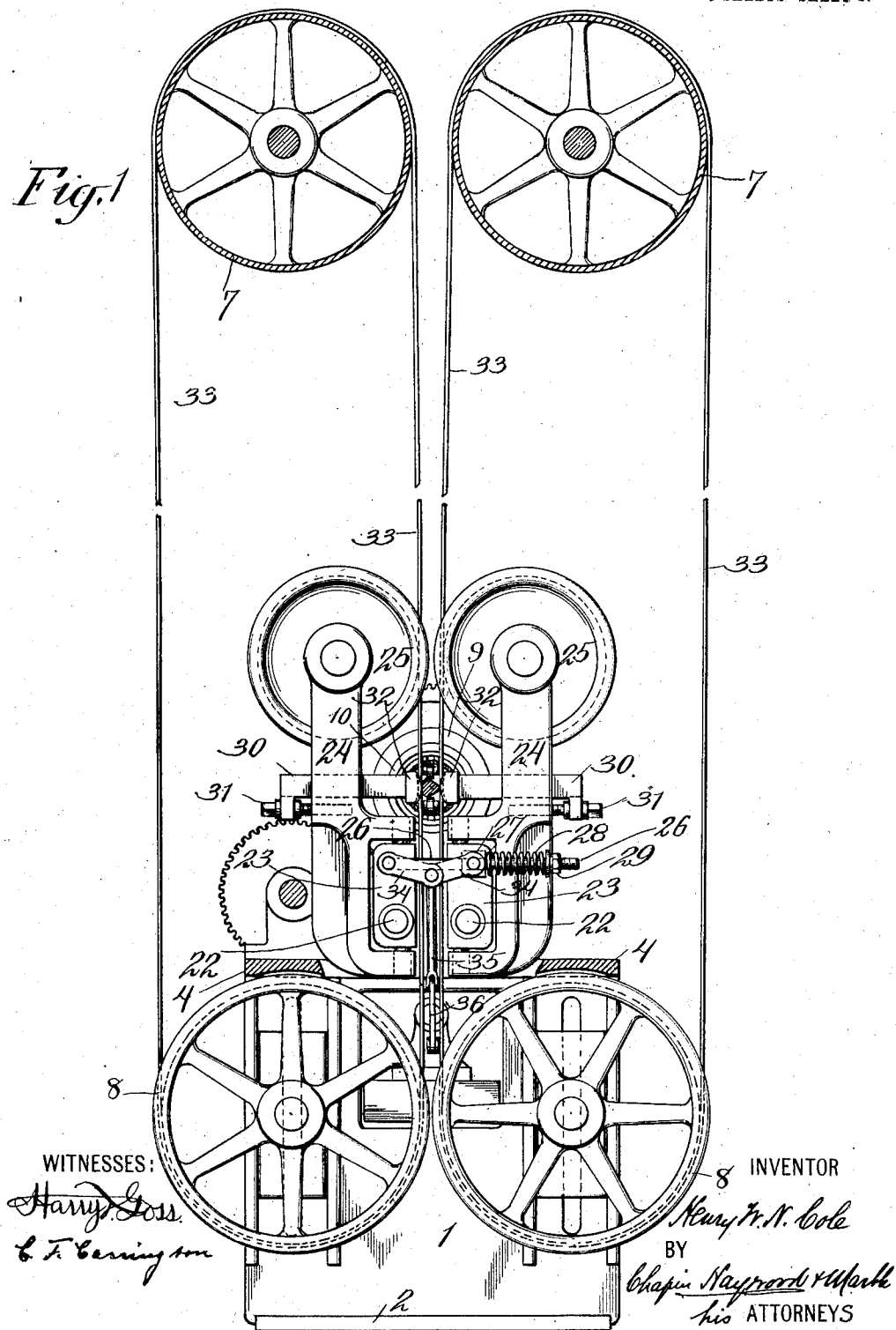


H. W. N. COLE.
GRINDING APPARATUS.
APPLICATION FILED OCT. 26, 1901.

NO MODEL.

3 SHEETS—SHEET 1.

Fig. 1



WITNESSES:

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C. F. Carrington

INVENTOR

Henry W. N. Cole
BY
Chapin Raymond & W. H. W. H.
his ATTORNEYS

No. 736,939.

PATENTED AUG. 25, 1903.

