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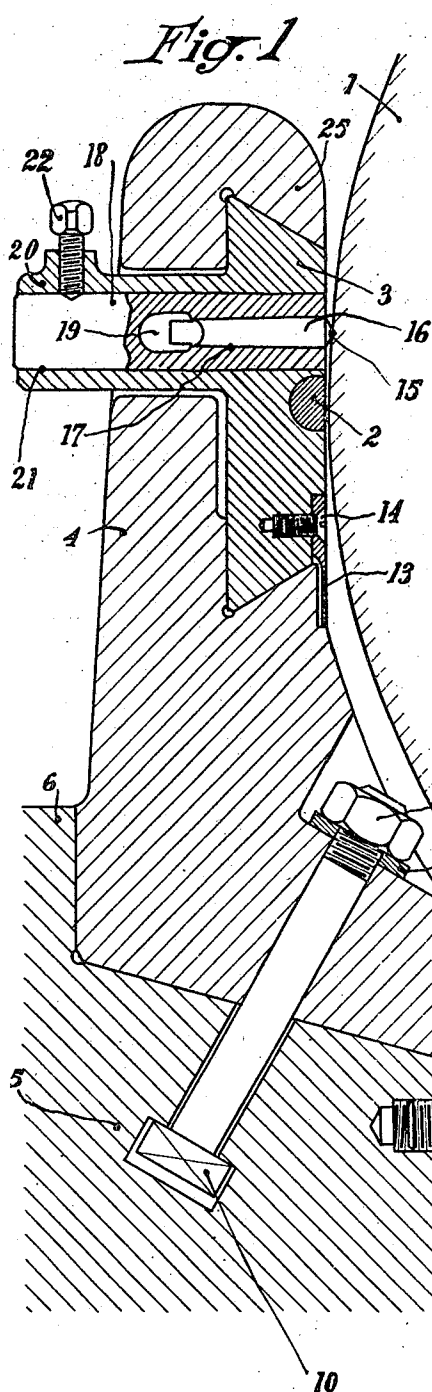
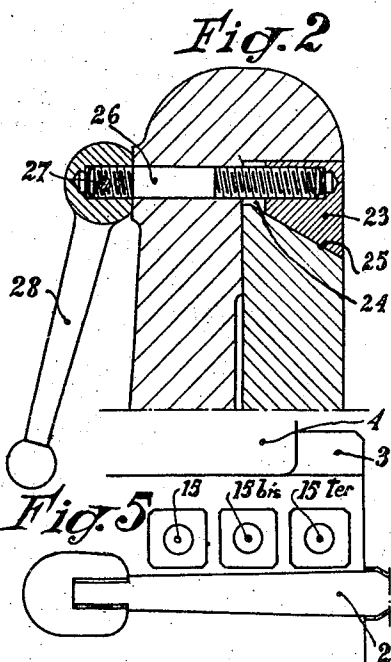
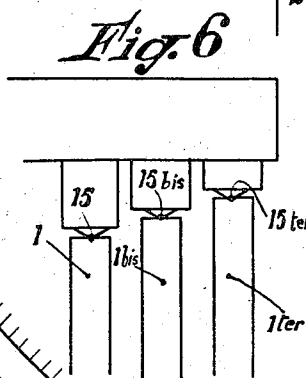
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2,456,252

