3 Sheets--Sheet 1.

M. G. WILDER, W. H. McNEIL & H. C. TYLER.

Boring-Machine.

No. 168,862. Patented Oct. 19, 1875.

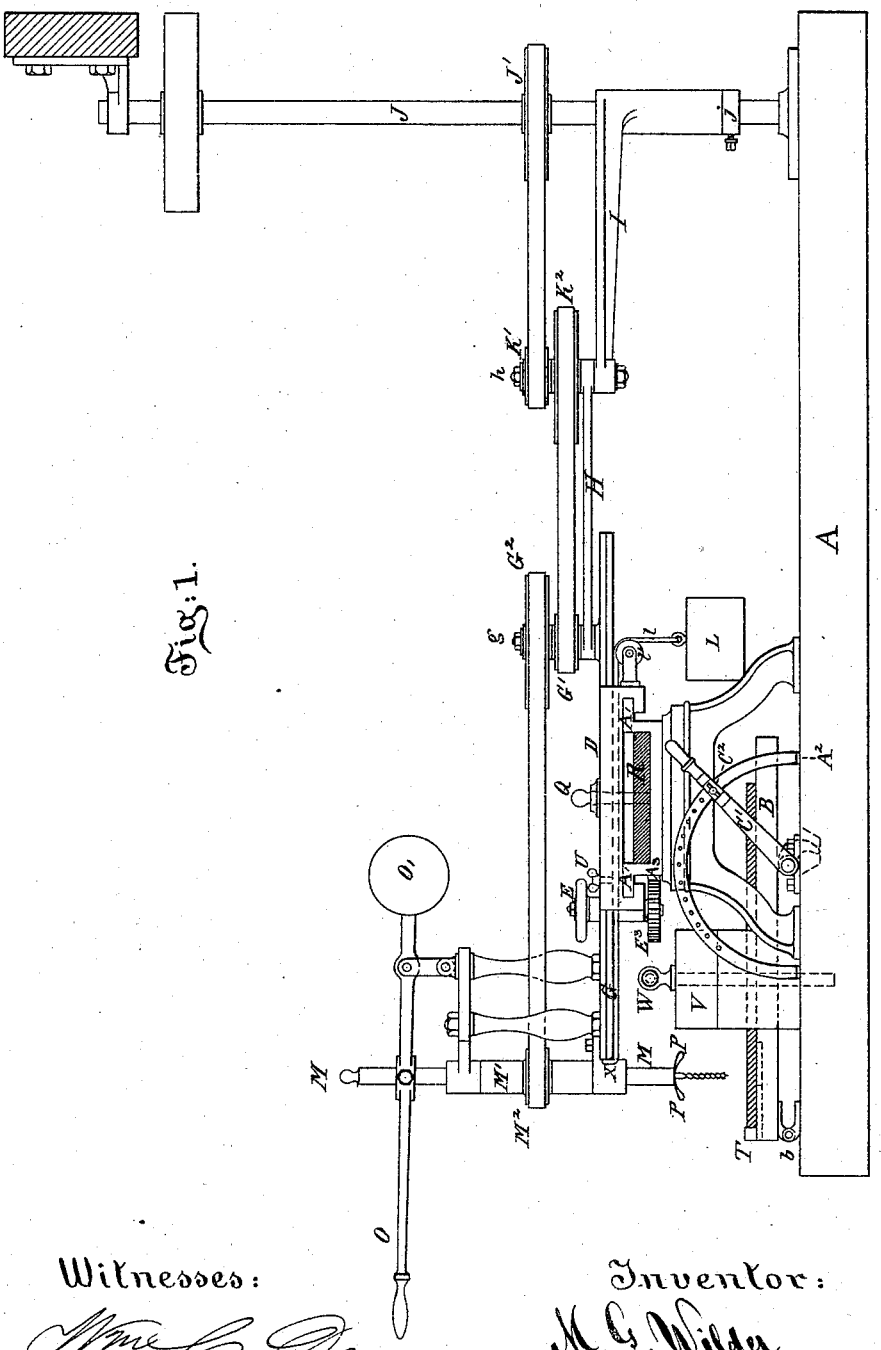

Fig. 1.