H. W. N. COLE.
GRINDING APPARATUS.
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NO MODEL.

3 SHEETS—SHEET 2.

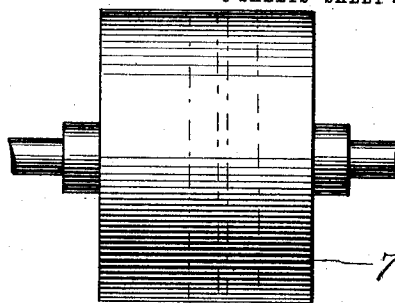
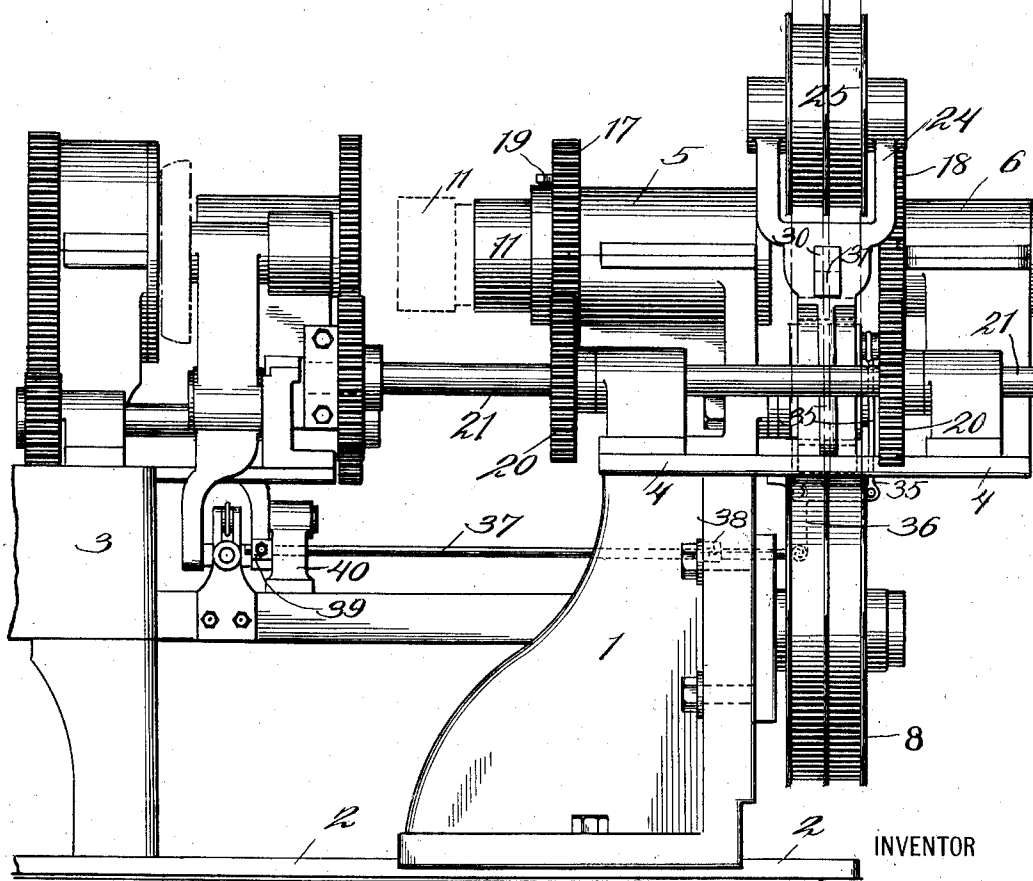


Fig. 2,



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GRINDING APPARATUS.

APPLICATION FILED OCT. 26, 1901.

NO MODEL.