GRINDING MACHINE AND FOOTSTOCK THEREOF

Filed Oct. 29, 1945

2 Sheets-Sheet 1



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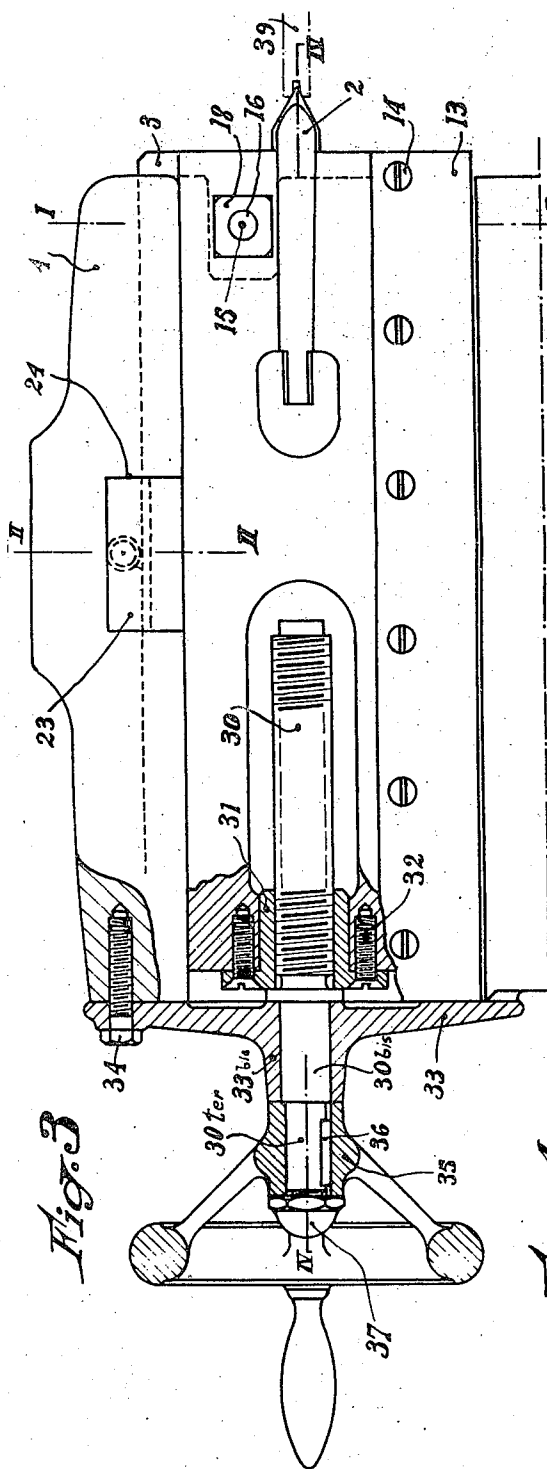
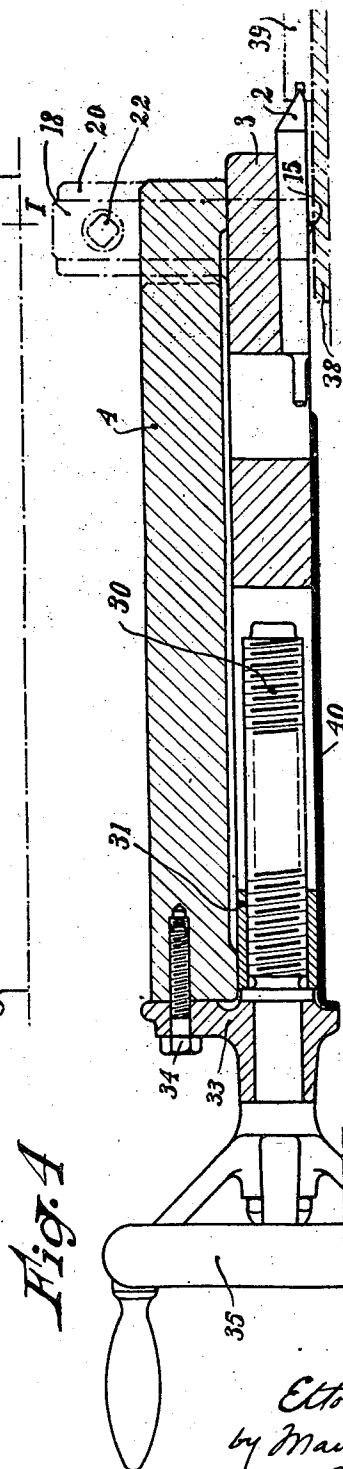
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UNITED STATES PATENT OFFICE

2,456,252

GRINDING MACHINE AND FOOTSTOCK
THEREOF

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5 Claims. (Cl. 51—237)

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Grinding between stocks is one of the commonest methods used for machining cylindrical or conical works with accuracy. The work is held between the conical centres of the headstock (which carries the work round in its rotation) and the footstock (adapted to be moved longitudinally on the table as required for the work).

It is an object of my invention to provide an improvement whereby works of very small diameter may be ground between stocks, the production of such slight diameters being secured with maximum accuracy by passing the grinding wheel on a diamond provided on the footstock.

According to this invention, a grinding machine footstock including its conical centre is partly or wholly located on the side away from the grinding wheel of a vertical plane containing the innermost generatrix of said grinding wheel when the latter is in the position nearest to the work centre. This position is determined by the minimum diameter of the works to be ground. In the present instance, this diameter may amount to about 5 millimeters.

The diamond or if need be the diamonds may be located either above or below the axis of the work, thus above or below the axis of the grinding wheel, as near as possible to said axis and in such a position that the grinding wheel can contact said diamond or diamonds before each grinding stroke. The foregoing arrangement may be applied indiscriminately to any one of both types of machines for grinding between stocks, to wit those in which the grinding wheel is moved along the work, and those in which the work travels in front of the grinding wheel.

The diamond or diamonds are preferably mounted in a position adjustable transversely according to the desired diameter for the finished work, taking into account the correction to be made as the diamond or diamonds are not rigorously at the level of the grinding wheel axis.

