

Aug. 5, 1924.

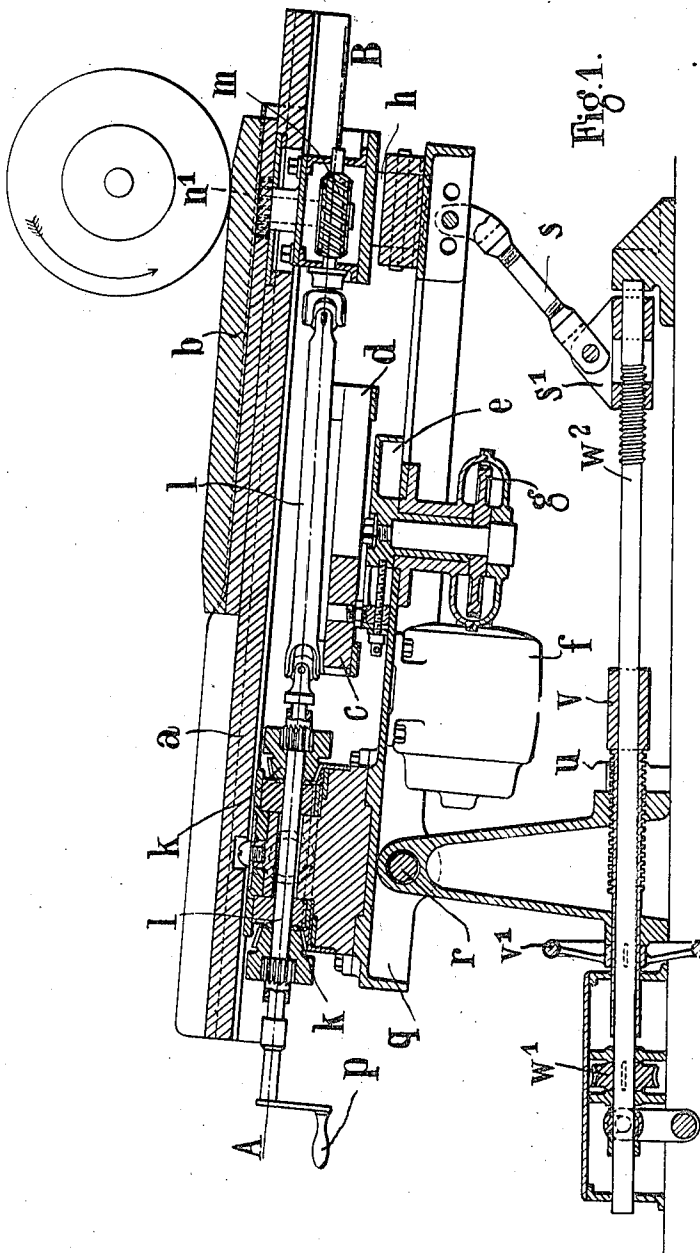
H. J. HUNT

1,503,687

APPARATUS FOR GRINDING, ABRADING, OR POLISHING METAL AND OTHER SURFACES

Filed March 21, 1921

5 Sheets-Sheet 1



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Aug. 5, 1924.

