A. Davis.

Dovetailing Mach.

No. 1297

Patented Aug. 21. 1839.

Fig. 3.

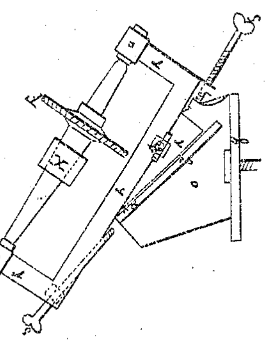


Fig. 4

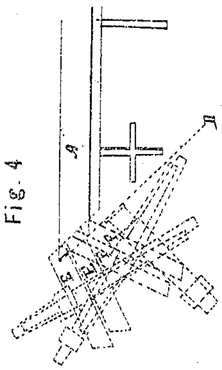


Fig. 5

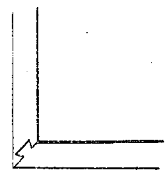


Fig. 1.

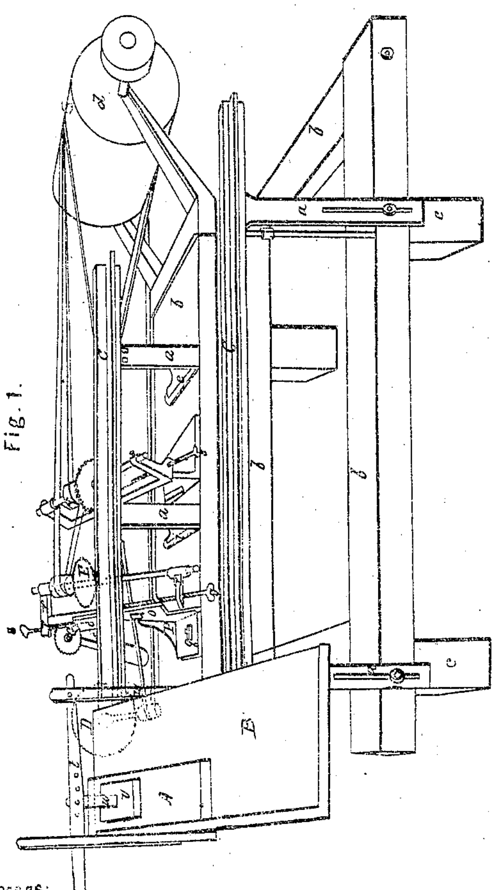
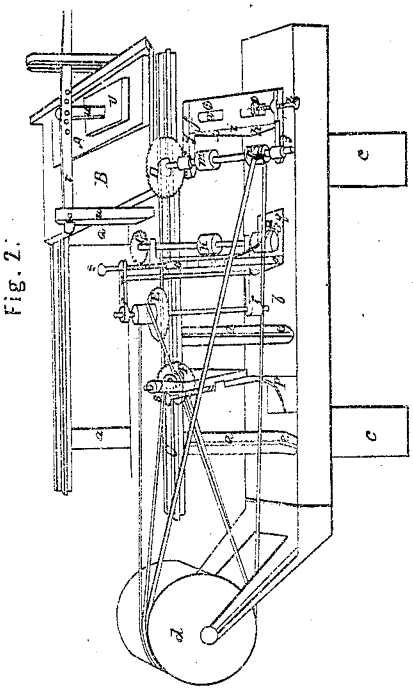


Fig. 2.



Witnesses:

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UNITED STATES PATENT OFFICE.

ARI DAVIS, OF BOSTON, MASSACHUSETTS.

MACHINE FOR MITERING AND DOVETAILING THE ENDS OF BOARDS, &c.

Specification of Letters Patent No. 1,297, dated August 21, 1839.

To all whom it may concern:

Be it known that I, the undersigned, ARI DAVIS, formerly of Princeton, in the county of Worcester, in the State of Massachusetts, now of Boston, in the county of Suffolk, in said State, philosophical-instrument maker, have invented some new and useful Improvements in Machines for Mitering and Dovetailing the Ends of Boards, called "Dovetailing-Machines," of which the following is a full and exact description.