3 SHEETS—SHEET 3.

Fig. 3,

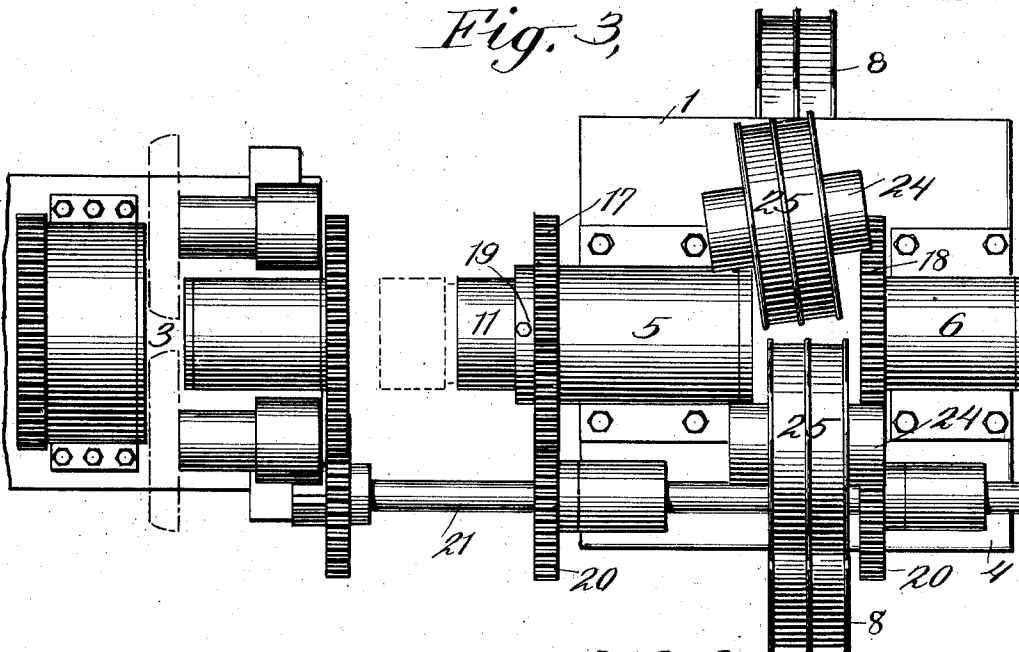
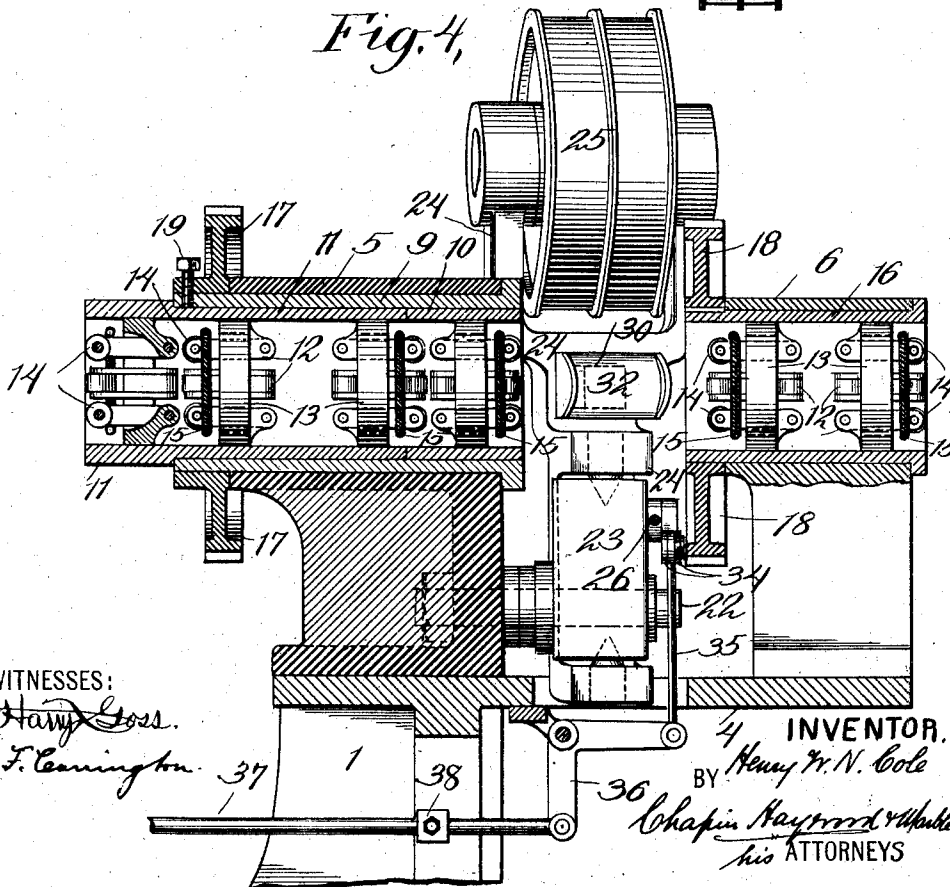


Fig. 4,



WITNESSES:

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E. F. Carrington.

INVENTOR.

BY *Henry W. N. Cole*

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UNITED STATES PATENT OFFICE.

HENRY W. N. COLE, OF BROOKLYN, NEW YORK, ASSIGNOR OF ONE-HALF
TO WALLACE A. DOWNS, OF NEW YORK, N. Y.

GRINDING APPARATUS.

SPECIFICATION forming part of Letters Patent No. 736,939, dated August 25, 1903.

Application filed October 26, 1901. Serial No. 80,061. (No model.)

