

C. H. NORTON, J. C. SPENCE & H. N. CUDWORTH.
REVERSING DEVICE.

APPLICATION FILED DEC. 28, 1908.

Patented Nov. 16, 1909.

2 SHEETS—SHEET 1.

940,549.

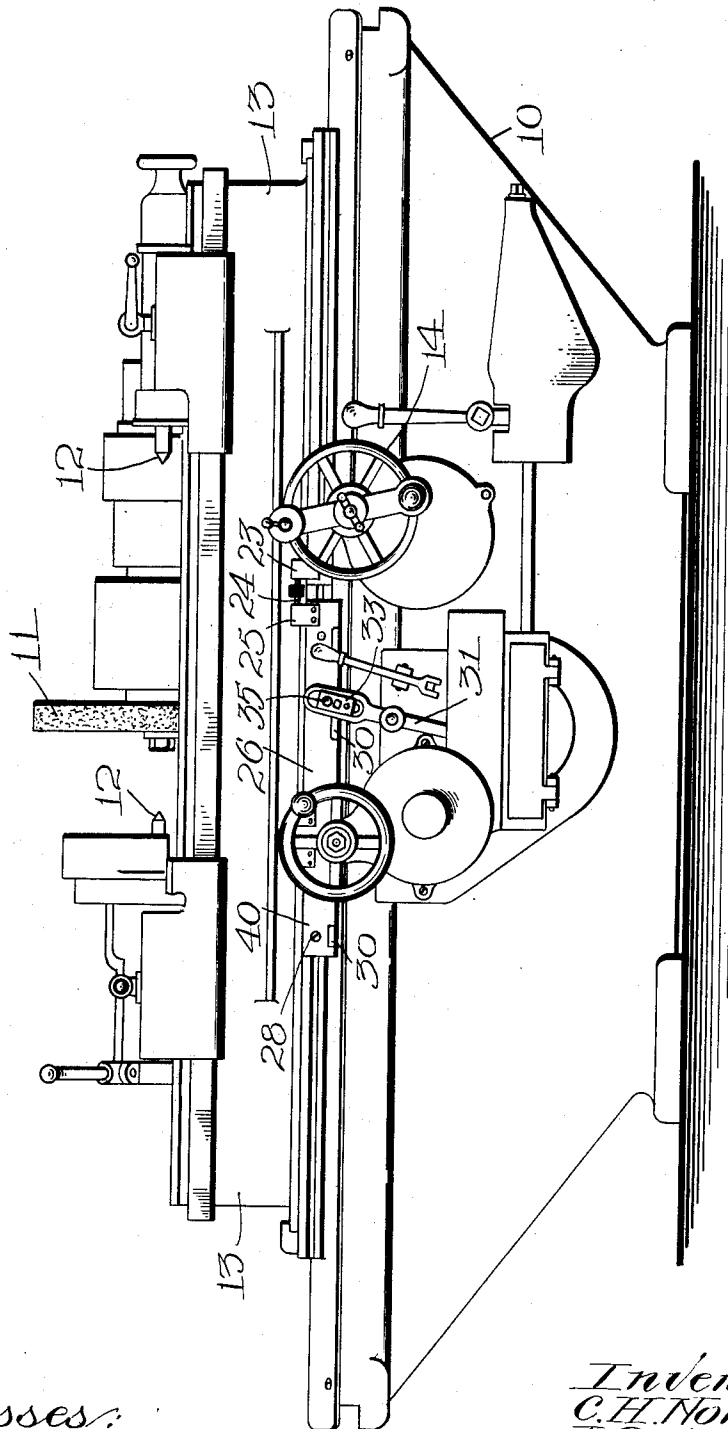


Fig. 1

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2 SHEETS—SHEET 2.

