

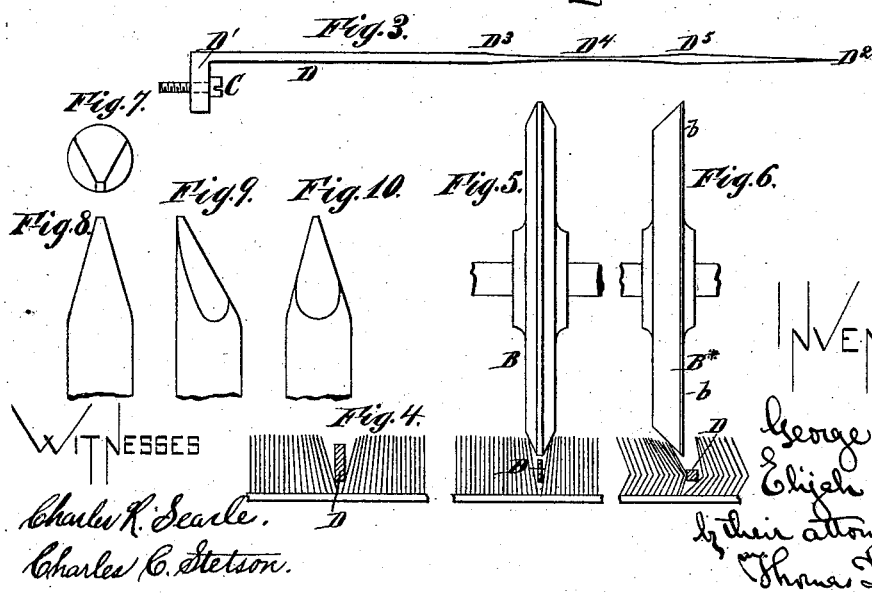
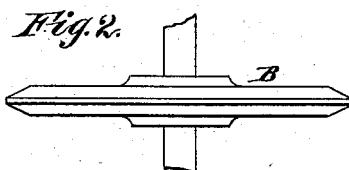
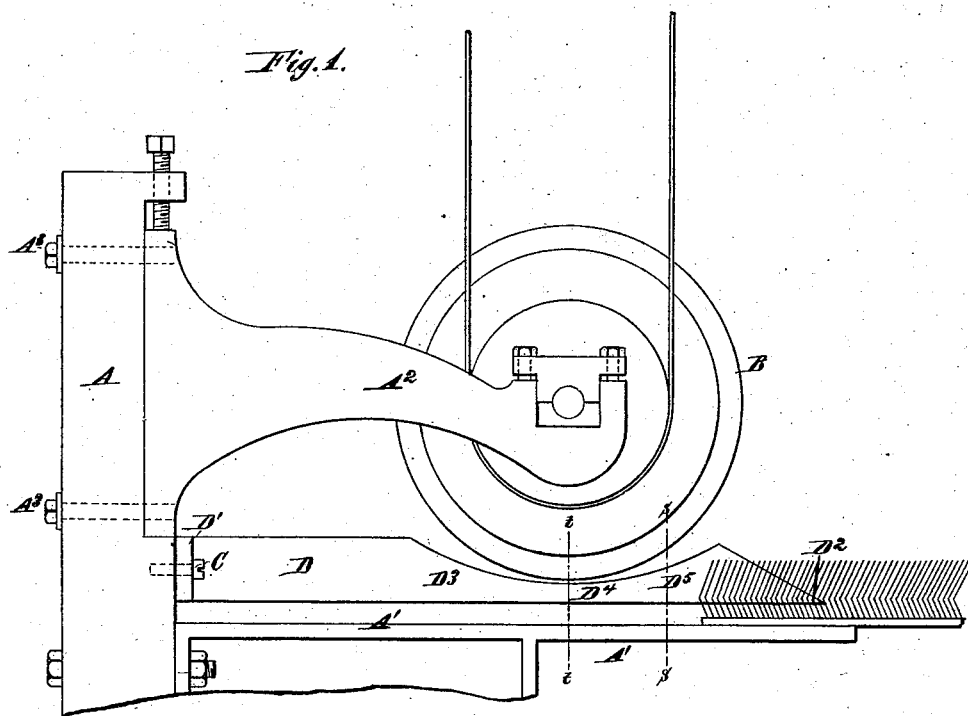
(No Model.)

