April 26, 1927.

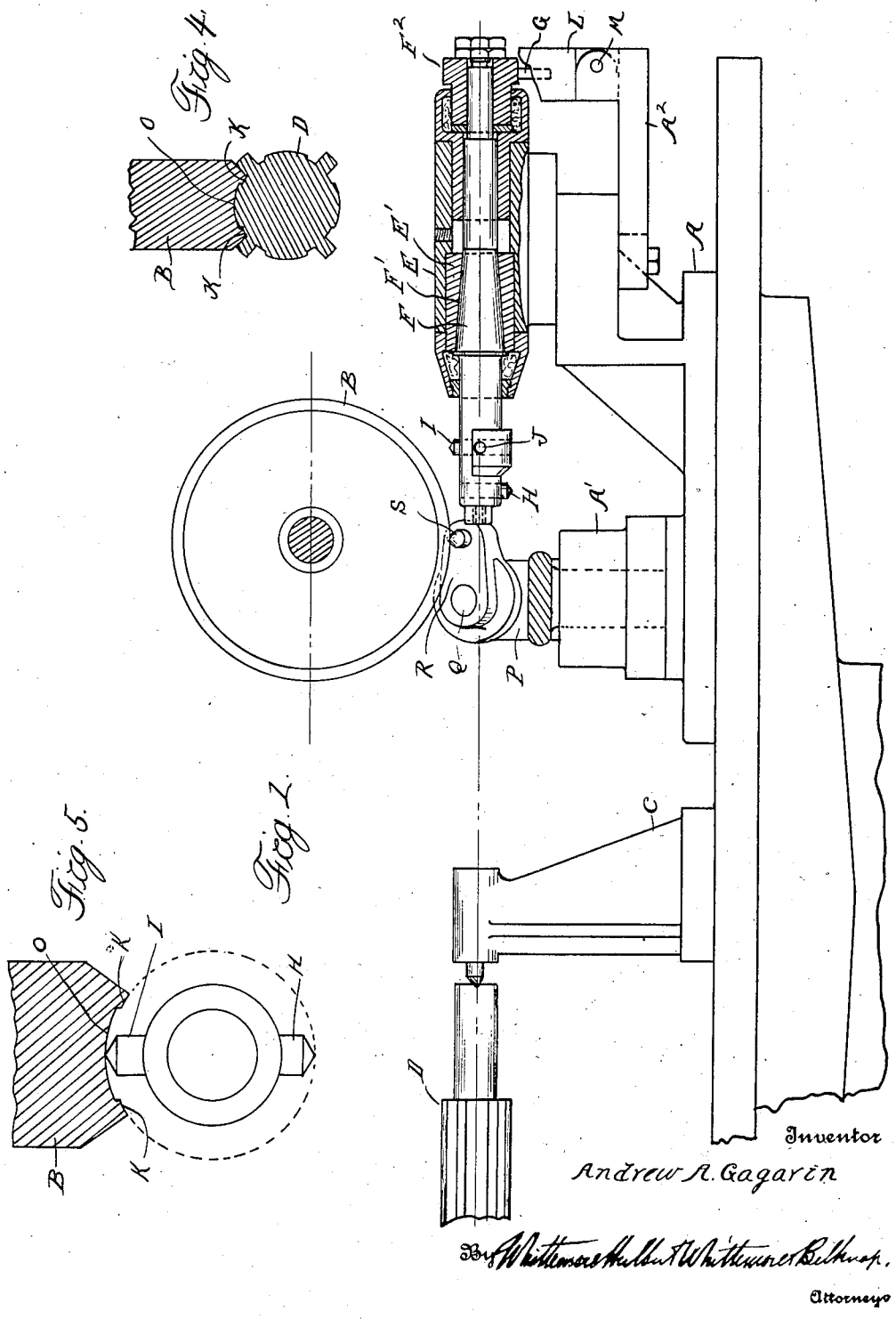
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A. A. GAGARIN

TRIMMING DEVICE

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Fig. 3.