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5 Sheets-Sheet 2

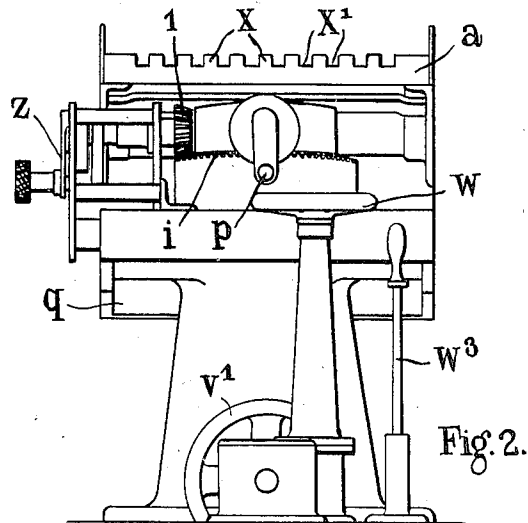
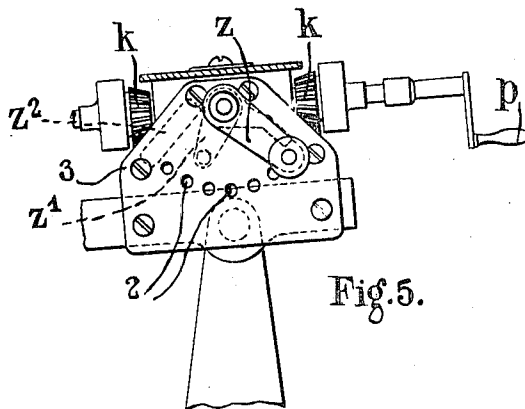
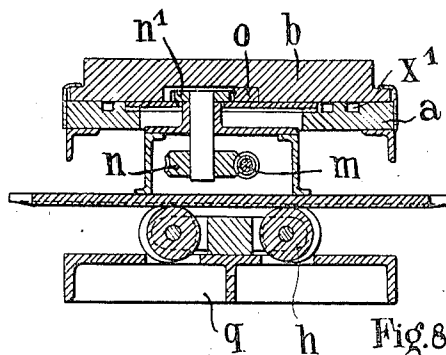


Fig. 8. *Inventor*
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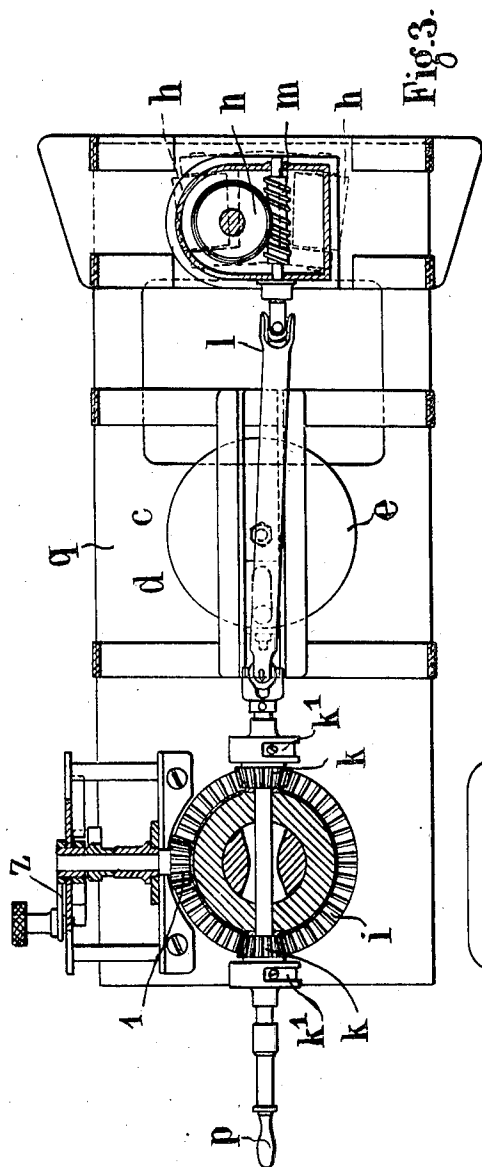
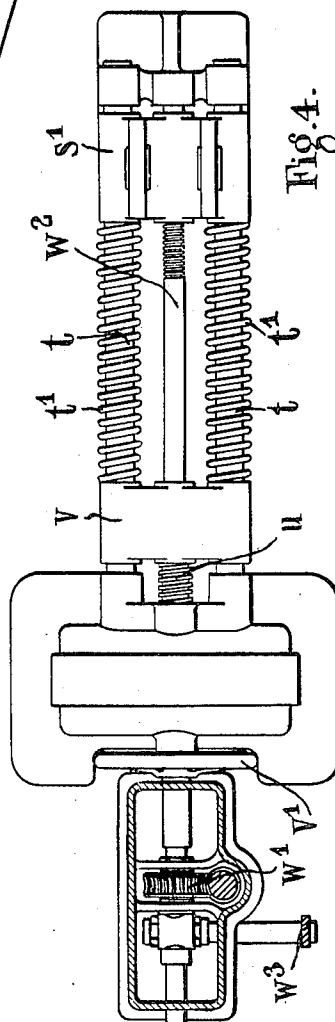
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Filed March 21, 1921