The carriage which supports the footstock centre and allows it of travelling lengthwise as required by the work is preferably shaped as a prism having a trapezoidal section, the parallel bases of which are disposed vertically on the side already referred to of the vertical plane tangent to the grinding wheel surface.

The support for said carriage, which forms the footstock body, may rest on the bed of the machine and, being suitably guided, may be moved lengthwise when the carriage stroke is not large enough.

The diamond or diamonds are preferably set in cylindrical or prismatic tools which are movable

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transversely in guides provided in the footstock body, in order that the point of said diamond or diamonds may be brought to the proper position for the securing the required diameter.

The advantages of the foregoing arrangement are as follows:

1. It is possible to grind works having small diameters between stock centres while with known machines, precautions must be taken in order that the grinding wheel does not travel beyond the end of the work so as not to contact any portion of the footstock. In view of this requirement, one generally did not grind certain works between stocks; the works must then be mounted on the headstock in overhanging position, and this is a jeopardizing practice in such a case.

2. A work or a series of identical works may be ground to a predetermined diameter which is secured once for all by adjusting the position of the diamond or diamonds in transverse direction and causing the grinding wheel to pass on it or them either before grinding each work or, where it is necessary to operate in a plurality of steps, before each cut.

3. A work having a complex outline or profile may be ground with several grinding wheels of different diameters. To this end, the grinding wheels are caused to contact diamonds, one for each grinding wheel, the diamond tools being disposed transversely, so as to secure the desired diameters on the work. The position of the carriage supporting the grinding wheel spindle being marked by means of a vernier provided for this purpose, the carriage is then moved backwards so as to clear the diamond-tools or the work (according to their relative position) in the lengthwise movement, then it is moved towards the work to the extent required from the reading on the vernier.

The following description with reference to the drawings given solely by way of examples will show how this invention may be carried out.

Fig. 1 is a cross-section (along line I—I on Fig. 3) of a footstock constructed in accordance with my invention.

Fig. 2 shows in cross-section (along line II—II on Fig. 3) a detail of said footstock.

Fig. 3 is an elevation of the footstock with parts broken away.

Fig. 4 is a longitudinal section taken along line IV—IV on Fig. 3.

Figs. 5 and 6 illustrate an alternative arrangement with several diamond-tools.

Grinding wheel 1 is shown in part on Fig. 1.

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Its centre is in the same horizontal plane as the axis of centre 2 which is set in a carriage 3. Carriage 3 is slidably mounted in a support 4 which is itself movable on a table 5, a shoulder 6 of which guides support 4 in cooperation with a strip 7.

Strip 7 is secured to table 5 by a series of screws 8, with an interposed liner 9 for adjusting the amount of play in the slideway 6, 5, 7. Alternatively support 4 may be guided by any other known means (dovetail, V, feathers and the like).

Support 4 can be kept immovable on table 5 by one or more square-headed bolts 10 provided with nuts 11 and washers 12, according to a well-known arrangement.

Secured on carriage 3 by screws 14 is a strip 13 provided to protect the lower slideway in support 4 against ingress of water and dust or filings from the grinding wheel.

Diamond 15 is set in a tool 16 which is preferably of frusto-conical shape ("morse" or like cone as used for removable members of machine-tools such as drills, lathe or grinding machine stock centres, etc.). Tool 16 is clamped in the conical bore 17 of a holder 18 in which a recess 19 is provided to enable of pushing tool 16 out of the bore. Holder 18 which has a preferably square or rectangular cross-section is accommodated in a part 20 integral with carriage 3 and having a bore 21. One or several set screws 22 in part 20 or any other known means secure the position of holder 18.

The amount by which diamond 15 projects beyond the vertical plane including the axis of stock centre 2 is determined as a function of:

1. The diameter of the work to be produced;
2. The distance from diamond 15 to the horizontal plane including the axis of stock centre 2;
3. The diameter of the grinding wheel.

The last factor has but little influence on the result as the radius of the grinding wheel is relatively great with respect to the vertical distance referred to under 2. Said vertical distance may be as low as a few millimeters, and in actual practice the second and third factors may be neglected, chiefly if the diameter of the first ground work is checked. Like support 4, carriage 3 should be held immovable in operative position, in certain cases. For this purpose, a wedge 23 (Figs. 2 and 3) is guided in a slideway 24 provided in the upper part 25 which provides a guide for carriage 3 in support 4. A spindle 26 pinned at 27 on a hand lever 28 in which it is screwed, strongly presses wedge 23 on the corresponding face of carriage 3, wedge 23 having a screw-threaded bore to accommodate the screw-threaded end of spindle 26.

