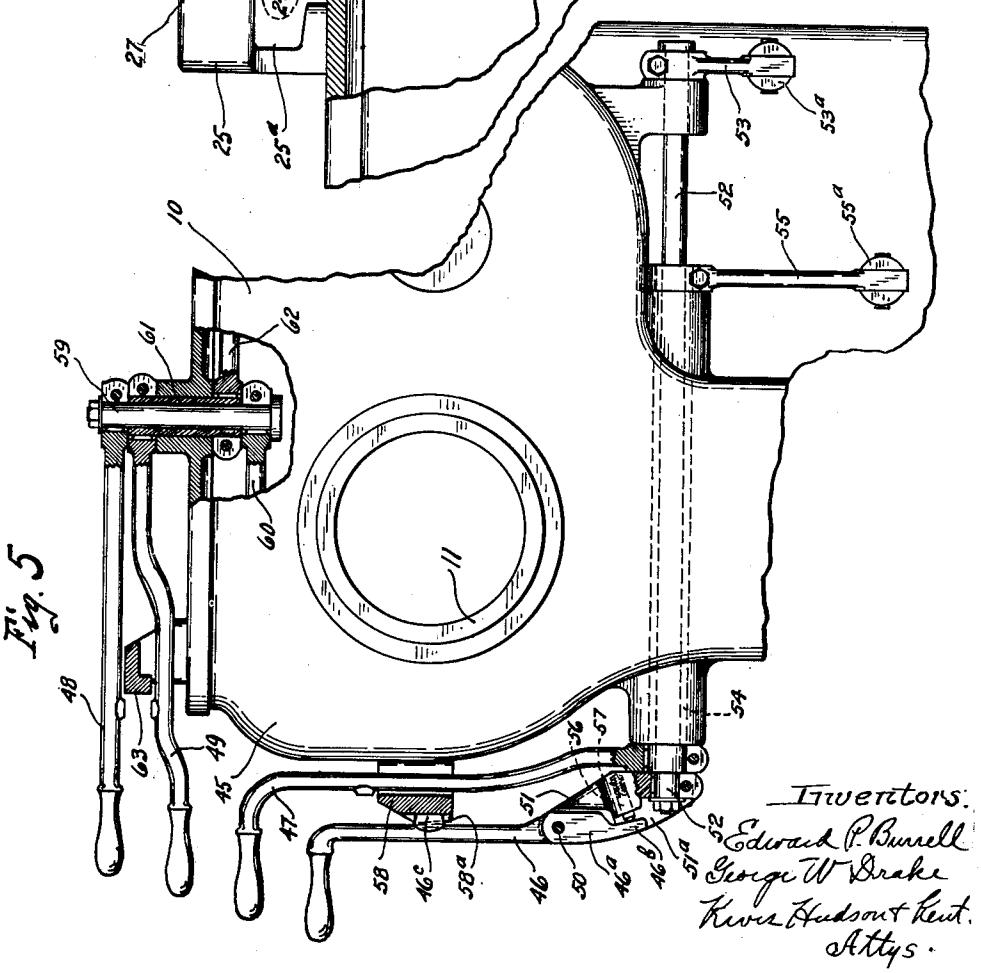


Fig. 5



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1,908,885

UNITED STATES PATENT OFFICE

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CONTROL FOR MACHINE TOOLS

Application filed December 5, 1928. Serial No. 323,822.

This invention relates to control levers for machine tools and has especial utility when applied to the head-stock of a lathe, though not necessarily confined thereto, as will be explained presently.

The invention, in one of its aspects, is applicable to a machine tool wherein a series of levers is required for clutching and unclutching and for speed change purposes or equivalent functions, the object of the invention, when considered from this aspect, being to so group or arrange the levers that they may be conveniently actuated by the operator while standing in one position at the front of the machine. In this connection, there is a further object which involves the application of two or more control levers in association with a single indicating bracket or combined indicating and holding bracket which will indicate to the operator the movements to be imparted to the levers to obtain certain predetermined results in so far as direction of rotation and speed are concerned.