The said machine is supported by a strong wooden frame, marked in the annexed drawing *b*, *b*, *b*, *b*, standing upon short legs (*c*, *c*, *c*, *c*), the length of which frame in the machine from which the annexed drawing is taken being four and a half feet and its breadth two and a half, though the dimensions, as will be evident, may be varied. On and attached to the wooden frame first described are iron legs or supports (*a a a a*) for supporting two cast iron ways (C, C), of the same length as the wooden frame first described, on which ways a carriage (B) is slid or otherwise moved by hand backward and forward, being guided by grooves or other guides, on which carriage (being a platform) the board (A) on the end of which the tongue or groove for the dovetail is to be formed, is placed, being held down upon the carriage by a lever (*t*) working on a pivot at one end in a post (*u*) standing up from the posterior edge of the sliding carriage. Near the center of this lever is a swinging arm (*w*) suspended near the top by a pin in a mortise in the lever, which arm may be shifted to different places in the lever, so as to come nearly over the middle of the board to be mitered and grooved or tongued, and the board to be operated upon being laid upon the carriage, another small piece of board (*v*) is placed upon it, and the movable end of the lever being then lowered by the operator the lower end of the swinging arm rests upon the piece of board and the operator bearing down upon the movable end of the lever presses down the board to be tongued or grooved and moves the carriage along the ways and the saws and cutters being in motion the saw (D) makes the miter and the saw (G) and the cutters make the tongue or groove as the board passes along.

In one of the machines in operation a ratchet with a spring attached to it is attached to a standard on the side of the carriage where the operator stands and when the board is placed on the carriage the lever is brought near to this ratchet, and then the operator letting go the lever, the spring of the ratchet draws or presses its teeth down upon the catch upon the lever with a sufficient force to hold the board to be operated upon, so that the operator has merely to move the carriage along the ways, it not being necessary for him to bear down on the lever during the operation. This ratchet is represented in the annexed drawing, but the matchine has been often operated without it and it is not considered by the inventor to be an essential part of the machine.

The working parts of the machine consist of a circular saw (D) for mitering the board and the small saw (G) and two circular cutters (E and F) for cutting the tongue and the groove. The saw (G) between (D and E) acts with the cutter E and cuts the shoulder of one side of the tongue of the dovetail, but does not act in cutting the groove. The saw (G) cuts the shoulder of one side of the tongue and the cutter follows it and chips off the remaining wood of that side. The inventor considers this as an improvement in one respect, viz., in requiring less power, so more saws and cutters may be added in case of making a double dovetail, or one more irregular and complicated than that cut by the machines now in operation; but a plain tongue or groove of two sides and a base may be perfectly well cut and the end of the board mitered at the same operation by a mitering saw (D) and two cutters. From the description of the construction of the machines with two saws and two cutters, it will be apparent to a skilful mechanic how other saws and cutters are to be added and adjusted. The saw (D) cuts the end of the board in a miter form, and for this purpose the plane of the saw makes an angle of forty-five degrees with the horizon, and also with the upper and under surfaces of the boards, if it lie horizontally, as it usually does in the machine in operation, and as it ought to do in forming a dovetail of a miter joint at a right angle, as for instance the joints at the corners of a square box. But the machine may be adapted to a joint of a different angle, for which purpose the two standards (*a a*) of the rail (C) on the side of the ways opposite to the saws and cutters,

are attached to the outside of the wooden frame by a bolt, fixed in that frame and projecting through a slot or mortise in the standard and terminating with a screw, to which a nut is adapted. This mortise may be of any desired vertical length and accordingly the two standards and with them the rail they support, may be raised or lowered to the whole length of this mortise, so as to be on a level with the other rail, or higher or lower than that, and when in the right position, may be fixed and fastened in such position by the nut and screw. If the joint is to be at an obtuse angle, this rail, (it will be evident) must be raised higher than the other; if at a right angle, on a level with it, and if at an acute angle, it must be lower, supposing the mitering saw to stand, as already described, at an angle of forty-five degrees to the horizon.

It will be seen from the drawings that the saw (D) and cutters E and F are driven by bands passing over pulleys and around a drum (*d*). In the annexed drawing there is a pulley (*m*) on the shaft of the saw (D), which is for a band to pass over it and the pulley (H) to drive the saw (G). This saw G may also be driven by a band passing over the drum (*d*).