5 Sheets-Sheet 3



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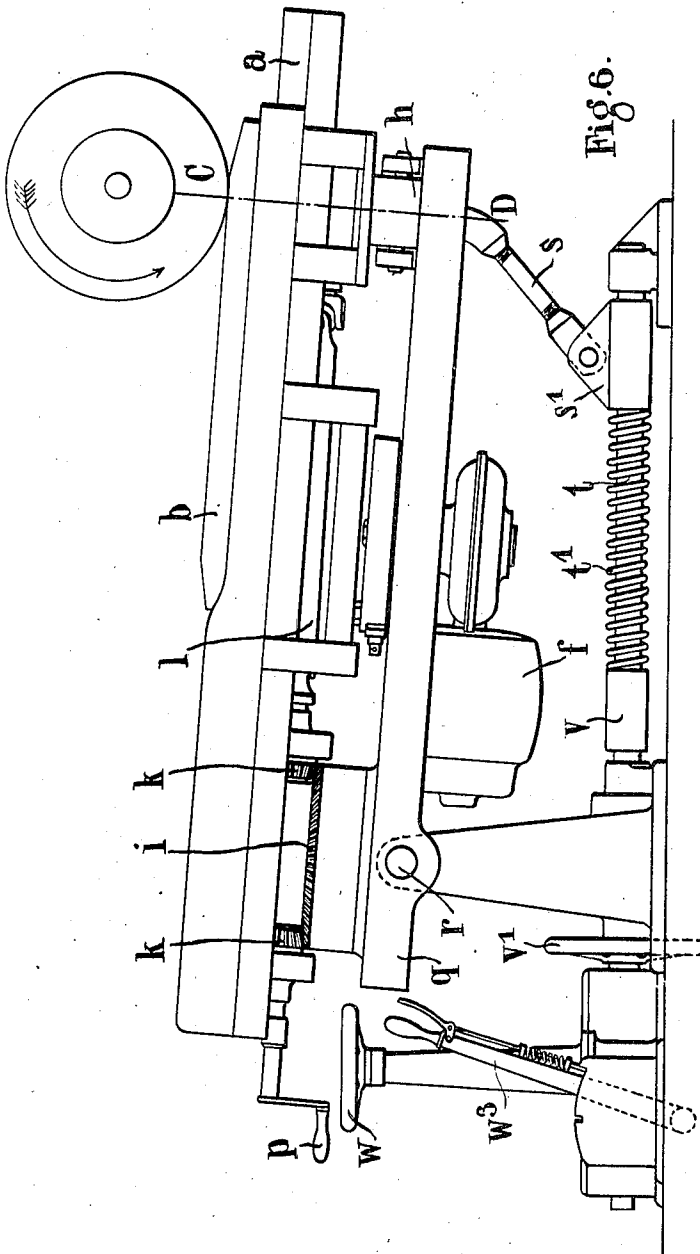
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Filed March 21, 1921

