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GRINDING-MACHINE.

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To all whom it may concern:

Be it known that I, CHARLES G. SMALL, a citizen of the United States, residing at Hartford, in the county of Hartford and State of Connecticut, have invented certain new and useful Improvements in Grinding-Machines, of which the following is a specification.

This invention relates to grinding machines, the object of the invention being to provide an effective machine of this character which is adapted to rapidly grind surfaces of various kinds of work.

In the drawings accompanying and forming part of the present specification I have represented in detail one convenient form of embodiment of the invention which to enable those skilled in the art to practice the same will be set forth fully in the following description, while the novelty of the invention will be included in the claims succeeding said description. From such observations it will be apparent that I do not restrict myself to the showing made by said drawings and description; I may depart therefrom in several respects within the scope of my invention included in said claims.

The machine in the organization illustrated comprises broadly an oscillatory or swinging member carrying a rotary grinding tool. As shown the axis of rotation of the tool is in parallelism with the axis of motion of said oscillatory or swinging member while the plane of the working face of said grinding tool, which is preferably in the form of a surface-grinding wheel, is transverse to the axis of rotation of said tool or wheel, by virtue of which the tool on each stroke of the said swinging member can be made to sweep or cover a relatively large area.

The work is generally, but not necessarily, held stationary during the grinding operation, although I prefer to make provision for moving the work toward the active face of the grinding, abrading or reducing wheel as the grinding progresses, and I also prefer to provide means for feeding the work transversely of the arcuate path of the tool; this latter movement might be probably aptly considered as a cross feed. As a matter of

preference the grinding tool is immovable in the direction of its axis of rotation.

Referring to said drawings: Figure 1 is a side elevation of a machine involving my invention. Fig. 2 is a top plan view of the same. Fig. 3 is a detail view in front elevation of a means for adjusting the main support.

Like characters refer to like parts throughout the several figures of the drawings.

The different parts of the machine may be supported by any suitable framework, for example by the column 5. The machine preferably includes in its make-up an oscillatory tool-carrying member, and although the same may differ radically as to form and mounting, it is shown consisting of an arm 6 through a hub at the inner end of which the stud shaft 7 loosely extends. The oscillatory member or arm 6 swings about a vertical axis, but this is not essential. The fixed stud or pivot member 7 is, therefore, shown vertically disposed.

The arm 6 is shown provided at its outer end with companion hubs each denoted by 8 in which the spindle 9 is disposed, said spindle being represented as in parallelism or substantially so with the stud or pivot 7. To the lower end of the spindle 8 is fixed a grinding member as the wheel 10 the plane of the working or active face of which is preferably at right angles to the axis of rotation of said wheel.

I prefer to provide an auxiliary support for the tool carrying member 6, and this may differ as to character; it is shown, however, consisting of a substantially segmental flange 11, the curved part of which is concentric with the axis of motion of said swinging arm 6. The flange 11 is removed from, or is relatively remote to, the pivot or stud 7, being located in proximity to the outer end of said arm 6. The latter has a pendent portion 12 which slides on or traverses the flange or auxiliary support 11 during the back and forth motion of said arm. To the pendent member 12 I have shown connected the gib or plate 13. This provides an effective construction for preventing vertical vibration or chattering of the arm 6; in other words said arm is ade-

quately steadied and supported. In the present case I provide a main work support as 14 which may, as illustrated, consist of a knee mounted for movement on ways or guides 15 extending as shown vertically, although as will be understood from the statements already made, this is not essential. I prefer as intimated to provide for the movement of the work toward and from the tool 10, but it is not necessary, although preferable that such action be secured by the vertical movement of the work. The main support 14 carries an auxiliary support 15 which may as illustrated consist of a cross slide to which the work is directly rigidly connected by bolts or otherwise as common in grinding machines.