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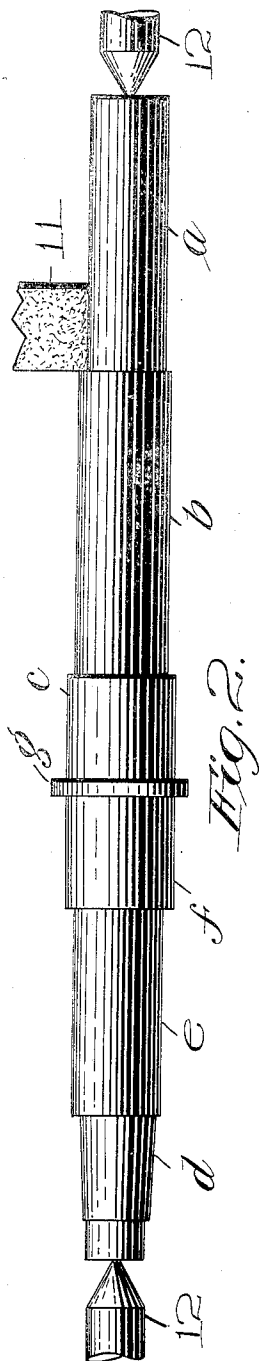


Fig. 2.

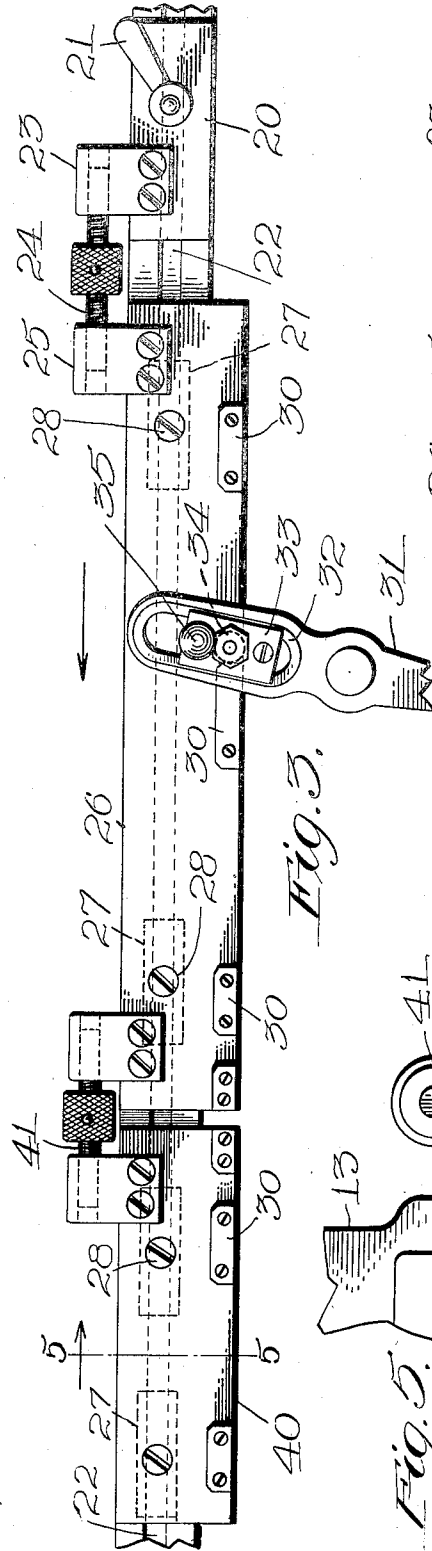


Fig. 3.