5 Sheets-Sheet 4



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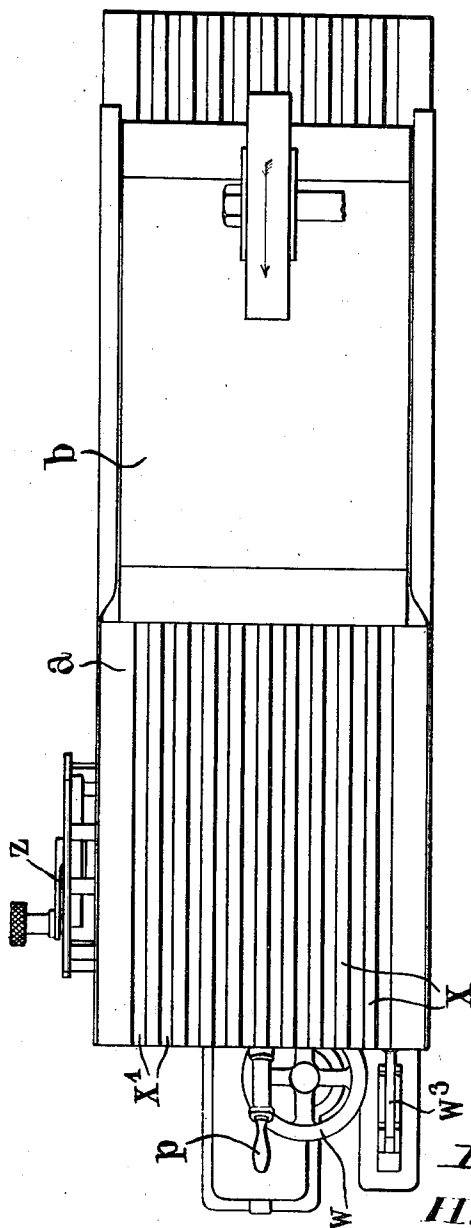
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APPARATUS FOR GRINDING, ABRADING, OR POLISHING METAL AND OTHER SURFACES

Filed March 21, 1921

5 Sheets-Sheet 5

Fig. 7.



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UNITED STATES PATENT OFFICE.

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APPARATUS FOR GRINDING, ABRADING OR POLISHING METAL AND OTHER SURFACES.

Application filed March 21, 1921. Serial No. 454,027.

To all whom it may concern:

Be it known that I, HENRY JAMES HUNT, a subject of the King of Great Britain and Ireland, and residing at 42, Meyrick Road, Battersea, London, S. W. 11, England, have invented a certain new and useful Improved Apparatus for Grinding, Abrading, or Polishing Metal and Other Surfaces, of which the following is a specification.

This invention relates to the operations of grinding, abrading, polishing and the like as applied to sheet metal, glass, vulcanite or other material susceptible of such treatment.

The object of the present invention is to provide apparatus for use in the grinding, abrading or polishing of metal and other surfaces which will be free from the defects of existing apparatus while possessing all the advantages of such apparatus as compared with hand methods of operation.

The invention consists in apparatus for grinding, polishing and like operations comprising mechanical means for moving the sheet or the like to be treated relatively to a grinding or like element which is fixed in space in operative relation to the sheet, this arrangement enabling totally enclosed bearings to be adopted so that no difficulties will be experienced by reason of the entry of grit or other foreign matter into the bearings. Moreover, it is possible to use a grinding element of relatively narrow width as compared with the width of the sheet to be treated so that there is economy effected not only in the cost of constructing the element but also in the cost of driving the same.

The invention also consists in apparatus for grinding, abrading, polishing and like operations comprising mechanical means for oscillating the work beneath the grinding or polishing element which is fixed in space in operative relation with the work.

The invention also consists in apparatus of the above character provided with means for automatically feeding the work relatively to the grinding or like element so that the latter may treat successive portions of the surface until the whole has been covered.

The invention also consists in the provision of means for adjusting the rate of feed of the work.

The invention also consists in the provision of means for varying the amplitude of oscillation or the extent of reciprocation of the work relatively to the grinding or like element.

The invention also consists in arranging the work to be held in a resilient support so that the polishing or like member will be able to follow all inequalities or unevennesses in the work surface so that the whole will be adequately treated.

The invention also consists in means for varying the resistance to movement of the resilient support as may be determined by the class of material being operated on, the nature of the operation or the character of finish required.

The invention further consists in means for disengaging the work from the grinding or like element which disengagement may be required to be rapidly effected, for example, in the event of any accident happening to the grinding or like element.

The invention still further comprises other details and arrangements hereinafter described or indicated.

The accompanying drawings illustrate one convenient form of apparatus in accordance with the invention.