While any suitable means may be provided for operating the main support 14, that shown for such purpose will now be described, and is indicated fully in Fig. 3. Swiveled to a suitable bearing on the column 5 is a feed screw 16 which extends through a nut 17 rigidly connected with the main support or knee 14. Splined to the feed screw is a bevel gear 18 in mesh with a similar gear 19 rigidly connected with the inner end of a shaft 20 provided with a hand wheel 21, or its equivalent by turning which the main support 14 can be raised to move the work into the grinding zone or lowered if necessary, through the agency of the intermediate described parts. The cross slide 15 may be actuated by the usual nut and screw, the screw only being shown and being denoted by 22. By virtue of the latter adjustment I can grind a very wide area. That is to say, after the tool has swept over one part of the work I can operate the slide 15 so as to permit the tool on a second stroke to cover an entirely different part of the work and naturally thereby increase the efficiency of the machine. After one grinding step, as it might be considered has been effected, the main support 14 will be elevated to repeat the grinding operation.

Loose on the stud 7 above the oscillatory arm 6 is a sectional pulley 23 mounted between suitable bearings at the head of the column 5. Although the pulley 23 is carried by the shaft 7, this is not essential, although I do prefer that said pulley or its equivalent be coaxial with the swinging member 6. To the upper end of the spindle 9 I have shown rigidly connected the driven pulley 24 connected by a belt 25 with the lower section of the pulley 23 constituting a driver for said pulley 24. Around the upper section of said pulley 23 is passed the belt 26, the two runs of which are bent downward around the coaxial idlers 27 supported by a suitable bearing on the rear upper portion of the column and which belt may be operated by a driving pulley as 27' on the column 5.

From the foregoing explanation it will

be evident that my invention comprehends broadly the provision of a swinging or oscillatory member provided with a grinding tool, the axis of rotation of which latter is parallel to the axis of motion of said swinging or oscillatory member. Said swinging or oscillatory member may be operated in any suitable manner to cause the tool to sweep across the relatively fixed work. For this purpose I have shown the same equipped with a forwardly-extending handle 28 which may be grasped by an operator who can thus move said oscillatory or swinging member so as to carry the tool against the work which is for the time being stationary or at rest.

It is believed that the operation of the apparatus will be readily understood from the description already given, but nevertheless I deem it desirable to briefly set forth the same. Initially work will be clamped or otherwise attached to the supplemental support or cross slide 15 at which time the main support or knee 14 will be operated in the manner already described to bring the upper surface of the work into the grinding plane, the arm 6 at this time being in such position as to hold the tool 10 out of contact with the work, said arm being in one of the dotted line positions shown in Fig. 2. The wheel 10 will then be thrown into action if it be not in rotation by either shifting a belt or throwing a clutch after the usual fashion, to start the belt 26, which latter through the intermediate connections with the tool 10 will rotate the latter. The handle 28 will then be grasped and the arm 6 will be swung first in one direction and if necessary in the other to sweep the active face of the tool across the upper surface of the work. In some cases the necessary reduction can be made on a single stroke of the arm, that is from one dotted line position in Fig. 2 to the other, whereas it may be necessary to make two double strokes or a complete oscillation. As a matter of fact this action may have to be repeated. The arcuate dotted lines in Fig. 2 show the range of the tool and the area covered thereby. In case the work is very wide the cross slide 15 will be operated by the screw 22 to bring the different areas of the work under the action of the tool.

What I claim is:

1. In a grinding machine, an oscillatory member, a grinding tool carried by said oscillatory member and rotative about an axis parallel to the axis of motion of said oscillatory member, and an annular flange upon the framing of the machine to which said oscillatory member is gibbed for sliding movement.

2. In a grinding machine, an oscillatory member, a rotary, surface-grinding wheel supported by said oscillatory member, the

plane of the working face of said wheel being transverse to the axis of rotation of said wheel and said axis being in parallelism with the axis of motion of said oscillatory member, and means for positively preventing motion of said oscillatory member in the direction of said axes.

In testimony whereof I affix my signature in presence of two witnesses.

CHARLES G. SMALL.

Witnesses:

F. E. ANDERSON,
HEATH SUTHERLAND.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."