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Fig. 2.

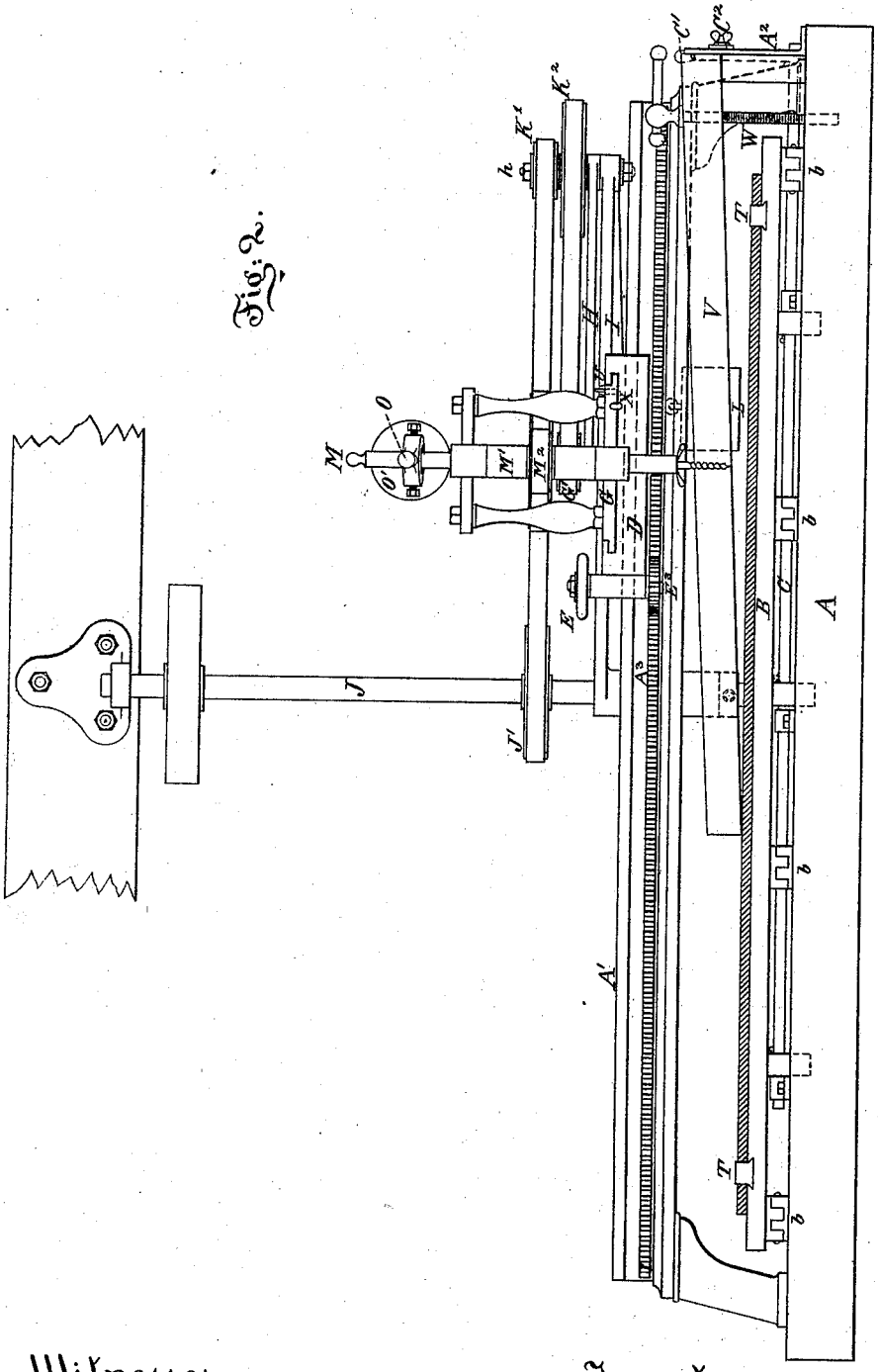