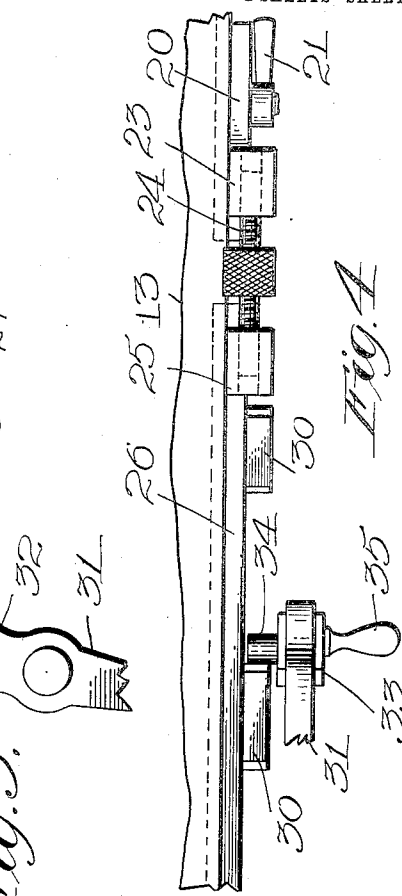


Fig. 4.

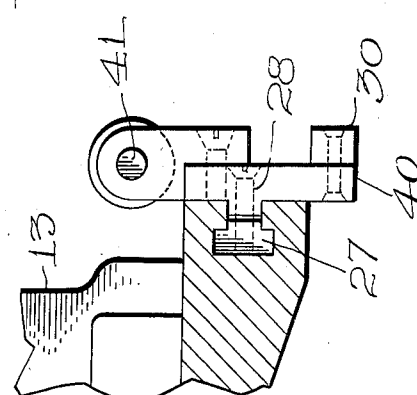


Fig. 5.

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UNITED STATES PATENT OFFICE.

CHARLES H. NORTON, JOHN C. SPENCE, AND HIRAM N. CUDWORTH, OF WORCESTER, MASSACHUSETTS, ASSIGNORS TO NORTON GRINDING COMPANY, OF WORCESTER, MASSACHUSETTS, A CORPORATION OF MASSACHUSETTS.

REVERSING DEVICE.

940,549.

Specification of Letters Patent.

Patented Nov. 16, 1909.

Application filed December 28, 1908. Serial No. 469,548.

To all whom it may concern:

Be it known that we, CHARLES H. NORTON, JOHN C. SPENCE, and HIRAM N. CUDWORTH, citizens of the United States, all residing at Worcester, in the county of Worcester and State of Massachusetts, have invented a new and useful Reversing Device, of which the following is a specification.

This invention relates to a machine for truing cylindrical and conical surfaces.

The principal objects of this invention are to provide means whereby a piece of work having a series of shoulders thereon can be trued or ground accurately, and a large number of such pieces of work operated upon uniformly after the mechanism has been adjusted or set for the first one, and to provide for truing up the several cylindrical or conical surfaces to the proper length, independently of the depth of the countersunk holes in the ends.

The invention is particularly adapted for grinding motor shafts and similar articles in which there are a series of shoulders on each end, and particularly where the distance apart of the two opposite shoulders of largest diameter does not have to be brought to dimensions with any great degree of accuracy. The invention, however, is not limited to this particular class of work, but is capable of general use.

Further objects and advantages of the invention will appear hereinafter.

Reference is to be had to the accompanying drawings in which,

Figure 1 is a side elevation of a grinding machine showing a preferred form of this invention applied thereto. Fig. 2 is a plan showing a sample of work that can be performed on the machine. Fig. 3 is a side view of a portion of the reversing mechanism for the piece of work shown in Fig. 2. Fig. 4 is a plan of a portion of the same, and Fig. 5 is a sectional view on the line 5—5 of Fig. 3.

Although as has been stated, this invention is capable of general use, it is illustrated herein with particular reference to the grinding of a motor shaft, such for example as that illustrated in Fig. 2. This shaft is shown as provided near its ends with a series of cylindrical or conical portions *a*, *b*, *c*, *d*, *e* and *f*. Between the portions *c* and *f* are a pair of shoulders connected by a cylindrical

part *g*. As is well understood, articles of work of this kind, whether they are ground or turned, ordinarily are prepared for application to the machine by making a prick punch in each end and countersinking it. The countersunk hole is of varying depth, and ordinarily it is not used by the workmen as a starting point for making their measurements. When a piece of work of this kind has to be ground or turned, the workman first measures from the end of the work a certain distance to the shoulder at the end of the portion *a*. Now it will be seen that on account of the variations in the depth of the countersunk holes in the ends into which the center points extend it would be impossible to locate the grinding wheel in a certain definite relation to either center point, and secure uniform results with different pieces of work intended to be of the same size.