To all whom it may concern:

Be it known that I, HENRY W. N. COLE, a citizen of the United States, and a resident of Brooklyn, in the county of Kings and State of New York, have invented certain new and useful Improvements in Surfacing-Machines, of which the following is a specification, reference being had to the accompanying drawings, forming a part thereof.

My invention relates generally to improvements in grinding or abrading apparatus, and more particularly to surfacing-lathes or sandpapering and buffing apparatus.

The machine herein described is adapted to be used in connection with and to be directly connected to lathes for turning irregular forms and to perform that smoothing or surfacing operation upon objects produced by such lathes which is customarily termed "sandpapering," although not necessarily performed by means of sandpaper. The apparatus is especially adapted for use in connection with the lathe for turning irregular forms covered by the application of William L. Cole for United States Letters Patent, filed February 25, 1901, Serial No. 48,734.

My invention consists in the use, in connection with means for holding and feeding the object to be surfaced, of automatically-conforming means for pressing a suitable abrasive medium against the object to be surfaced; in the construction of this automatically-conforming means for pressing the abrasive medium against the object acted upon; in the adaptation of a machine containing such an automatically-conforming device to employ an endless band or belt of abrasive material; in the employment of means for moving the abrasive material out of contact with the object acted upon at a predetermined time and for bringing it again into contact with another object to be acted upon at a predetermined time, and in the construction and arrangement of the machine with respect to a forming-machine whereby it is adapted to receive objects directly from said forming-machines.

My invention also consists in various other features hereinafter pointed out.

The objects of my invention are to improve the construction of grinding-machines, and

more especially abrading or surfacing machines of the class specified; to render the same automatic in action; to cause the same to conform their action automatically to the character of the object acted upon, and especially to conform their action to the form of irregular objects; to adapt such machines for direct use in connection with lathes and other machines for forming irregular objects; to adapt such machines for automatic control by pattern-lathes or other machines for forming irregular objects, and to make the machine as simple, compact, durable, and inexpensive as possible.

I will now proceed to describe a surfacing-machine embodying my invention and will then point out the novel features in claims.

In the drawings which form a part of this specification, Figure 1 is an end elevation of my surfacing-machine with one of the rotating heads, one of the driving-shaft bearings and gearing between the driving-shaft and the said rotating head removed, and the driving-shaft and table in transverse section. Fig. 2 is a side elevation of such machine shown in connection with the rear or discharge portion of a pattern-lathe. Fig. 3 is a top view of the principal parts shown in Fig. 2, the upper drums for the abrading-bands being omitted. Fig. 4 is a vertical longitudinal section through the center of the machine.

The machine shown in the drawings consists of a standard 1, adapted to be bolted or otherwise secured to a bed-plate 2, to which also may be secured a pattern-lathe or other machine 3, in connection with which the surfacing-machine is to be used, a table 4, forming a part of said standard and provided with bearings 5 and 6 for hollow heads, hereinafter mentioned, through which the work may be fed, drums 7 and 8 for carrying abrading-bands, means carried by said table for pressing such bands against the object held by the rotary heads or either of them, and suitable operating devices.

The machine is adapted to receive objects turned by the pattern-lathe 3 and fed forward thereby into the rotary head of the bearing 5, which head guides the said object into the corresponding head of the bearing 6, the two rotary heads supporting the object and rotat-

ing it while it is being acted upon by the abrading-bands. The construction of these rotary heads is shown in Fig. 4. That of the bearing 5 consists of a sleeve 9, having within it two sleeves 10 and 11, separable longitudinally from each other and provided with gripping devices for holding the work, such gripping devices comprising spring-pressed arms 12, pivotally connected to the rings 13, mounted within the sleeves 10 and 11 and carrying rollers 14, which are adapted to engage the work. Coil-springs 15 embrace each set of arms and tend to press them together. As the work is forced forward through the rotary head it will be successively received by the successive sets of arms, and the work will force the arms outwardly against the spring tension, which will operate to press them with a yielding force toward the work, so that they will adjust themselves to the shape of the work. The rotary head within the bearing 6 consists of a sleeve 16, provided with similar gripping-arms. The gripping-arms are fully claimed in the application of the said William L. Cole, above mentioned, and therefore are not claimed herein.

The purpose of providing the rotating head within the bearing 5 with two sleeves 10 and 11, carrying gripping-arms, is to permit longitudinal adjustment of one of these sleeves toward or from the machine from which the work is received, so that too long a gap shall not exist between the said machine and the receiving-head of the sandpapering-machine.