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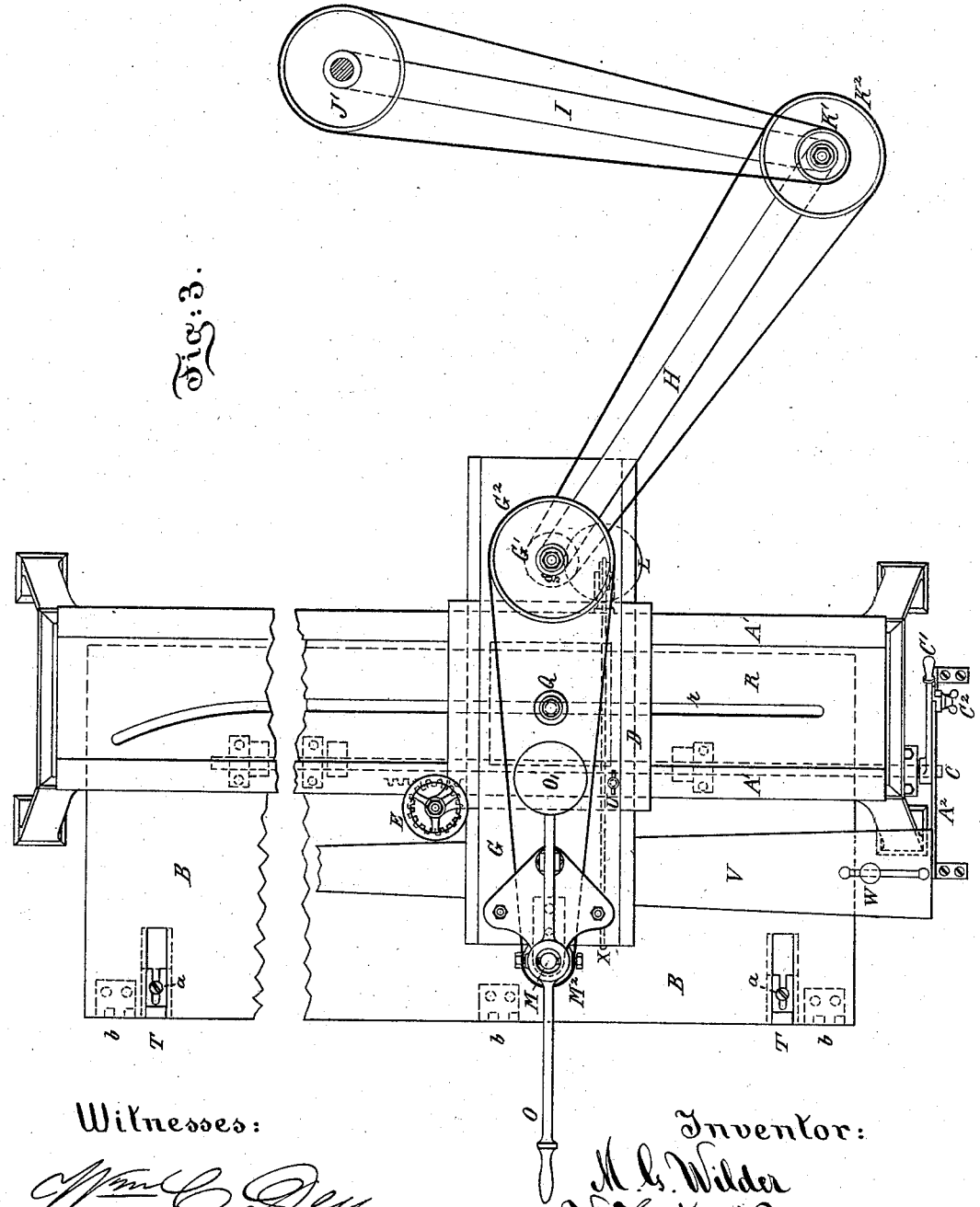
Fig. 3.