Figure 1 is a longitudinal sectional elevation.

Figure 2 is an end elevation.

Figure 3 is a section on the line A—B of Figure 1.

Figure 4 is a part sectional plan of the lower part of the apparatus, and

Figure 5 is a side elevation of a change speed mechanism forming part of the apparatus shown.

Figure 6 is a side elevation of the machine,

Figure 7 is a plan, and

Figure 8 is a section on the line C—D of Figure 6.

In carrying my invention into effect in one convenient manner I may provide any suitable form of table, foundation, framework or support (not shown) forming part of or adapted to take my improved mechanical work-holder and traverser, the latter in one convenient construction taking the form of a table or slide α supported preferably in an inclined manner beneath the grinding wheel or other grinding, pol-

ishing, or like element (which may be of any suitable or usual character and which is not shown) and adapted to take the metal or other sheet to be operated on or a base
5 or support *b* upon which such sheet is carried.

It will be understood that any suitable means may be adopted for holding the work but when dealing with metal sheets I find
10 it convenient to provide a wooden or other base plate *b* upon which the sheet is laid, one end being adapted to be firmly held between the bevelled end of the wooden or like support and a plate or clip conveniently,
15 though not necessarily, furnished with holding points or projections adapted to be folded down upon and to firmly grip the end of the sheet by means of a lever or other operative member. Such gripping means
20 is not shown in the drawing.

The table *a* with the work thereon is adapted by suitable mechanical means to be reciprocated or oscillated beneath the grinding
25 element and the slide or work holder *b* is also mechanically fed longitudinally with reference to the grinding element so that the latter may operate upon successive portions of the surface until the whole has been covered.

In the construction shown the table *a* is adapted to be pivoted about one end and is oscillated about its pivot by means of a slider crank mechanism comprising, for example,
35 a pivotal block *c* engaging a slide *d* upon the under side of the table and carried by a plate or disc *e* adapted to be rotated from any suitable source of power with or without the intervention of suitable
40 bevel wheels and pinions or other convenient transmission mechanism. In the example shown the disc is rotated by the electric motor *f* carried upon the apparatus, and connected to said disc by worm and
45 worm wheel *g*. The block may be made adjustable in relation to the disc to vary the amplitude or extent of the oscillation of the table, and may be held in any desired position by suitable means.

It is convenient that the table be pivoted
50 about its rear end or the end remote from the grinding element and the forward end or end adjacent to the grinding element may be supported upon rollers *h* carried by a portion of the framing. Such rollers may
55 be tapered rollers arranged radially with regard to the centre of oscillation of the table to facilitate the smooth working of the latter and they may be located beneath the grinding element so as to furnish a
60 support or abutment upon which the load is taken.

If desired the rear end of the table may be loaded or counterweighted, or the electric
65 motor may be arranged at such rear end for this purpose.

The slider crank mechanism above referred to is preferred for the reason that it provides that the table will move most rapidly at the part situated beneath the grinding
70 element while the movement will be retarded at each end of the oscillation which is convenient for facilitating the reversal of the movement but it is to be understood that such mechanism is given by way of example only and any other convenient means
75 for the purpose may be adopted.

Automatic means are provided for feeding the work relatively to the grinding element and it is convenient that the feed
80 motion be derived from the motion of the table. This may be effected in one convenient manner by arranging a fixed bevel wheel *i* with its centre coinciding with the centre of oscillation of the table with which
85 mesh two bevel pinions *k* situated on opposite sides of the centre of the bevel wheel and suitably controlled by ratchets *k'* so that both may communicate motion in one
90 direction to a shaft *l* universally jointed and running longitudinally beneath the table so as to transmit the drive from the bevel pinions to a worm *m* which drives a worm
95 wheel *n* mounted on the shaft of a pinion *n'* engaging a rack *o* upon the under side of the support for the work, by which arrangement the work will automatically be fed forward in a step-by-step manner while at the same time the feeding means
100 will not in any way interfere with the free oscillation of the table.