The two rotating heads are driven by gears 17 and 18, the former mounted on sleeve 9, but connected to sleeve 11 by a set-screw 19, projecting through sleeve 9, while gear 18 is connected to sleeve 16. By unscrewing set-screw 19 the sleeve 11 is freed, so that it may be moved in or out, and in whatever position it may be adjusted it will be held by the set-screw 19 when the latter is turned up. Dotted lines in Figs. 2 and 3 indicate the adjustability of the sleeve. Gears 17 and 18 are driven by other gears 20, mounted upon a driving-shaft 21, which is shown in the drawings as connected with and driven by one of the shafts of the pattern-lathe 3, though I do not restrict myself to driving said shaft in this manner. Gears 17 and 18 being of the same size and gears 20 being likewise of the same size, the two rotating heads revolve in the same direction and with the same velocity.

The bracket which supports the bearing 5 is provided with two trunnion-pins 22, upon which are mounted trunnion-blocks 23. Pivotally mounted upon these trunnion-blocks by cone-pivots, as shown, are followers comprising brackets 24, portions of which constitute pressers 30 for pressing abrading-bands against the object to be acted upon and guide-pulleys 25. The axes of the trunnion-pins are substantially horizontal, while the axes of the cone-pivots between the brackets and the trunnion-blocks are in a plane substantially at right angles thereto. Hence each

bracket is free to move both about a horizontal axis and about another axis substantially at right angles thereto, so as to permit the follower to conform to variations in the contour of the work acted upon. The pressers 30 are here shown as sliding presser-bars, rigidly secured with relation to the brackets during the operation of the machine, but adjustable in position with respect to their respective brackets for purposes of compensation for wear or for different sizes of objects to be acted upon by means of adjusting-screws 31 and are provided with heads 32, recessed, as shown, for the reception of the abrading-bands. A rod 26, Fig. 1, pivoted to one trunnion-block 23 and passing through a guide-block 27 of the other trunnion-block, is provided beyond said guide-block 27 with a spring 28 and a compression-block 29, by means of which the tension of said spring may be adjusted. The normal tendency of the spring 28 will be to draw the trunnion-blocks 23 together. The followers being mounted upon the trunnion-blocks will partake of their movements, and hence will also be drawn together by the said spring, but being pivotally mounted with respect to said trunnion-blocks will have in addition thereto a movement transverse with respect to the said blocks.

The abrading-bands are designated in the drawings by the numeral 33. In the drawings I have shown two such bands—one each side of the center line of the machine; but it will be understood that the number of such bands on either or both sides may be increased or decreased at will, or the machine may be provided with such bands upon one side of the work only. The drums 7 for the said bands are the driving-drums, the drums 8 being idlers.

To the trunnion-blocks 23 are connected toggle-links 34, to which is connected a rod 35, connected at its other end to a pivoted bell-crank lever 36, which lever is also connected to a rod 37, mounted to slide lengthwise and carrying adjustable stops 38 and 39. The toggle-links 34 are of the well-known type in which a movement to force them just beyond a position on the opposite side (to the position in which they are shown in the drawings) of a straight line passing through their centers results in locking them in such a position until they are again freed by pressure applied at the knuckle to cause same to return across the said line. Said rod 37 is adapted to be operated by some portion which moves forward synchronously with the forward movement of the stock. Such portion may be a portion of the lathe or forming-machine with which the apparatus herein is adapted to be employed and may hence be some portion of the forming-machine which moves forward synchronously with the movement of the stock through said lathe or which partakes of the movement of the pattern with reference to its follower or of the cutters with reference to the stock. In the particular pattern-lathe a

portion of which is shown in Fig. 2 the pattern-supports themselves move forward synchronously with the movement of the stock through the lathe, and the rod 37 is arranged to be operated by one of these supports 40 through an aperture in which the rod passes. The support 40, being between the stops 38 and 39, will move rod 37 to the right of Fig. 2 when said support reaches stop 38, thereby pressing trunnion-blocks 23, brackets 24, and pulley-wheels 25 apart, so as to disengage the abrading-bands from the work, while upon its return movement the support 40 will move the rod 37 to the left of Fig. 2 when it reaches stop 39, thereby permitting the spring 28 to press the pulleys 25 toward each other, and so bring the abrading-bands again into contact with the work. It is not necessary for me to illustrate the particular means for reciprocating the pattern-support 40, since such reciprocating pattern-supports are well known and in common use.