Carriage 3 (Figs. 3 and 4) is moved in support 4 by a screw 30 and a nut 31 fast with carriage 3 to which it is secured by screws 32. Attached to support 4 by screws 34 is a lid or cover 33 which holds screws 30 through its hub portion 33 bis. Screw 30 has cylindrical extensions 30 bis and 30 ter, the former being borne in hub 33 bis while the latter 30 ter is fitted with a hand-wheel 35, keyed by a feather 36 and locked by a nut 37.

Fig. 4 illustrates the general shape of a footstock in accordance with this invention. The cylinder generated by the grinding wheel in its axial movement is shown by its projection 38 which is delimited by the projection of a cylindrical work 39 being machined. Stock centre 2 set in carriage 3 is cut away along a plane parallel with its axis so as to leave clearance between the flat face of said centre and projection 38.

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Diamond 15 and holder 18 are shown in chain and dot lines, the point of diamond 15 lying in the area swept by the grinding wheel (said area being delimited by projection 38).

The exposed portion of carriage 3 may be concealed by a metal sheet 40 fast with support 4.

Resilient means such as springs may be interposed between nut 31 and carriage 3 in order that the work be not abruptly squeezed between the stock centres. Such means are well known in conventional technics of grinding machines.

Figs. 5 and 6 illustrate an arrangement with several diamond tools on carriage 3; grinding wheels 1, 1 bis and 1 ter have stepped diameters to enable of grinding works with complex outline. The use of such an arrangement requires that grinding wheels 1, 1 bis, 1 ter are withdrawn backwards after operation of diamonds 15, 15 bis, 15 ter. The return of the wheels to operative position (in contact with the work) is obtained with accuracy with the help of a vernier on the carriage for the grinding wheel spindle, by using the mark observed when truing-up the wheels with the diamonds.

What I claim is:

1. In a grinding-machine footstock, the combination of a carriage having a substantially planar outer face and a recess extending from said faces substantially at right angles thereto; a diamond holder slidably held in said recess for adjustment purposes; means on the carriage for clamping said diamond holder in said recess; and a footstock centre having a pointed end, set in said carriage in close proximity to said recess, with the pointed end axis considerably nearer to said outer face than to the inner face of said carriage.

2. In a grinding machine having a bed and a grinding-wheel, the combination of a longitudinal support slidably mounted on said bed, including a flat upstanding member which has a generally concave wall on the side facing said grinding-wheel, said member having a longitudinal slot in said wall; a longitudinal carriage slidably held in said slot, having its outer surface flush with said wall and a recess extending from said surface substantially at right angles thereto; a diamond tool adjustably clamped in said recess; a footstock centre having a pointed end, set in said carriage in close proximity to said recess, with the pointed end axis considerably nearer to said outer face than to the inner face of said carriage; and means interposed between said support and said carriage for moving the latter in said slot.

3. In a grinding-machine footstock, the combination of a carriage having a substantially planar outer face and a plurality of parallel recesses extending from said face substantially at right angles thereto; a diamond holder slidably held in each of said recesses for adjustment purposes; means on the carriage for separately clamping each diamond holder in the corresponding recess, and a footstock centre having a pointed end, set in said carriage in close proximity to said recess, with the pointed end axis considerably nearer to said outer face than to the inner face of said carriage.

4. A grinding-machine footstock which comprises a rigid body having side walls, one of which is substantially planar in its upper part; a footstock centre supported in said body with its axis considerably nearer to said substantially planar upper part of said side wall than to the opposite side wall; a diamond located outside said body in close proximity to said substantially planar

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upper part of said side wall, at a level very close to the level of said footstock centre axis; and means for supporting said diamond from said footstock body.

5. In a grinding-machine footstock, the combination of a support having a substantially planar, vertical wall and a longitudinal keyway on the side of said wall; a key-shaped carriage operatively engaging said keyway with its exposed face co-planar with said wall, having a longitudinal recess in said exposed face running to an end of said support, said carriage further having a cross recess in its exposed face, substantially at right angles thereto in close proximity to said longitudinal recess; a rigid elongated member in said longitudinal recess, having an exposed planar face flush with said exposed face of the carriage and an integral pointed tip projecting from said end of the carriage, said tip having its axis located considerably nearer to said

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exposed planar face of said rigid member than to the opposite wall thereof; and a diamond tool held in said cross recess with its operative end slightly protruding out of said cross recess.

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REFERENCES CITED

The following references are of record in the file of this patent:

UNITED STATES PATENTS

Number	Name	Date
470,245	Kempsmith et al.	Mar. 8, 1892
610,677	Grohmann	Sept. 13, 1898
921,982	Hanson	May 18, 1909
1,261,157	Norton	Apr. 2, 1918
1,312,276	Shields et al.	Aug. 5, 1919
1,744,780	Mathewson	Jan. 28, 1930
1,768,734	Becker	July 1, 1930
2,116,135	Bath	May 3, 1938