I now proceed to describe the saw D, and the cutters and their frames and the modes of adjusting them, and first the saw D for making the miter. This saw in the machines in operation is about seven inches in diameter, but its diameter may be greater or less, as will be evident, provided it be large enough to cut through the board. As the saw plate is at an angle of forty-five degrees with the horizon, its shaft will make the same angle with the horizon. Accordingly a triangular supporting standard (*a*, *h*, *i*) of strong plate of cast or wrought iron about five or six inches in breadth is placed on the frame of the machine on one side, so that one side (*a*) of this triangular fixture serves as a support to one of the ways (C). Another side (*h*) serves to attach it to the wooden frame (*b*, *b*, *b*, *b*,) and the other side *i* (the hypotenuse) serves as a support to the saw frame (*g*, *f*, *g*,), which is a flat piece of cast iron (*f*) with two projections (*g*, *g*) for the support of the saw shaft, the bearings of which are fixed at the bottom in a step, and at the upper end in a box. It is necessary to be able to bring the saw nearer to or farther from the ways (C). Supposing the two cutters E and F, to be in a fixed position, for instance, for cutting the tongue or groove, then the farther the saw (D) is moved up in the line of its shaft toward the rail (C) the shallower groove or tongue will be formed by the cutters, and on the contrary, the farther it is moved down from the rail (C) the deeper groove or more prominent tongue will be formed by the cutters. The screw (*k*) at the bottom of the saw-frame (*f*) works in a female screw in the saw-frame, and with the projection φ serves as a gage in adjusting the saw frame. In the machine in operation the saw-frame may be moved in the line of its shaft about two inches. To keep the saw frame in place, it has a slot or mortise near its center, through which projects a bolt fixed in the supporting fixture of the saw frame, and terminating with a screw and nut Figure 2. When the frame is put in its proper position, it is fastened by screwing down the nut upon its outside. It is evident that it may be shifted and readjusted at pleasure in different positions admitted of by the length of the mortise.

I next describe the supports and frames of the cutters F and F, and the modes of adjusting and operating the same, and it will be sufficient to describe the frame, supporting fixture and adjustment of one of the cutters, since the principles and modes of construction, support and adjustment are similar in respect to the two, and so would be in respect to others, if it were desirable to add more cutters in order to make a tongue or groove of a different form from those made by the machines in operation, or to make a double dovetail at the same joint. A description of the frame, support and adjustment of one cutter will enable a mechanic of ordinary skill to construct any number without the exercise of any invention for that purpose. The same two cutters cut both the tongue and the groove. Each cutter cuts one side of the groove and one side of the tongue. The two sides of the groove, and so of the tongue, being oblique to each other, it will be evident that if the two cutters be so placed as to cut a groove of two sides and base, as already described, and then the two cutters be slid on their shafts or with their shafts so as to pass by each other, still preserving the same angle of their two plates with each other the two cutters will in this case form a tongue, the sides of which will be at the same angle with each other as the two sides of the groove and it is also evident accordingly that if the two cutters be moved a proper distance, the two will cut a tongue that will precisely fit the groove before cut. Accordingly to cut a tongue and groove with the same cutters, it is only necessary to shift their position as above described. The cutter shafts and their bearings and the cutter frames are constructed, fitted and adjusted so as to admit of a variation of their position in respect to each other, to cut either the tongue or the groove as above described, and also so as to bring either or both nearer to, or remove them farther from the ways (C). The cutter shafts are stepped at each end by movable steps. In the ma-

chines in use the planes of the cutters, and consequently the sides of the groove and those of the tongue, are at an angle of about thirty-four degrees with each other.

It is obvious that cutters of different thicknesses will be required to dovetail stuff of different thicknesses and that the cutters must be beveled off to the angle at which they are placed with the saw D, and with the miter, that is, in the machines in use, an angle of about seventeen degrees.