The operation of the machine is as follows: Work which has been shaped by the pattern-lathe 3 is fed forward thereby into the receiving-head of the surfacing-machine and by the same means is pressed forward through said head until the front end of the work is between the abrading-bands 33. Portions of the work which have been fed forward to a point beyond actual engagement with the feeding means are further fed forward by pressure from similar objects in the rear thereof. The adjustment of the machine upon the bed-plate 2 is such that the front end of the object to be acted upon reaches a position between the bands when the brackets 24 and guide-wheels 25 are held apart by the toggle-links 34. Upon the return movement of the pattern-support this toggle-locking mechanism is tripped, thus permitting the spring 28 to press the pulleys 25 and the pressers 30 against the bands 33, so as to press said bands against the object to be surfaced. As the pattern-support of the lathe 3 next moves to the right the stock in said lathe, being likewise fed forward to the right, will press the object in the surfacing-machine which is in advance of the object in the lathe onward and past the bands 33, which bands are caused to conform to the varying shape of the work owing to the pressure of the spring 28 and the conforming support of the followers, including the pulleys 25 and pressers 30, by which said bands are pressed against the work. In this way the machine is caused to surface the object acted upon thoroughly.

It will of course be obvious instead of feeding the object to be surfaced through the machine by the pressure of a similar object behind it and fed forward by the pattern-lathe such object may be fed through the machine by hand-pressure or by other suitable feeding means.

I do not confine myself to any particular material from which to form the abrading-

bands 33, but may use any material suitable for the purpose.

It will further be understood that I do not desire to be limited to the form or construction of apparatus herein illustrated, as the same may obviously be varied within wide limits without departing from the spirit and scope of my invention.

Having thus completely described my invention, what I claim, and desire to secure by Letters Patent, is—

1. In a surfacing-machine, the combination with means for holding an object to be acted upon, of a follower arranged to press an abrading medium against the said object, and a support for said follower permitting movement thereof about an axis which is in a plane transverse of the longitudinal axis of the said object.

2. In a surfacing-machine, the combination with means for holding an object to be acted upon, of a follower arranged to press an abrading medium against the said object, and a support for said follower permitting movement thereof toward and away from the said object, and also about an axis transverse of said first-named movement.

3. In a surfacing-machine, the combination with means for holding an object to be acted upon, and means for producing relative rotation between the said object and an abrading medium, of a follower arranged to press an abrading medium against the said object, and a support for said follower permitting movement thereof about an axis which is in a plane substantially perpendicular to the axis of the said relative rotation.

4. In a surfacing-machine, the combination with means for holding an object to be acted upon, and means for producing relative rotation between the said object and an abrading medium, of a follower arranged to press an abrading medium against the said object, and a support for said follower permitting movement thereof toward and away from the said object, and also about an axis which is in a plane substantially perpendicular to the axis of the said relative rotation.

5. In a surfacing-machine, the combination with means for holding and rotating an object to be acted upon, of a follower arranged to press an abrading medium against the said object, and a support for said follower permitting movement thereof about an axis which is in a plane substantially perpendicular to the axis of rotation of the said object.

6. In a surfacing-machine, the combination with means for holding an object to be acted upon, of a follower arranged to press an abrading medium against the said object, the said follower pivoted about two axes transverse of each other.

7. In a surfacing-machine, the combination with means for holding an object to be acted upon, of a follower arranged to press an abrading medium against the said object, the said follower pivoted about an axis substantially

parallel to the axis of the object acted upon, and also about another axis which is in a plane substantially at right angles thereto.

8. In a surfacing-machine, the combination
5 with a hollow rotary head containing means for receiving and supporting an object to be acted upon, and means for rotating the head, of a follower arranged to press an abrading
10 medium against the said object, and a support for said follower permitting movement thereof about an axis which is in a plane transverse of the axis of rotation of the said head.

9. In a surfacing-machine, the combination
15 with a hollow rotary head containing means for receiving and supporting an object to be acted upon, and means for rotating the head, of a follower arranged to press an abrading medium against the said object, and a support
20 for said follower permitting movement thereof toward and away from the said object, and also about an axis which is in a plane transverse of the axis of rotation of the said head.

10. In a surfacing-machine, the combination
25 with two hollow rotary heads containing means for receiving and supporting an object to be acted upon, and means for rotating the heads in unison, of a follower located between the said heads, and arranged to press an abrading
30 medium against the said object, and a support for said follower permitting movement thereof toward and away from the said object, and also about an axis which is in a plane transverse of the axis of rotation of the
35 said heads.