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UNITED STATES PATENT OFFICE.

MOSES G. WILDER, OF MERIDEN, CONNECTICUT, WILLIAM H. McNEIL, OF LANCASTER, MASSACHUSETTS, AND HENRY C. TYLER, OF DEEP RIVER, ASSIGNORS TO PRATT, READ & CO., OF DEEP RIVER, CONNECTICUT.

IMPROVEMENT IN BORING-MACHINES.

Specification forming part of Letters Patent No. **168,862**, dated October 19, 1875; application filed April 5, 1875.

To all whom it may concern:

Be it known that we, MOSES G. WILDER, of Meriden, New Haven county, in the State of Connecticut, WILLIAM H. McNEIL, of Lancaster, Worcester county, in the State of Massachusetts, and HENRY C. TYLER, of Deep River, in the town of Saybrook, Middlesex county, in the State of Connecticut, have invented certain Improvements in Boring-Machines, of which the following is a specification:

The improved machine is intended for boring the key-boards and key-board frames of piano-fortes and analogous keyed instruments. In these there is required a series of holes in a peculiarly-curved line, which line varies in different kinds and makes of pianos. There is also required a straight line of holes.

It may be important to briefly explain the general manufacture of key-boards and pianos by saying that unusual care is required to secure not only a uniform appearance in the keys, but also great uniformity in the material, and in the balance of the closely-lying and delicately-fitted keys. The manufacture of keys is in some cases conducted as a business by itself, one factory furnishing the sets of keys and the frames on which they are mounted for a large number of manufacturers of pianos.

The wood for an entire set of keys is got out and glued together in a continuous broad piece. The keys are made side by side in a nearly complete condition and then smoothly separated by means of saws, and other fine dividing instruments.

The thickness of a thin saw-kerf is the proper distance apart to mount the keys in a piano. While the keys are in the form of a continuous board the holes for the fulcrum-pins are sunk through the key-board and into the key-frame. The pins being afterward set in the holes in the key-frame, the keys are mounted thereon with absolute exactness. The position of the fulcrum-pins for the several keys varies.

Our invention provides for conveniently determining their position and rapidly producing them with a necessity for little labor or skill. The power is conveyed to the boring-arbor in all the positions required; the key-board and key-frame are firmly clamped without interfering with the line of holes; the positions of the holes may be varied with facility; the inclination of the table, and consequently of the holes, is varied at will; all lost motion resulting from imperfect workmanship or wear may be taken up; the position of the front edge of the board is determined promptly and exactly, with power to change at will; and the chips or borings are instantly removed without cumbrous mechanism.

The following is a description of what we consider the best means of carrying out the invention. The accompanying drawings form a part of this specification.

Figure 1 is a side elevation of the machine, with a key-board and key-frame in place. The latter parts, and also a removable part, which is ordinarily of wood, are sectioned, to more readily distinguish them from the metal. Fig. 2 is a front elevation, and Fig. 3 is a plan view.

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

A is the fixed table, supported at a convenient height on legs not represented. Certain portions of the fixed framing will be marked A^1, A^2, &c. B is an adjustable table, connected to A by hinges *b* at the front, and supported near the rear edge by cams on a shaft, C, which is adjustable in position by means of a handle or lever, C^1, and a pinching-screw, C^2, which engages with a curved piece, A^2. By slackening the screw C^2, and changing the position of the lever C^1, and again tightening the screw C^2, the adjustable table B *b* will be changed in its inclination by reason of its back edge being supported on the cams at a higher or lower level. Thus the holes being always bored vertically, their inclination relatively to the key-board will be changed as required. A^1 A^1 are straight guides supported rigidly at a suitable elevation above the fixed table A. D is a carriage fitted upon and embracing these guides, so that it is steadily guided thereby. The only motion of which

it is capable is a direct traverse longitudinally of the table. E is a hand-wheel fixed on a short upright shaft supported in the carriage D, and carrying at its lower extremity a gear-wheel E^3, which meshes into a rack, A^3. By turning the hand-wheel E the gear-wheel E^3 causes the carriage D and its connections to traverse in one direction or the other, as required.