G. & E. ASHWORTH.

METHOD OF AND APPARATUS FOR GRINDING THE TEETH OF CARDS.

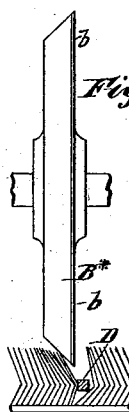
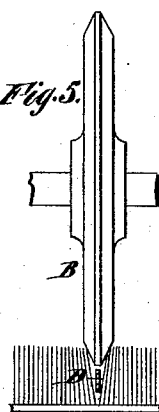
No. 261,650.

Patented July 25, 1882.



WITNESSES

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# UNITED STATES PATENT OFFICE.

GEORGE ASHWORTH AND ELIJAH ASHWORTH, OF MANCHESTER, COUNTY OF LANCASTER, ENGLAND.

## METHOD OF AND APPARATUS FOR GRINDING THE TEETH OF CARDS.

SPECIFICATION forming part of Letters Patent No. 261,650, dated July 25, 1882.

Application filed May 20, 1881. (No model.)

### *To all whom it may concern:*

Be it known that we, GEORGE ASHWORTH and ELIJAH ASHWORTH, of Manchester, Lancaster county, England, have invented certain new and useful Improvements relating to the Method of and Apparatus for Grinding the Teeth of Cards for Wool and other Fibrous Materials, of which the following is a specification.

The machinery by which we have in our experiments carried out the invention is of a very simple character, the motions being produced largely by hand. Power is applied only to the rotating of the grinding-wheel. By proper arrangements power may be applied to the several other motions; but we will describe the invention as having the other motions produced by hand.

The following is a description of what we consider the best means of carrying out the invention in a simple manner.

The accompanying drawings form a part of this specification.

Figure 1 is a side elevation, showing all the principal parts. Fig. 2 is a plan view of the grinding-wheel. Fig. 3 is a plan view of what we term the "plow." Fig. 4 is a vertical section through the plow and card-clothing on the line S S in Fig. 1. Fig. 5 is an edge view of the grinding-wheel, with a section through the plow and card-clothing on the line t t in Fig. 1. The above parts are as formed and worked for longitudinal grinding. Fig. 6 is a view corresponding to Fig. 5, with the proper parts adapted for transverse grinding. In this figure the card is sectioned longitudinally. Figs. 7 to 10 show the point of the tooth on a larger scale. Fig. 7 is an end view; Fig. 8, a front view; Fig. 9, a side view, and Fig. 10 a back view.

Similar letters of reference indicate corresponding parts in all the figures.

A is a rigid frame-work, certain parts of which will be designated by additional marks, as A' A<sup>2</sup>, &c.

A' is a plane surface or table smoothly finished, on which the card-clothing to be ground is laid on its back with the points upward, and moved in the required directions by hand or otherwise.

A<sup>2</sup> is a forked bracket carrying a grinding-

wheel, B, driven by a belt from a line-shaft. (Not represented.) The bracket is secured adjustably to the fixed framing A by bolts A<sup>3</sup>, which stand in long holes and allow the bracket with its grinding-wheel to be adjusted up and down to accommodate various sizes of grinding-wheels, or to allow for different lengths of the teeth of the card. The grinding-wheel is beveled at the edge. In the operation of grinding it cuts or grinds away the sides of the points of the teeth. The card-clothing is moved horizontally under the grinding-wheel as many times as there are lines of teeth in the respective directions. The teeth may be of the ordinary size and form except at the points—that is, they may be set and bent by the ordinary machinery for making and setting card-teeth. In the act of grinding the teeth are reduced to needle-points, or nearly so, but the needle-points are not in the center lines of the respective wires. The points are forward of the center line and quite at the front edge of the teeth. To attain this form, each tooth is beveled on each side and at the back, and the front side not being beveled at all, but left with the natural cylindrical surface of the wire. It will thus be seen that the tooth at and near the point is nearly square in cross-section. If it is tapered back to too great a distance, the reduction in the cross-section weakens the tooth too much. It is important that the tapering extend back to a proper extent, but not too far, and that it be very accurately and uniformly produced.