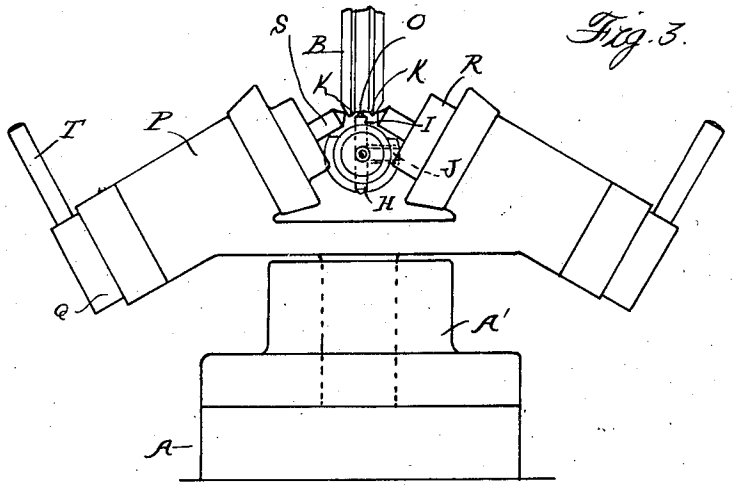
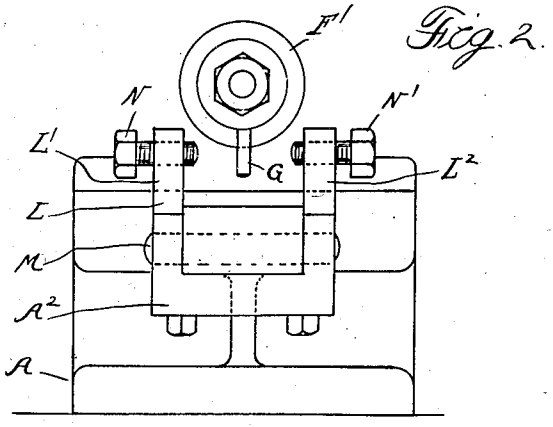



Fig. 2.




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Patented Apr. 26, 1927. 1,626,232

# UNITED STATES PATENT OFFICE.

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## TRIMMING DEVICE.

Application filed January 2, 1923. Serial No. 610,281.

The invention relates to trimming mechanism for grinding wheels and more particularly to a device which may be used for trimming a rotary grinder adapted for grinding spline shafts.

One method for grinding spline shafts consists in trimming a grinder with a concave segment upon the periphery of the wheel corresponding exactly to a segment of the finished work between the splines and in also trimming the edges of the wheel to correspond with the sides of the splines. It is sometimes desirable to relieve the corners between the sides of the splines and the shaft itself and the usual practice for accomplishing this result is to machine an undercut in the shaft before it is hardened.

One of the objects of my invention is to do away with the necessity of machining the undercut in the work. Another object is to provide a grinding wheel with projecting corners for grinding the relief in the corners of the spline shaft. A further object is to obtain a simple trimming mechanism which will trim a portion of the wheel to correspond exactly with a segment of the finished work and will trim a second portion in such a manner as to form a grinding surface for relieving the corners of the work.

These and other objects are obtained by a simple construction which consists essentially of two diamond trimmers of different radius which are rotatable about a common center, the trimmer of greater radius being provided with suitable stops to limit its movement to a predetermined segment.

In the drawings:—

Figure 1 is a longitudinal section of my improved trimming device showing its relation to the other elements of a grinding machine;

Figure 2 is an end elevation of the trimming mechanism showing the stops for limiting the movement of the trimmers;

Figure 3 is an end elevation at the opposite end of the trimming mechanism showing the relation of the trimmer points to the grinding wheel;

Figure 4 is a cross section showing the grinder in engagement with a work piece;

Figure 5 is a cross section showing the trimming mechanism in engagement with the grinder wheel.

In detail, A is a suitable base for the trimmer mechanism which is arranged to have a relative longitudinal movement with respect to a rotating grinder wheel B. C represents a work holder for supporting a work piece D, such as a spline shaft. The trimmer base A consists of two upwardly extending pedestals A′ and $A^2$, the latter forming a suitable bearing E for a rotatable arbor F which is preferably in longitudinal alignment with the axis of the work piece D.

The arbor F may be of any suitable construction to form a rigid bearing but as shown it is provided with a tapering surface F′ engaging the corresponding brushing E′ and the rear end of the arbor $F^2$ has secured thereto a depending pin G. At the forward end of the arbor F are the trimmer points H and I which are longitudinally spaced from each other and which are preferably provided with adjusting means J for varying the distances of the respective points from the axis of the arbor. The trimmer point I is set to have a slightly greater radius than the trimmer point H. In the operation of the device the grinder wheel B is first moved relative to the trimmer so that its axis is in the plane of rotation of the trimmer point H. The arbor F may then be rotated to trim a segment K in the periphery of the grinder wheel. During this operation the stop L, which is pivoted upon a transverse pin N in the trimmer pedestal $A^2$, is in a downward position and the arbor F is free to rotate through a complete cycle.