G is a transversely-sliding carriage, mounted in guides in the carriage D. It partakes necessarily of the motion of the carriage D, and is capable of a further motion at right angles thereto—that is to say, toward or from the front of the machine. This carriage G performs important functions. A smoothly-polished post *g* is planted on the back end of the slide G. From this post a radius-bar, H, extends backward to a post, *h*, on another radius-bar, I, which is supported by a collar, *j*, on an upright shaft, J, and turns thereon as a center.

As the carriage G is moved to the right or left, or forward or back, the radius-bars H and I change their positions to accommodate it.

The shaft J carries a pulley, J′, from which a belt communicates motion to a small pulley, K^1. This is fixed on a sleeve, which turns on a swinging post or pin, *h*, and carries a larger pulley, K^2. This latter is belted to a small pulley, G^1, which is keyed on the sleeve which turns on the post *g*. Thus the shaft J, being driven by a steam-engine or other power, (not represented,) imparts a powerful rapid rotary motion to the pulley G^1 in all positions of the carriages D and G.

M is a boring-spindle, firmly supported in widely-separated bearings in the front of the carriage G. It carries a boring-bit of any desired size or character at its lower end, and is raised and lowered by the hand-lever O, which communicates with it by means of a suitable collar and trunnions, as will be readily understood. The weight of the lever O and boring-arbor is balanced by a weight, O′. A continuous rapid rotatory motion is communicated to the boring-arbor M, in all positions, by means of a belt running from a large pulley, G^2, to a small pulley, M^2, on a sleeve, M^1, which is feathered to the boring-arbor M.

P P are screw-wings, formed on a piece of thin metal secured to the arbor M, in the immediate vicinity of the boring-bit. Its rapid rotation generates, by its direct action on the air, a sufficient current to blow away the borings. A trough of rectangular section is formed between the guides A′ A′, adapted to receive a thick board, or a corresponding piece of metal, R. A peculiarly-curved groove is formed in its upper surface, which may, if preferred, be sunk quite through it, so as to form a slot, as indicated by *r*. This groove or slot *r* receives a pin, Q, which is fixed in the carriage G, and may be removed at pleasure.

It will be understood that a sufficient aperture is provided in the carriage D to allow the pin Q to traverse backward and forward to a proper extent.

A key-frame, with a key-board properly applied thereon, is placed on the adjustable table B, and held in the proper position thereon. I have devised, as a means for clamping, a long arm, V, with a stout screw-fastening, W, on the fixed framing A. A suitable block of metal or wood being placed under the opposite end, the long arm of this clamp is made to bear with sufficient firmness on the key-board near the center, and thus clamps the parts firmly in position, without interfering with the boring of the two lines of holes.

The front edge of the key-board and key-frame should be pressed against adjustable gages T, which are held by screws *a*, applied through slots therein. By slackening these screws *a*, the gages may be set forward or back, as required, to bring the line of holes in the proper position for any given style of key-board.

Having clamped the work, and introduced the proper grooved board R, and inserted the pin Q, the attendant grasps the hand-wheel E with his left hand, and the handle of the lever O with his right hand, it being understood that the lines by which the several keys are to be ultimately sawed out have been plainly traced upon the upper surface of the key-board by means of the templets, or otherwise. The attendant turns the hand-wheel E until the boring-bit has traversed to a position approximating the center of one of the keys, and then depresses the handle O until its descent is arrested by a stop. He then raises the handle and turns the wheel E until it has brought the bit over a point approximating to the center of the next key, and depresses again, and so on. The pin Q, during these movements, traverses along the groove *r*, and causes the slide G, and consequently the boring-arbor M, to move backward or forward to just the right extent, so that the holes are placed in exactly the proper curve to correspond with the scale of the piano.