The feed may also be effected wholly or in part by a hand-wheel *p* or other member arranged upon the feed shaft *l*, this being
105 of advantage, for example, to facilitate the rapid movement of a sheet not worth operating on or that has had facial defects revealed in process of treatment.

If desired, I may arrange for the fixed bevel wheel *i* to be adjustable so that it may be moved circumferentially from time to
110 time as may be required to equalize the wear caused by the oscillating bevel pinions.

The worm *n* is preferably provided as part of the feeding mechanism so that the same may be self-locking, this being re-
115 quired for the reason that the rotation of the grinding element is usually in the direction tending to assist the feed of the work, and if any excessive friction be developed between the work and the grinding
120 element the action of the latter might cause the feeding mechanism to race.

It is desirable that means be provided for enabling the work to be moved out of operative
125 relation with the grinding element should any defect be developed in the latter or for other reasons, and this is effected by mounting the support *q* carrying the pivot of the table and the rollers upon which the
130 latter moves so as to be movable about a

pivot r in a downward direction or in a direction away from the grinding element, that end of the support remote from the pivot r being connected by a link s which in turn is connected to a block or crosshead s' adapted to slide in or on a guide or guides t carried by the table or framework of the apparatus against the action of a spring or springs t' or the equivalent so that the support for the work is of a resilient character. Normally the table is so set that it must be depressed to a certain extent against the springs t' before the grinding or like element can operate, so that the element will follow all unevennesses in the surface and thus the whole be adequately treated. This arrangement also enables any desired pressure to be set up between the work and the grinding element by means, for example, of an adjusting screw u and crosshead v operated by handwheel v' to control the spring or the like above referred to, and if necessary or desirable any suitable gauge may be provided with the apparatus so that any predetermined pressure may thus be set up by operating the adjusting screw until the index of the gauge points to the desired pressure.

Fine adjustment of the angular position of the table may be effected by the handwheel w actuating the worm and worm wheel w' to rotate the threaded shaft w'' , and rapid withdrawal of the work from the grinding wheel or the like may be effected by the pivoted hand lever w^3 .

In order that the free feed of the work may not be interfered with by grit or other foreign matter working its way between the table and the slide supporting the work the table b may be grooved, fluted or channelled for the reception and carrying off of such foreign matter, the slide thus working only upon the ridges x (Figure 2) formed between the grooves or flutings x' . Moreover, the table or the like may be made telescopic or expanding by screw-operated or other means so that its width may be varied to suit the varying widths of sheet upon which the machine is required to operate.

As hereinbefore stated the invention is not to be confined to any particular form, type or construction of grinding, abrading, polishing or like element, but where this is adapted to be rotated by the application of suitable power as, for example, in ordinary grinding wheels it will be evident that it is important for accurate work that the centre of the grinding wheel axis be maintained as accurately as possible at a given height from the work and this is conveniently effected by arranging the grinding wheel or other member to be mounted upon a hollow bush having a flanged ring at one end and a screw portion at the other end so that a similar bush may be threaded thereon whereby the

grinding wheel or the like may be firmly clamped between the flanges.

The bushing and flanges may be made of mild steel or other material not subject to rapid wear and the bush is made internally a free sliding fit upon the grinding wheel spindle, the whole being held in position by a nut screwed upon the reduced end of such spindle.

When it is required to provide means for varying the rate of feed as may be required, for example, to suit different classes of operation, different materials or different standards of finish required, this may conveniently be effected by introducing any suitable form of change speed gear between the feed wheel and mechanism driving the same and such may be combined if desired with any suitable form of indicator so that the machine may be set to give any predetermined rate of feed.