After completing the trimming movement of the trimmer H, the arbor F is rotated through a half revolution to bring the trimmer point I in its upward position and the stop L is also placed in its upward position, thereby bringing its bifurcations L′ and $L^2$ in alignment with the pin G. N and N′ are adjustable stops for the pin G and are set in a position to allow the rotation of the arbor F through a predetermined angle. When the stop L has been set in its upward position, the grinder wheel B is moved relative to the trimming mechanism to bring its axis in the plane of rotation of the trimmer point I and the arbor F is then rotated through the angle allowed by the adjustable stops N and N′. This movement trims the segment O in the periphery of the grinder wheel to conform exactly to the contour of the spline shaft to be ground.

For trimming the edges of the grinder wheel, the pedestal A′ contains the bifur-

cated bearing portions P which are arranged at opposite angles and contain the rotatable arbors Q having the transversely arranged arms R extending therefrom, on which are mounted the trimming points S. In the operation of the edge trimmer the wheel B is moved into alignment with the trimmer points S which are then given their trimming movement by means of the handles T which are attached to the arbors Q.

The grinding wheel, which has been trimmed with my improved trimming device, is shown in Figure 4 in engagement with a work piece and it will be seen that the projecting portions K on the grinder are used for grinding in the relief at the corners of the spline shaft thereby obviating the necessity of machining this relief before hardening the shaft.

While I have shown the trimmer points H and I as being located upon the same arbor and rotated about the same center, it is obvious that there are a number of modifications which would come within the scope of my invention and I do not wish to limit myself to the specific arrangement illustrated in the drawings. The essential part of the trimming mechanism consists in limiting the angular movement of the trimming point I to a predetermined arc and in so relating this angular movement with the sides of the grinder wheel or with the edge trimmers that the grinder wheel will be provided with projecting portions K for grinding the relief in the corners of the spline shaft.

What I claim as my invention is:—

1. In a trimming mechanism for grinder wheels, a plurality of trimming points for independently trimming different portions of the grinder wheel to exactly conform to the contour of the work, said points being rotatable about a common axis through arcs having different radii.

2. In a trimming mechanism for grinder wheels, a rotatable arbor, a trimmer point on said arbor for trimming a concave segment in the grinder wheel, a second trimmer point upon said arbor for trimming a second concave segment, said second trimmer point having a greater radius than said first trimmer point, and means for limiting the rotative movement of said second trimmer point to a predetermined arc.

3. A trimming mechanism for grinder wheels, comprising means for trimming a concave segment in the periphery of the grinder wheel exactly corresponding to the finished work, the center of said trimming arc being in alignment with the axis of the shaft being ground, means for limiting the angular movement of said trimming means to form flanges upon said grinder wheel for grinding the corners of the work, and second trimming means of smaller radius than the first and revoluble about the same center for trimming a concavity in the periphery of said flanges.

4. The combination with a rotary grinder wheel and a relatively reciprocable work holder, of a trimming mechanism comprising a member rotatable about the longitudinal axis of the work, a trimming point on said rotatable member for trimming a concave segment upon the periphery of said grinder wheel, and a second trimmer point on said rotatable member for trimming a second concave segment of different radius in a different portion of said grinder wheel.

5. The combination with a rotary grinder wheel and a relatively reciprocable work holder, of a trimming mechanism comprising a member rotatable about the longitudinal axis of the work, a trimming point on said rotatable member for trimming a concave segment upon the periphery of said grinder wheel, a second trimmer point upon said rotatable member longitudinally spaced from said first trimmer point and having a greater radius, means for rotating said member, and an adjustable stop for limiting the angular movement of said member to a predetermined arc during the trimming of the grinder wheel by said second trimming means.

6. A trimming mechanism for grinder wheels, comprising a supporting base relatively reciprocable with respect to a grinder wheel, a rotatable arbor journaled in said base in alignment with the plane of said grinder wheel, a trimmer point on said arbor, a second trimmer point of greater radius than said first trimmer point, means for rotating said arbor, a member projecting from said arbor, an adjustable stop cooperating with said member to limit the angular movement of said second trimmer point to a predetermined arc, and means for moving said stop out of operative relation with said member to permit unlimited rotation of said first trimmer point.

In testimony whereof I affix my signature.

ANDREW A. GAGARIN.