We propose to make the form of tooth herein described the subject of a separate application for patent.

It is especially important to the success of the operation that the grinding-wheel be prevented from touching the teeth before and after the proper period. We attain this and hold the teeth in the exactly right position by a very simple device. This is what we term a "plow," a dividing-plate, of steel or other suitable material, extending horizontally in the plane of the grinding-wheel and just out of contact below N.

Our plow is represented at D, certain portions being indicated by additional marks, D', &c.

D' is an elbow by which it is firmly secured

to the stationary framing A by a fastening-screw, C.

D<sup>2</sup> is a sharp point, which, being properly entered between two rows of teeth, feels its way, and serves as a guide to aid the attendant in traversing the card material past the wheel in the right direction, and in the exactly right position laterally.

Two forms of the grinding-wheel B are employed. The form of wheel which is employed for grinding longitudinally of the card-clothing is beveled on both sides. It grinds the right-hand side of one tooth and the left-hand side of the adjacent tooth at the same time; but the form of wheel which is employed in grinding across is beveled only on one side. It is beveled on the side which acts on the heel or back side of the tooth, and that part alone is prepared with emery or other abrasive surface to grind off and remove a portion of the material of the tooth. The other side of the grinding-wheel, employed in transverse grinding, is unbeveled, and is made as smooth as possible, so as to produce little effect on the front side of the succeeding teeth if it should by any chance rub against them.

We will first describe the longitudinal grinding.

The wheel B is an emery-wheel of the proper grade, and is manufactured with the double-beveled periphery, as shown. The width of the plow is not uniform. At D<sup>3</sup> and D<sup>4</sup> it has considerable width—say an eighth of an inch or more. These points hold the teeth widely apart. They stand respectively under the entering and emerging sides of the wheel. At an intermediate portion, D<sup>4</sup>, directly under the center of the wheel, the plow is narrow. At this point it does not hold the teeth apart to the same extent, but allows them to straighten up by their elasticity and to lie against the beveled cutting-surface of the wheel. As the card-clothing is traversed slowly along by the attendant the plow opens a path for it in advance. It first opens the path too wide, so that it begins to move under the wheel without being touched. As it approaches the position for the efficient action of the grinding-wheel the narrowing of the plow in the vicinity of D<sup>4</sup> allows the channel to narrow and the teeth on each side to be brought into contact with the wheel and be beveled off by the abrasive action thereof. As any point by the continuous motion of the card moves again onto the broad portion of D<sup>5</sup> the channel held open by the plow is again widened, and the teeth are held out of contact with the grinding-wheel until they pass beyond its influence.

The table A' should be large enough to allow the treatment of broad sheets of card-clothing for covering main cylinders. Taking a broad sheet of such material properly and uniformly set with the teeth unground, we move it across and back as many times as there are rows of teeth, grinding the bevels on each side of the path till the whole is completed.

Now for the transverse grinding.

We employ a different form of the grinding-wheel B and a different form of the plow D. The grinding-wheel is beveled only on one side. The plow is pointed, as before, and has the wide places D<sup>3</sup> D<sup>5</sup>, but need not be very narrow at the point D<sup>4</sup>. It is not intended in this operation to allow the fronts of the teeth to come in contact with the grinding-wheel at any stage. B\* represents the wheel. It is an emery-wheel beveled on one face. The other face is plain, and to guard against mischief in any possible case the plain surface is faced with a smooth sheet of metal, b, which is cemented to the emery and serves as a unit therewith. For this transverse grinding the plow is set sufficiently to one side of the wheel to present the teeth properly to the action of the grinding-wheel, as indicated in Fig. 6, so that the beveled surface of the emery shall remove the metal from the heel of the tooth, and no part of the wheel shall touch the points of the succeeding row. Thus conditioned, the sheet of card-clothing is moved slowly across and back as many times as there are rows of teeth in this direction.