A simple and more convenient method of obtaining variation in the rate of feed may be provided by the arrangement of the bevel wheel i and pinions k hereinbefore referred to. For this purpose, the bevel wheel i , instead of being fixed, may be capable of a variable amount of slip, relatively to the bevel pinions k , the amount of slip being determined, for example, by any suitable form of adjustable stop. In the drawings shown the stop takes the form of a lever z' , connected with a bevel pinion 1 engaging the wheel i , the angular position of the lever z being varied by means of holes 2 bored in a plate 3 so that lever z' is free to move between the gap formed between stop z'' and lever z . When the slip is nil the rate of feed will be a maximum and when the slip is equal to the number of teeth of the bevel normally engaged by the pinions, the rate of feed will be zero. Thus it is evident that I may obtain varying rates of feed merely by varying the amount of slip that can occur between these limits.

If desired the grinding or like wheel may be enclosed with the exception of that part in contact with the sheet being treated and suitable means provided for extracting the dust or foreign matter from within such enclosure.

I do not wish the invention to be limited to the details of construction hereinbefore given by way of example as it will be obvious that I may modify the means for providing the necessary movement of the work relatively to the grinding or like element, the mechanical devices adopted for feeding the work and the various forms of transmission gear employed in the apparatus, all as may be determined by the class of operation for which the machine is designed or any practical requirements that may have to be fulfilled.

Having now described my invention, 130

what I claim as new and desire to secure by Letters Patent is:—

1. Apparatus for grinding or polishing the surface of a work-piece comprising a work-holder, a grinding or polishing element fixed in space in relation to said work-holder, mechanical means for oscillating the work-holder past the grinding element in the plane of the surface to be treated and means actuated by said oscillating means for automatically and simultaneously feeding the work also in the plane of its surface so that successive portions of the surface will be uniformly treated.

2. Apparatus for grinding or polishing the surface of a work-piece comprising a work-holder, a grinding or polishing element fixed in space in relation to said work-holder, mechanical means for oscillating the work-holder past the grinding element in the plane of the surface to be treated, means actuated by said first mentioned means for simultaneously feeding the work also in the plane of its surface so that successive portions of the surface will be treated and means for varying the rate of feed of the work.

3. Apparatus for grinding or polishing the surface of a work-piece comprising a work-holder, a grinding or polishing element fixed in space in relation to said work-holder, mechanical means for oscillating the work-holder past the grinding element in the plane of the surface to be treated, means for simultaneously feeding the work also in the plane of its surface so that successive portions of the surface will be treated and means for varying the rate of feed.

4. Apparatus for grinding or polishing the surface of a work-piece comprising a work-holder, a grinding or polishing element fixed in space in relation to said work-holder, mechanical means for oscillating the work-holder past the grinding element in the plane of the surface to be treated, means for simultaneously feeding the work also in the plane of its surface so that successive portions of the surface will be treated and means for varying the amplitude of the oscillation of the work-holder.

5. Apparatus for grinding or polishing the surface of a work-piece comprising a work-holder, a grinding or polishing element fixed in space in relation to said work-holder, mechanical means for moving the work-holder past the grinding element in the plane of the surface to be treated, means for automatically and simultaneously feeding the work also in the plane of its surface so that successive portions of the surface will be uniformly treated and means whereby the work may be fed by hand in addition to the mechanical feed.

6. Apparatus for grinding or polishing the surface of a work-piece comprising a

work-holder, a grinding or polishing element fixed in space in relation to said work-holder, mechanical means for moving the work-holder past the grinding element in the plane of the surface to be treated, means for simultaneously feeding the work also in the plane of its surface so that successive portions of the surface will be treated and a resilient means supporting said work-holder.

7. Apparatus for grinding and polishing the surface of a work-piece comprising a work-holder, a grinding or polishing element fixed in space in relation to said work-holder, mechanical means for moving the work-holder past the grinding element in the plane of the surface to be treated, means for simultaneously feeding the work also in the plane of its surface so that successive portions of the surface will be treated and a resilient support for said work-holder and means for varying the resistance to movement of the resilient support away from the grinding element.

8. Apparatus for grinding or polishing the surface of a work-piece comprising a grinding or polishing element, a work-holder in operative relation thereto, a table supporting said work-holder and pivoted near one end, means for oscillating said table about its pivot and in the plane of its surface and automatic means for feeding the work in relation to the grinding element in the plane of the surface of the work.