11. In a surfacing-machine, the combination with a hollow rotary head for receiving an object to be acted upon, containing yielding gripping devices adapted to receive objects
40 of irregular form and to permit feeding of the same through the head, and means for rotating the head, of a follower located between the said heads, and arranged to press an abrading medium against the said object, and a
4 support for said follower permitting movement thereof about an axis which is in a plane transverse of the axis of rotation of the said head.

12. In a surfacing-machine, the combination
50 with a hollow rotary head for receiving an object to be acted upon, containing yielding gripping devices adapted to receive objects of irregular form and to permit feeding of the same through the head, and means for rotating
55 the head, of a follower located between the said heads, and arranged to press an abrading medium against the said object, and a support for said follower permitting movement thereof toward and away from the said
60 object, and also about an axis which is in a plane substantially perpendicular to the axis of rotation of the said head.

13. In a surfacing-machine, the combination with means for holding an object to be
65 acted upon, of two followers arranged to press abrading mediums against the said object,

upon opposite sides thereof, and supports for each of said followers, permitting independent movements thereof about an axis which is in a plane transverse of the longitudinal axis of the said object. 70

14. In a surfacing-machine, the combination with means for holding an object to be acted upon, of two followers arranged to press
75 abrading mediums against the said object, upon opposite sides thereof, and supports for each of said followers, permitting independent movements thereof toward and away from the said object, and also about an axis transverse of said first-named movement. 80

15. In a surfacing-machine, the combination with means for holding and rotating an object to be acted upon, of two followers arranged to press abrading mediums against the said object, upon opposite sides thereof,
85 and supports for each of said followers, permitting independent movements thereof toward and away from the said object, and also about an axis which is in a plane substantially perpendicular to the axis of rotation thereof. 90

16. In a surfacing-machine, the combination with means for holding an object to be acted upon, of a follower having a portion constituting a presser for engaging an abrading-band, and a support for said follower permitting movement thereof about an axis which is in a plane transverse of the longitudinal axis of the said object. 95

17. In a surfacing-machine, the combination with means for holding an object to be acted upon, of a follower having a portion constituting a presser for engaging an abrading-band, and a support for said follower permitting movement thereof toward and away
100 from the said object, and also about an axis transverse of said first-named movement. 105

18. In a surfacing-machine, the combination with means for holding an object to be acted upon, and means for producing relative rotation between the said object and an abrading-band, of a follower having a portion constituting a presser for engaging the abrading-band, and a support for said follower permitting movement thereof about an axis which is in a plane substantially perpendicular to the longitudinal axis of the said object. 110

19. In a surfacing-machine, the combination with means for holding an object to be acted upon, and means for producing relative rotation between the said object and an abrading-band, of a follower having a portion constituting a presser for engaging the abrading-band, and a support for said follower permitting movement thereof toward and away
115 from the said object, and also about an axis transverse of said first-named movement. 120

20. In a surfacing-machine, the combination with means for holding and rotating an object to be acted upon, of a follower having a portion constituting a presser for engaging an abrading-band, and a support for said fol- 125

lower permitting movement thereof about an axis which is in a plane transverse of the longitudinal axis of the said object.

21. In a surfacing-machine, the combination with means for holding an object to be acted upon, of a follower having a portion constituting a presser for engaging an abrading-band, a guide-pulley for the abrading-band carried by the said follower, and a support for said follower permitting movement thereof about an axis which is in a plane transverse of the longitudinal axis of the said object.

22. In a surfacing-machine, the combination with means for holding an object to be acted upon, of a follower having a portion constituting a presser for engaging an abrading-band, a guide-pulley for the abrading-band carried by the said follower, and a support for said follower permitting movement thereof toward and away from the said object, and also about an axis transverse of said first-named movement.

23. In a surfacing-machine, the combination with means for holding and rotating an object to be acted upon, of a follower having a portion constituting a presser for engaging an abrading-band, a guide-pulley for the abrading-band carried by the said follower, and a support for said follower permitting movement thereof about an axis which is in a plane substantially perpendicular to the longitudinal axis of the said object.

24. In a surfacing-machine, the combination with means for holding an object to be acted upon, of a follower for pressing an abrading-band against the object acted upon, having means for guiding said band, and a support for said presser to which said presser is pivoted about two axes transverse of each other, and means for driving said band.

25. In a surfacing-machine, the combination with means for holding and rotating an object to be acted upon, of a follower for pressing an abrading-band against the object acted upon, having means for guiding said band, and a support for said presser to which said presser is pivoted about an axis substantially parallel to the axis of rotation of the said object, and also about another axis substantially at right angles thereto.