In another aspect, the invention has particular reference to the construction of a lever, such as a main control lever, and its arrangement with respect to the holding bracket or equivalent device, the object being to provide automatic locking of the lever against unintentional movement by vibration or otherwise when the lever is in a given position and to provide for the release of the lever by the weight of the operator's hand so that no conscious effort on the part of the operator is required to release it or to restore it to locked position.

The above and other objects are attained by the present invention which may be briefly summarized as consisting in certain novel combinations and arrangements of parts and details of construction which will be described in the specification and set forth in the appended claims.

In the accompanying sheets of drawings, we have shown the invention applied to the head-stock of a lathe, and in the drawings Fig. 1 is an elevational view of the head of the lathe, i. e., looking toward the end of the spindle from the bottom of the sheet of Fig. 2, the main operating lever, which in this instance controls the clutch, being in its locked neutral position; Fig. 2 is a top plan view of the same, showing only the forward portion of the head; Fig. 3 is a transverse sectional view of the same substantially along the irregular line 3—3 of Fig. 2; Fig. 4 is a fragmentary sectional view substantially along the line 4—4 of Fig. 2; and Fig. 5 is a front view of a portion of the head, showing a modification in the grouping of the levers and in the construction and arrangement of the control lever, the parts being shown on a slightly reduced scale.

Though the invention is not confined in its use to the head-stock of a lathe, but may be used to advantage on other parts of a lathe and on other types of machine tools, it is especially useful, as stated above, when applied to the head-stock of a lathe and for that reason is so illustrated.

Referring now to the drawings and, first, to Figs. 1 to 4, 10 represents generally the head-stock of a lathe which includes a work spindle 11, which, as usual, projects through and slightly beyond the front wall of the head-stock. In this instance, the spindle is designed to be driven by a drive shaft 12 in the forward direction through shafts 13 and 14, sleeve 15 and shaft 16, with suitable gearing between them, and the spindle is designed to be driven in the reverse direction through an idler shaft 17 with suitable gearing which connects it to the shaft 13. A head-stock with driving and driven parts which are here illustrated simply and conventionally is well known and therefore a further description is unnecessary. The connection with the drive shaft 12 for both forward and reverse rotation of the work spindle is, in this instance, controlled through a double-acting clutch on the drive shaft 12. The operative part of the clutch, in the form of a cone, is shown at 18 in Figs. 2 and 3, this cone in this instance being shifted in either direction by a clutch shifting member 19 which is slidable on a rod 20 supported by the top plate of the head-stock.

To control the starting, stopping and reversal of the spindle and to control the speed

of the spindle in both directions, we have in Figs. 1 to 4 shown four levers 21, 22, 23 and 24. The levers 21 and 22 have coaxial mountings with one lever above the other and the levers 23 and 24 have coaxial mountings one above the other and one pair being arranged adjacent the other at the top of the head-stock. All four levers are in substantially horizontal position and project forwardly to the front of the head-stock.

It might be here stated that the lever 21 is the main control lever which is shiftable in both directions from neutral position and which controls the clutch member 18 by shifting it in either direction from central position into engagement with either of two companion clutch members so as to cause the spindle to be driven in either forward or reverse direction and by shifting it to disengaged position to stop the rotation of the spindle, the lever then being in neutral position. The other levers are in this instance designed to control the various speed changes of the work spindle by movement in both directions, these levers being usually operatively connected with speed change gears or gear cones or clutches.

Some features of the present invention involve the main control lever 21, but other features of the invention reside in the grouping of the several levers mentioned in connection with a single holding and indicating bracket 25 which, in the construction illustrated in Figs. 1 to 4, is supported on the top plate of the head-stock. It will be observed that the main control lever 21 and the lever 23 extend over this bracket and that the other two levers 22 and 24 extend through an opening 25^a of the bracket. The levers which are designed to be moved back and forth over the bracket and the two levers which are designed to be moved back and forth in the opening 25^a of the bracket have indicating points 26 which are designed to cooperate with suitable indicia 27 on the bracket to enable the operator to manipulate the several levers to obtain desired results in the way of the direction of drive and speed of rotation of the work spindle (see Fig. 4).