9. Apparatus for grinding or polishing the surface of a work-piece comprising a grinding or polishing element, a work-holder in operative relation thereto, a table supporting said work-holder and pivoted near one end, means for oscillating said table about its pivot and in the plane of its surface and means operable in synchronism with the oscillation of the table for feeding the work in relation to the grinding element in the plane of the surface of the work.

10. Apparatus for grinding or polishing the surface of a work-piece comprising a grinding or polishing element, a work-holder in operative relation thereto, a table supporting said work-holder and pivoted near one end, a slider crank mechanism for oscillating said table about its pivot and in the plane of its surface and means for feeding the work in relation to the grinding element in the plane of the surface of the work.

11. Apparatus for grinding or polishing the surface of a work-piece comprising a grinding or polishing element, a work-holder in operative relation thereto, a table supporting said work-holder and pivoted near one end, means for oscillating said table about its pivot and in the plane of its surface, means for feeding the work in relation to the grinding element in the plane

of the surface of the work and means for resiliently supporting that end of the table remote from the pivot.

12. Apparatus for grinding or polishing the surface of a work-piece comprising a grinding or polishing element, a work-holder in operative relation thereto, a table supporting said work-holder and pivoted near one end, means for oscillating said table about its pivot and in the plane of its surface, and means for feeding the work-holder along the table in synchronism with the oscillation of the table.

13. Apparatus for grinding or polishing the surface of a work-piece comprising a grinding or polishing element, a work-holder in operative relation thereto, a table supporting said work-holder and pivoted near one end thereof, means for oscillating said table about its pivot and in the plane of its surface, a rack on said work-holder, a pinion engaging said rack, and means actuated by the oscillation of the table for rotating said pinion.

14. Apparatus for grinding or polishing the surface of a work-piece comprising a grinding or polishing element, a work-holder in operative relation thereto, a table supporting said work-holder and pivoted near one end, means for oscillating said table about its pivot, a rack upon said work-holder, a pinion engaging said rack, a jointed spindle carrying gear for driving said pinion, a bevel wheel concentric with the pivot of the table, bevel pinions upon said jointed shaft engaging said bevel wheel and ratchets whereby said bevel pinions may operate for each direction of oscillation to rotate the pinion for feeding the work-holder.

15. Apparatus for grinding or polishing the surface of a work-piece comprising a grinding or polishing element, a work-holder in operative relation thereto, a table supporting said work-holder and pivoted near one end, means for oscillating said

table about its pivot, a rack upon said work-holder, a pinion engaging said rack, a jointed spindle carrying gear for driving said pinion, a bevel wheel concentric with the pivot of the table, bevel pinions upon said jointed shaft engaging said bevel wheel, ratchets whereby said bevel pinions may operate for each direction of oscillation to rotate the pinion for feeding the work-holder and change speed gear for varying the rate of movement of said work-holder.

16. Apparatus for grinding or polishing the surface of a work-piece comprising a grinding or polishing element, a work-holder in operative relation thereto, a table supporting said work-holder and pivoted near one end, means for oscillating said table about its pivot, a rack upon said work-holder, a pinion engaging said rack, a jointed spindle carrying gear for driving said pinion, a bevel wheel concentric with the pivot of the table, bevel pinions upon said jointed shaft engaging said bevel wheel, ratchets whereby said bevel pinions may operate for each direction of oscillation to rotate the pinion for feeding the work-holder and means for varying the slip between said bevel wheel and said bevel pinions for varying the rate of movement of the work-holder.

17. Apparatus for grinding or polishing the surface of a work-piece comprising a grinding or polishing element, a work-holder in operative relation thereto, a table supporting said work-holder and pivoted near one end, a slider crank mechanism for oscillating said table about its pivot, means for feeding the work in relation to the grinding or polishing element in the plane of the surface of the work, and a spring-controlled link for supporting the end of the table remote from the pivot about which the same oscillates.

In testimony whereof I have signed my name to this specification.

HENRY JAMES HUNT.