According to the present invention the table or carriage supporting the work is provided with means whereby a reversing mechanism is controlled so that after the work is first set for the truing of the portion *a*, for example, the other portions will be trued to the proper length without any readjusting of the machine or work. This is accomplished by providing a reversing bar having reversing dogs thereon at definite predetermined distances apart corresponding to the several lengths between of the work. In addition to this the bar is provided with adjusting means so that when the first piece of work, marked as above indicated, is set up with proper relation to the grinding wheel, nothing but an adjustment of this reversing bar as a whole is necessary to get the first shoulder of any subsequent piece into proper position with respect to the grinding wheel. The machine will grind to the rest of the shoulders in a uniform manner.

Another feature of the invention relates to the grinding of the portions at the end of the work which, during the first part of the operation, were held near the head center, as for example, the portions *d*, *e* and *f* in Fig. 2. For this purpose a second reversing bar is mounted on the table or carriage substantially like the first except for the distance apart of the stationary dogs thereon, and it is provided with an adjusting device preferably connected with the first reversing bar so that when the work is turned around in

the machine the second bar can be adjusted up to the first shoulder, as at the end of the portion *d*, in the manner described above. It will be understood, of course, that this adjustment is possible only when the width of the portion *g* may vary somewhat.

The invention is shown as applied to a grinding machine having a bed 10, a grinding wheel 11, and work centers 12. The work centers are mounted on a table 13 so that the work can be caused to reciprocate in front of the grinding wheel which is adjusted by an adjusting device 14 of any desired type. The bed carries means for controlling the position of the table, as for example, a reversing device.

Connected with the work table in fixed position is a table dog or bracket 20 adapted to be secured thereon by a handle 21 and a screw in a well known way. Although this dog is described as stationary or fixed, it is to be understood that it can be adjusted along a T-slot 22 in the side of the table and is intended to be fixed by the handle 21 and screw whenever a job is to be started. After it is once fixed for the particular work, it is not again disturbed and the adjustments are secured in other ways as will be described hereinafter. Mounted on this dog is a nut 23 carrying an adjusting screw 24 which engages in a nut 25 on an adjustable reversing bar 26. One of the screw-threads on the screw 24 is right-handed and the other left-handed so that the rotation of the same will adjust the position of the bar 26 with respect to the table and dog. This bar is provided with T-shaped members 27 removably held in position by screws 28 and working in the T-slot 22 so as to keep the bar in proper position and to permit tightening the same after it is properly adjusted. This bar is provided with a series of dogs 30 thereon, and adjustable along the table with the bar. These dogs are arranged in line and are mounted at such distances apart that the reversing lever or other device 31 will be turned at the proper times to cause the carriage or table to shift the work the proper distance each stroke. The reversing lever is shown in position for grinding the first cylindrical portion of the right end of the piece of work shown in Fig. 2.

The reversing lever is provided with ways 32 thereon in which moves a slide 33 having a pin 34 and a handle 35. This slide is normally in the position shown in Fig. 3 so that the pin is engaged by the dogs 30 at the ends of the stroke of the table. It will be understood, of course, that the distance between the ends of the dogs does not have to be quite as great as the distance on the work which is to be ground because the lever has to be turned a definite distance by the motion of the table after the dog engages the pin 34; consequently, the dogs

must be of such length and spaced at such distance apart as to give the proper time and space for the turning of the lever and reversing of the table.