The boring-bit is made to bore a small hole quite through the key, and into the key-frame below, while a larger hole is sunk in the key to only the proper extent. Thus the position of each hole laterally is not of extreme importance, because if some or all the holes are placed a little to one side or the other of the exact centers of the keys, the holes in the key-board being correspondingly placed, no mischief results; but it is important that the length of the respective arms of the keys, or, in other words, that the curvature of the line of holes, be correct. This is determined by the traverse of the guide-pin Q in the slot or groove *r*, except in case where, from imperfection of workmanship or wear, a looseness or lost motion is allowed. I avoid this by employing a weight, L, connected, by means of a flexible cord or strap, *l*, to a hooked wire, X. The wire X may be turned so that its hook shall engage with the guide-pin Q or some connected part, in which

case the gravity of the weight depending over a pulley, l', at the front edge holds the guide-pin Q firmly against the front side of the groove r. When the machine is adjusted by hand, without any guide-board R r, or when, for any other reason, it is desired to relieve the guide-pin Q and its connections from the pull of the weight, the hooked wire X is disengaged, and, the hook being reversed in position, may be turned over, so as to be of no effect.

Some of the advantages due to certain features of the invention may be realized without the others. Thus, for example, the means for taking up lost motion may be dispensed with; and, in case the groove r matches very closely to the pin Q, the position of every hole will be sufficiently correct for all practical purposes. I have, in some cases, operated in making a line of holes by marking their position with a templet, and, dispensing with the special grooved board R r, pushed the carriage G backward, and drew it forward by hand to bring it into the right position for each hole. This mode of working involves more labor and a risk of greater inaccuracy, but it may be used for the manufacture of a single key-board, or for a small number of any pattern for which no guide R r has been prepared. U is a pinching-screw, tapped through the carriage G, and adapted to unite this carriage firmly to the longitudinally-traversing carriage D when it is desired to bore the straight line of holes along the front of the key-board. To operate this, the key-board being turned with its under face upward, and properly gaged and clamped, and the proper boring-bit being set, the pin Q is withdrawn from the guide-groove r, the carriage G is moved forward on the carriage D to exactly the right position, and is there firmly set by turning the set-screw before described, marked U. Thus adjusted, the hand-wheel E is turned, and the lever O depressed, as before.

We claim as our invention—

1. The carriages D G, capable of lateral and longitudinal movement, boring-arbor M, supporting means O′, depressing means O, sleeve M′, and train of belt and pulley gearing, for communicating power thereto in all positions, combined and arranged for joint operation, substantially as and for the purposes herein set forth.

2. The guide-pin Q and guide-groove r, in combination with the carriages D G, boring-arbor M, weight O′, lever O, sleeve M^1, and means for communicating power thereto in all positions, combined and arranged for joint operation, as and for the purposes herein set forth.

3. In combination with the carriages D G, capable of moving upon each other, as shown, the boring mechanism M^1 M^2 P, the adjustment O O′ therefor, and the pulley G^2, the confining device U, adapted for fixing the carriages D and G rigidly together for the boring of the line of straight holes, as specified.

4. The hinged tilting table B b, and adjusting-lever and cam-shaft C C′, in combination with the boring-arbor M and means for operating it in its several required positions, as herein specified.

5. The bar V and screw W, in combination with the tilting table B, and boring-tool M, as herein specified.

6. The weight L and connected hook-wire X, in combination with the carriages D G, guide-pin Q, and guiding groove or slot r, as and for the purposes herein specified.

In testimony whereof we have hereunto set our hands this 26th day of December, 1874, in the presence of two subscribing witnesses.

MOSES G. WILDER.
WM. H. McNEIL.
HENRY C. TYLER.

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