The lever 21 is pivotally connected at 28 to a lever bracket 29 which is suitably secured to the top of a rock shaft 30 which extends through the top plate of the head-stock and at its lower end has fixed thereto an arm 31 which engages an arm of the clutch shifting member 19. The lever 22 directly beneath lever 21 is fixed to a sleeve 32 which surrounds the rock shaft 30 and at its lower end has attached thereto an arm 33 at the free end of which is pivotally supported a shifting member 34 which straddles a suitable speed change member. A detent indicated at 35 may be provided on the arm 33 to hold the arm and the parts connected therewith, as well as the speed change member controlled by the arm, in predetermined working positions. A similar detent arranged in a similar manner may be employed in connection with each of the levers 23 and 24.

The lever 23 is secured to the top of a rock shaft 36 which extends down through the top plate of the head-stock similar to the rock shaft 30, and the other lever 24 is secured to a sleeve 37 (shown by dotted lines in Fig. 2) surrounding the rock shaft 36, similar to the sleeve 32. The rock shaft 36 and the surrounding sleeve 37 will have attached thereto suitable shifting arms which will operate on the speed change members utilized in the drive of the work spindle. As these devices are not directly involved in the invention, it is deemed unnecessary to illustrate them.

Referring now to the lever 21 and the associated lever bracket 29, it will be observed from Figs. 1 and 3 that the lever bracket 29 is provided with a pair of ears 38 which straddle the lever 21, these ears being located on the side of the axis of the rock shaft 30 opposite that on which the lever 21 is pivoted to the lever bracket. Additionally, it will be seen that the lever 21 is provided with an extension 39 which projects downwardly and toward the free end of the lever beneath a downturned flange 40 on the holding and indicating bracket 25. This flange of the bracket has a notch 41 shown most clearly in Figs. 3 and 4, this notch being slightly wider than the width of the lever extension 39 and being so located that it will receive the lever extension 39 when the lever 21 is in neutral position. Additionally, the lever 21 is provided with a plunger 42 pressed outwardly by a spring 43, the plunger and spring being in a socket formed in the lever and so arranged that the free end of the plunger bears against a surface 44 substantially midway of the ears 38 on the lever bracket 29, the function of the spring being to swing the lever upwardly about its pivot 28 when the lever is released.

By reason of the fact that the ears 38 straddle the lever 21, it is obvious that when the lever 21 is swung horizontally it will turn the lever bracket 29 and therefore the rock shaft 30 and the shifting arm 31 attached thereto. It will be seen also that, when the operator takes his hand from the lever 21 when the latter is in neutral position, the spring 43 and plunger 42 will swing the lever 21 upwardly about the pivot 28 so as to cause the extension 39 to engage in the notch 41 of the flange 40. Accordingly, the lever will be locked in neutral position and will not be accidentally moved by vibration or like cause.

Furthermore, the arrangement and proportioning of the parts and the effect of the spring 43 are such that simply the weight of the operator's hand, when he grasps the lever 21 to shift it, will be sufficient to lower the lever 21 and thereby disengage the extension

39 from the notch 40 so that the only conscious effort on the part of the operator will be that necessary to swing the lever 21 laterally in one direction or the other, depending upon whether the work spindle is to be driven in a forward or in a reverse direction. When the operator takes his hand off the lever when it is in either operative position, the extension 39 will engage the lower surface of the flange 40, and when the operator again grasps the lever and moves it to neutral position and then releases the lever, the extension 39 will automatically come into locking engagement with the notch of the flange.

Not only is the construction of lever 21 with its self-locking feature an important part of the invention, but we regard also within the scope of our invention the centralized arrangement of the several levers 21, 22, 23 and 24 and the provision of a single holding and indicating bracket associated and cooperating with these levers or with a part of them as shown in the modification illustrated in Fig. 5. One important advantage of the arrangement is simplicity of construction and ease of operation by reason of the fact that all levers can be manipulated when the operator is in a given position in front of the machine. It is unnecessary, as has been the case heretofore, for the operator to move from one position to another to reach the several operating levers.