To facilitate the grinding of card-clothing in the form of long and narrow fillets, the table is made clear at the front and back side, and the proper wheel and plow for longitudinal grinding being introduced, the fillet is started at the front end and fed continuously through to the other, allowing the fillet to accumulate in a pile on the floor or in a box as it is delivered. When the last end has been treated the attendant may seize it and pass it dexterously across, and, turning it over, may engage this end next to the proper position on the point of the plow, and feed the entire fillet through, thus presenting it in the reverse direction for the second line of grinding. The succeeding operation will again present what was originally the first end for grinding the third channel, and so on.

The transverse grinding for fillet may be performed very rapidly by a skilled attendant simply moving it rapidly across and back for one groove. Then, shifting it one-sixteenth of an inch, or whatever is required for one step, according to the coarseness of the card, he feeds it through again, and so on patiently till the whole is completed.

When our card-clothing is completed and is mounted in position for working, it is again ground slightly across the tops of the teeth to give a perfectly even length to all the teeth by the ordinary grinding mechanism worked in the ordinary manner; but the amount removed in this manner must not be sufficient to materially subtract from the needle-pointed condition of the tooth, as indicated in Figs. 7 to 10. In short, our invention allows the working-surfaces of the teeth to be finished in any ordinary or suitable manner. The fact that the points are reduced in no wise interferes with the proper finish and perfection of surface of the contracted area.

Although we have only shown one wheel,

B or B\*, and one plow, D, in each case, it will be readily understood that we may use two or more, placed side by side, with provisions for adjusting the width or distances apart to correspond with different widths of the rows of teeth. We can, for example, put the wheels B and plows D at the proper distance apart to act in every tenth space. Then, by repeating the operation, shifting the card-clothing one step to the right or to the left after each operation, ten operations will treat the whole. After the proper amount of material has been removed by the grinding we treat the material again by a similar machine carrying smooth cast-iron wheels with a proper bevel. The effect is to polish the surfaces.

Modifications may be made in many of the details.

The card-clothing may be firmly fastened by screw-clips or otherwise on a table and fed through the machine with the proper lateral motion after each stroke, the motions being induced either by hand or by machinery. In the treatment of fillets the card-clothing may be moved by feed-rollers.

A fillet may be passed through a number of machines in succession, the front end being entered in the second machine before the entire fillet has passed through the first.

Where a number of the beveled grinding-wheels are mounted on the same shaft there may be three or other desired number of the wheels mounted the proper distance apart, and each space in the card-clothing subjected to the action of each in succession. In such case the first may be coarse emery and the last fine. We esteem it highly expedient that the card-clothing be thus treated twice in each space either with the same or a different grinding-wheel, running the second time in a direction opposite to the first time. This treatment tends to reduce the liability to form slight burrs by the grinding.

We believe it practicable, in grinding longitudinally some kinds of card-clothing, to dispense with the plow and to cause the grind-

ing-wheel to act with approximate perfection along the channels between the several rows of teeth by simply providing a smooth flange projecting out from the periphery of the grinding-wheel; but we prefer the plow arranged as shown.

Parts of the invention may be used without the whole.

Instead of cast-iron wheels for the polishing, lead and various alloys may be employed; or we can use wheels of leather properly beveled.

We can, if preferred, set the grinding-wheels on axes or arbors which are inclined so as to grind at the proper bevel on the sides and backs of the teeth, near the points, without the necessity of beveling the wheels to the exact angle which is required if the shaft is parallel with the surface of the table A'.

It is obvious that by inclining the grinding-disk we may succeed with the employment of grinding-wheels which have little or no bevel; but we prefer the beveled wheels shown.

We claim as our invention—

1. The method of grinding the teeth of card-clothing herein described, consisting of parting the teeth in straight lines and feeding the clothing with the line thus opened to a revolving grinding-wheel, substantially as set forth.

2. In a machine for treating card-teeth, the plow D, mounted below the wheel B, in combination with said wheel, substantially as set forth.

3. In a machine for grinding card-clothing, the combination, with the grinding-wheel B, of a plow, D, having the point D<sup>2</sup>, wide breadths D<sup>3</sup> D<sup>5</sup>, and a narrow breadth at the part D<sup>4</sup>, arranged as shown relatively to the grinding-wheel B and to a table, A', for supporting and guiding the card-clothing, as herein specified.

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