It will be understood of course that for different kinds of standard pieces of work corresponding numbers of reversing bars will be kept in stock so that on taking out the screws 28 and disconnecting the screw 24, the reversing bar can be replaced by another when the work is to be changed. On many kinds of work a single bar having the necessary number of dogs 30 will be all that is required but on a piece of work like that shown in Fig. 2 when it is finished by grinding, it is desirable to have the grinding wheel move up toward the several shoulders from the small end and consequently after the work on one end is completed the work on the other may be done under such circumstances that it is necessary to have a slight adjustment between the dogs which control it and the dogs which control the work on the opposite end. For this purpose a second reversing bar 40 is shown constructed in accordance with the same principles as those described above and provided with an adjusting screw 41 like the screw 24 for adjusting it toward and from the reversing bar 26. The way in which this additional bar is used will be obvious.

While we have illustrated and described a preferred embodiment of the invention and the application of it to a grinding machine, we are aware that many modifications may be made therein and that it can be applied to many types of machines without departing from the scope of the invention as expressed in the claims. Therefore, we do not wish to be limited to all the details of construction or the particular application shown in the drawings, but

What we do claim is:—

1. The combination with a reciprocating table, and a reversing lever, of a dog movable with the table, and a reversing bar adjustably connected with said dog and having means for operating the reversing lever.

2. In a machine of the character described, the combination with a reciprocating table and a reversing lever, of a dog fixed on a table, and means for operating the lever adjustably connected with said dog.

3. In a machine of the character described, the combination with a reciprocating table and a reversing device, of means movable with the table and adjustable thereon for operating the moving device, said means having a plurality of dogs fixed thereon for engaging the lever.

4. In a reversing device, the combination of an adjustable bar, a plurality of dogs mounted at fixed distances apart on said bar, and a reversing device adapted to be operated by said dogs.

5. In a reversing device, the combination of an adjustable bar, a plurality of dogs arranged at fixed distances apart on said bar, and a reversing lever adapted to be operated by said dogs, said reversing lever having a pin adapted to be located thereon in the path of the dogs, and means for moving said pin out of the way of the dogs.

6. In a reversing mechanism, the combination of a reciprocable bar, fixed dogs thereon, a reversing lever, a slide mounted on said reversing lever, a pin on said slide adapted to engage said dogs when the slide is in normal position, and a handle connected with the slide for moving it to a position in which the pin will not engage the dogs.

7. In a machine of the character described, the combination of a reciprocating table, a reversing lever, a reversing bar, a plurality of sets of dogs mounted thereon at fixed and predetermined distances apart, each two of said dogs having a space between them for controlling the travel of the table, whereby a piece of work can be operated upon for a certain distance with the lever between two of the dogs, and then operated upon for a certain distance with the lever between the next two dogs.

8. In a machine of the character described, the combination of a reciprocating table adapted to support the work, and a reversing lever, of a reversing bar adjustably connected with said table, and having dogs fixed thereon for controlling the lever, and a second reversing bar having fixed dogs thereon adjustably connected with the first reversing bar.

9. In a machine of the character described, the combination of a reciprocating table, a pair of dogs adjustable together therealong and a second pair of dogs adjustable along the table with respect to the first pair of dogs.

10. In a machine of the character described, the combination of a reciprocating table, a reversing device, and a pair of reversing dogs immovable with respect to each other, but adjustable together along the table.

11. In a machine of the character described, the combination of a bed, a table movable thereon, means on the bed for controlling the position of the table, and a bar adjustably mounted on the table and having means thereon for engaging said controlling means and positioning the table on the bed.

12. In a machine of the character described, the combination of a bed, a table movable thereon, means on the bed for controlling the position of the table, and a bar adjustably mounted on the table and having a plurality of means in stationary position thereon for engaging said controlling means and positioning the table on the bed.

In testimony whereof we have hereunto set our hands, in the presence of two subscribing witnesses.

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JOHN C. SPENCE.
HIRAM N. CUDWORTH.

Witnesses:

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