In Fig. 4 the neutral position of lever 21 is shown by full lines and its two working positions by dotted lines and the other three levers 22, 23 and 24 are each shown by full lines in one working position and by dotted lines in another working position.

When the invention is applied to the head-stock of a lathe, the several levers may and generally will be arranged as illustrated in Figs. 1 to 4 on top of the head-stock so as to project substantially horizontally to the front of the head. However, this arrangement is not essential for the control levers for part of them may be arranged on the front side of the head. In Fig. 5 we have shown an arrangement wherein the main control lever and one of the speed controlling levers are arranged on the front side of the head, and two other speed control levers are arranged at the top of the head, the former projecting substantially vertically and the latter substantially horizontally, with the portions of all levers which are to be grasped by the operator at the front of the machine and substantially in vertical alignment.

In Fig. 5, 45 represents the head at the front of which are a main control lever 46 and a speed control lever 47, both mounted coaxially, and at the top of the head are two speed control levers 48 and 49 also mounted coaxially. The main control lever 46 is pivoted by a transverse pin 50 to a lever bracket 51 which in turn is secured to the outer end of a rock shaft 52 extending horizontally through the head, this rock shaft having secured to its inner end a clutch controlling arm 53 connected to a horizontally disposed shifting member 53^a. The speed control lever 47 is secured to a sleeve 54 which surrounds the rock shaft 52 and which has secured to its inner end a shifting arm 55 connected to a horizontally disposed shifting member 55^a. The shifting members 53^a and 55^a will be connected respectively to a clutch member and speed change gears which in the construction illustrated will be arranged in a downward extension of the head.

The lever 46 has an extension 46^a which fits between a pair of ears 51^a of the lever bracket 51 so that when the lever 46 is swung to start or stop the rotation of the work spindle the lever bracket 51 and the rock shaft 52 will be actuated. This extension has a lip 46^b which is engaged by a plunger 56 acted upon by a spring 57 in a socket of the lever bracket so that the spring and plunger will, as in the first instance, rock the lever on the pivot pin 50 when the lever is released. A combined holding and indicating bracket 58 is mounted on the front of the head and so arranged with respect to the levers 46 and 47 that the lever 46 extends along the outer side of the bracket and the lever 47 through an opening of the bracket. The inner side of the lever 46 has an extension 46^c which is adapted to engage in a notch 58^a on the outer side of the bracket, the extension and notch being so disposed that when the lever 46 is in neutral position (and is released by the operator) the lever 46 will be rocked by the spring 57 so as to cause the extension to automatically engage in the notch, thereby holding the lever against accidental movement by vibration or other cause.

The speed control lever 48 is secured to the top of a vertically disposed rock shaft 59 which extends down through the top of the head and its lower end has secured thereto a shifting arm 60. The lever 49 is secured to a sleeve 61 which surrounds rock shaft 59 and which has secured to its lower end a shifting arm 62. The lever 48 projects over an indicating bracket 63 and the lever 49 through an opening of the bracket.

As before stated, the arrangement illustrated brings the outer or operating ends of the levers at the front of the machine and in substantially vertical alignment with one another when the levers are in neutral position. Therefore, with this arrangement, as with the arrangement first described, all four levers may be actuated by the operator while standing in one position before the machine.

As to the main control lever 46, though it is normally locked to bracket 58 against accidental movement when this lever is in neutral

position, it can be disengaged from the bracket without any conscious effort on the part of the operator. To bring this about, the spring 57 is of such strength that it will slightly more than overbalance the effect of gravity on the lever, but when the operator's hand is placed on the outturned outer end of the lever the weight of his hand will be sufficient to rock the lever about the pin 50 and disengage it from the bracket 58 so that, as in the first instance, the only conscious effort on the part of the operator is that required to swing the lever to the right or left to start the work spindle either in forward or reverse or to stop its rotation.