26. In a surfacing-machine, the combination with means for holding an object to be acted upon, and a bracket, pivoted about two axes and carrying a guide-pulley for an abrading-band and a presser for pressing the band against the object acted on, of means for driving said band, and means for causing the said presser to press the same against the object acted on.

27. In a surfacing-machine, the combination with means for holding an object to be acted upon, and a bracket, pivoted about two axes and carrying a guide-pulley for an abrading-band, and a presser for pressing the band against the object acted on, of means for

driving said band, and a spring for pressing the same against the object acted on.

28. In a surfacing-machine, the combination with means for holding an object to be acted upon, and a bracket, pivoted about two axes and carrying a guide-pulley for an abrading-band, of an adjustable presser for pressing the band against the object to be acted on, means for driving said band, and means for causing the said presser to press the same against the object to be acted on.

29. In a surfacing-machine, the combination with means for holding an object to be acted upon, and a bracket, pivoted about two axes and carrying a guide-pulley for an abrading-band, of an adjustable presser for pressing the band against the object to be acted on, means for driving said band, and a spring for pressing the same against the object to be acted on.

30. The combination, with a rotary head for receiving an object to be acted upon, of two longitudinally-separable sections mounted within the said head, each provided with gripping devices adapted to receive objects of irregular form and to permit feeding of the same through the head, and means whereby the said sections may be longitudinally separated, but rotated in unison.

31. The combination, with a rotary head for receiving an object to be acted upon, of a sleeve mounted therein and formed in two longitudinally-separable sections, each provided with gripping devices adapted to receive objects of irregular form and to permit feeding of the same through the head, and means whereby one of said sections may be adjusted longitudinally with respect to the other, but whereby they may both be rotated in unison.

32. In a surfacing-machine, the combination with means for holding an object to be acted upon, of a follower arranged to press an abrading medium against the said object, and a block upon which said follower is mounted to move in one direction, said block itself mounted to move in a direction transverse thereto.

33. In a surfacing-machine, the combination with means for holding an object to be acted upon, and an abrading medium, of a follower arranged to press an abrading medium against the said object, and a support for said follower permitting movement thereof about an axis which is in a plane substantially perpendicular to the longitudinal axis of the said object.

34. In a surfacing-machine, the combination with means for holding an object to be acted upon, and an abrading medium, of a follower arranged to press an abrading medium against the said object, and a support for said follower permitting movement thereof toward and away from the said object and also about an axis substantially perpendicular to said first-named movement.

35. In a surfacing-machine, the combination with means for holding an object to be acted upon, and an abrading-band, of a follower for pressing an abrading-band against the object acted upon, having means for
5 guiding said band, and a support for said presser to which said presser is pivoted about two axes transverse of each other, and means for driving said band.

10 36. In a surfacing-machine, the combination with means for holding and rotating an object to be acted upon, and an abrading-band, of a follower for pressing an abrading-band against the object acted upon, having
15 means for guiding said band, and a support for said presser to which said presser is pivoted about an axis substantially parallel to the axis of rotation of the said object, and also about another axis substantially at right angles thereto.

20 37. In a surfacing-machine, the combination with means for holding an object to be acted upon, an abrading-band adapted to rotate upon pulleys having suitable bearings,
25 and a bracket, pivoted about two axes and carrying a guide-pulley for the abrading-band and a presser for pressing the band against the object acted on, of means for driving said band, and means for causing the said presser
30 to press the same against the object acted upon.

38. In a surfacing-machine, the combination with means for holding an object to be acted upon, an abrading-band adapted to ro-

tate upon pulleys having suitable bearings, 35
and a bracket, pivoted about two axes and carrying a guide-pulley for the abrading-band, and a presser for pressing the band against the object acted on, of means for driving said band, and a spring for pressing the
40 same against the object acted upon.

39. In a surfacing-machine, the combination with means for holding an object to be acted upon, an abrading-band adapted to rotate upon pulleys having suitable bearings, 45
and a bracket, pivoted about two axes and carrying a guide-pulley for the abrading-band, of an adjustable presser for pressing the band against the object to be acted on, means for driving said band, and means for
50 causing the said presser to press the same against the object to be acted upon.

40. In a surfacing-machine, the combination with means for holding an object to be acted upon, an abrading-band adapted to rotate upon pulleys having suitable bearings, 55
and a bracket, pivoted about two axes and carrying a guide-pulley for the abrading-band, of an adjustable presser for pressing the band against the object to be acted on, 60
means for driving said band, and a spring for pressing the same against the object to be acted upon.

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Witnesses:

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