It will be seen, therefore, that with both arrangements, the one illustrated in Figs. 1 to 4 and the other in Fig. 5, the levers are disposed so as to be convenient to the operator without making it necessary for him to change his position to reach all the levers and at the same time there is attained that feature of safety which results from the automatic locking of he main control lever against accidental displacement in either direction, along with the release of the lever without conscious effort on the part of the operator so that it may be actuated by him. The arrangement of the coaxially mounted levers at the front of the head and the coaxially mounted levers at the top of the head, as shown in Fig. 5, specifically forms no part of the invention covered by the present application, but constitutes the subject matter of a copending application of John J. N. Van Hamersveld, Serial No. 514,649, filed February 9, 1931.

While we have illustrated two forms of arrangements of the invention, we do not desire to be confined to the precise details of construction and arrangements of parts, but aim in our claims to cover all modifications which do not involve a departure from the spirit and scope of the invention. For example, the automatic locking and substantially automatic unlocking feature here shown applied to the main control lever may, if desired, be applied also to other levers of the group. Furthermore, this same feature may be utilized to lock a lever in a working or operative position rather than in neutral position as herein illustrated. In addition, other changes of like nature may be made without departing from the spirit and scope of the invention.

Having thus described our invention, we claim:

1. A control lever for machine tools comprising an outer lever member, an inner lever member to which said outer lever member is connected, the two lever members being arranged so as to swing together, said lever having a central neutral position and adapted to be swung therefrom in both directions to working positions, a holding member adjacent the outer lever member and positioned between the ends thereof, means for causing it to automatically engage the holding member when the lever is in neutral position, and a second lever arranged to swing coaxially of the first.

2. A control lever for machine tools having two portions arranged to swing in unison and including an outer operating portion pivoted to an inner portion, said lever having a central neutral position and adapted to be swung therefrom in both directions to working positions, a holding member arranged adjacent the outer portion, a spring carried by the outer portion of the lever for causing it to automatically engage the holding member when it is in neutral position, and a second lever arranged to swing coaxially of the first.

3. The combination with the head of a lathe having a work spindle and variable speed driving means therefor, of a plurality of pairs of levers for controlling the starting and stopping of the work spindle, the direction of rotation, and the speed thereof, said levers being arranged adjacent one another in a group with the operating portions of the levers at the front of the head, and a holding bracket arranged adjacent all said levers.

4. The combination with the head of a lathe having a work spindle together with means for driving it at a plurality of speeds and in opposite directions, of a main control lever for controlling the direction of rotation, starting and stopping of the work spindle, a plurality of speed control levers associated with said main control lever and arranged so that the operating portions of all said levers are in a group at the front of the head, and a holding bracket arranged adjacent all said levers.

5. A control for machine tools comprising a plurality of groups of levers arranged adjacent each other, the levers of each group being coaxial, and a single indicating bracket arranged between the levers of each group.

6. In a control for machine tools, a plurality of control levers arranged adjacent each other in two groups each having coaxial levers, and a bracket having a portion arranged between the levers of both groups.

7. In a control for machine tools, pairs of coaxially mounted control levers, and a bracket arranged adjacent said levers so that one of the levers of each pair will swing over the bracket and the other will swing through the bracket.

8. In a control for machine tools, a plurality of control levers arranged in groups having coaxial supports, one having a central neutral position and being adapted to be swung therefrom in both directions to working positions, and a holding bracket arranged with a portion between the levers so that some levers will swing over said portion and other levers will swing under said portion, one of said levers composed of pivotally con-

nected portions one adapted to interlock with said bracket when the lever is in neutral position.

9. A control device for machine tools comprising a rotatable bracket adapted to be connected to a shaft, a lever pivoted at one end of the bracket and guided in the other end of the bracket, a stationary bracket, said lever having an extension, means for moving said lever in one direction to engage said extension with said stationary bracket to form an interlock therewith, and means on said lever cooperating with said stationary bracket for limiting movement of the lever in the opposite direction.

10. A control device for a machine tool comprising a rotatable bracket adapted to be connected to a shaft and having forked portions at its opposite ends, a lever pivoted to one of said portions and guided in the other of said portions, a stationary bracket, an extension on said lever adapted to interlock with said bracket, and a spring carried by said lever for moving the same to interlocked position.

In testimony whereof, we hereunto affix our signatures.

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