The cutter F (Figs. 1 and 3) and its frame have a fixed support, consisting of a wide foot piece (q), by which it is attached to the wooden frame of the machine, a vertical piece (Q) to which the cutter frame is to be attached, and a brace (p), Fig. 2, to strengthen it, all one piece of cast-iron. In the foot piece (q), Fig. 3, is a slot or mortise some two inches in length crosswise of the frame of the machine, and wide enough to admit through it a strong bolt fixed in the frame beneath and having a nut and screw above to fasten down this fixture and hold it firmly in its position. As the cutter is by degrees worn away by use and setting, the teeth will (as is evident) be carried farther and farther from the ways (C, C) and so cut a shallower groove and less prominent tongue. In this case the nut of the fixture just described is unscrewed and the fixture itself (ceasing to be such for the moment) is moved up toward the ways and then, when in the right position, again fixed by screwing down the nut. This fixture is not moved except for the purpose just described. It will be evident that it may be easily moved more or less for this purpose. Upon the side of this fixture toward the drum (d) is a straight flanch, ledge or bearing (Fig. 3, a^2, b^2) on which the cutter frame is supported. The upper face of this flanch or bearing is at an angle of forty-five degrees to the horizon, and thus precisely parallel to the mitering saw, and accordingly to the miter of the board when shaped by that saw. The reason of making this flanch at this degree is that the cutter frame, resting upon it ought to be so constructed and adjusted as to admit of a variation of position higher or lower, so as to bring the cutter in the line on the miter across the end of the board, where it is intended it shall cut in forming the groove or the tongue, and the cutters must, as already stated, have their position shifted, being in one position in cutting the groove and in another in cutting the tongue, and yet in each position they ought still to keep the same distance from the plane of the miter. The cutter frame may accordingly be moved up and down on this bearing and yet preserve the same distance from that plane. The supporting fixtures of both cutter frames are constructed in a similar manner in the above respect. The supporting fixture projects up perpendicularly higher than this bearing. The bearing is distinctly presented in Fig. 3. But it will be apparent that the plate of the cutter will not be at right angles to the flanch or bearing just described, for in that case it would make a right angled groove and tongue, that is, a mortise and tenon and not a dovetail. Accordingly the shaft of the cutter must not be parallel to this flanch or bearing. In constructing the machines therefore it is determined beforehand what shall be the obliquity of the sides of the groove and tongue, that the shaft of the cutter and consequently the cutter itself may be in a position adapted to that particular obliquity. Accordingly the cutter frame (r, r, r, Fig. 3) has a triangular projection on the longer side opposite to the saw shaft, with a straight face and side adapted to the bearing already described, on the side of the supporting fixture (O), the triangular form being of such an angle (greater or less) as that when its face and side are applied to the bearing just described the plane of the cutter plate shall be at the proper angle to the plane of the miter. The planes of the two cutters (it is evident) will be oblique to and make an angle with each other, since the side of the groove and of the tongue cut by each cutter is to be oblique to that cut by the other.

A bolt is fixed in the supporting fixture of the cutter frame, projecting through a slot or mortise in the longer side of the frame near the triangular projection just described, where there is the strongest part of the frame, which projecting bolt terminates in a screw with a nut (H) by which the cutter frame may be fixed in its position when once placed.

The cutter frame admits of being moved up and down in order to put the cutter in its right position in respect to the miter, as already mentioned and when in the right position is fixed by the nut and screw H, Fig. 3. The screws (s, s, Fig. 3) on the cutter frame are adjusted so as to serve as guides or gages in shifting or adjusting the cutters to cut a tongue or a groove. This cutter is raised so that the lower screw bears in cutting a groove and lowered so that the upper screw bears in cutting a tongue. It is of course vice versa with the cutter E. The fixing screws can be loosened and the cutters shifted and readjusted in a very short time.

The dimensions of the machine (it will be evident) may be very much varied. In the machines in use, which are principally used for dovetailing boxes and cabinet work, the length of the ways is about four feet and a half, their breadth two and a half feet. The carriage is about fifteen inches wide, its length being of course of about the breadth

of the ways or longer. The shafts of the cutters are about fifteen inches in length, that of the saw D about ten inches, and that of the saw G about the same. The diameter of the saw D is about six or seven inches, that of G about three inches, that of the cutters about five inches. The thickness of the thickest cutter plate is about three-eighths of an inch, the other is a little less, the joint thickness of the two measured at the oblique angle of seventeen degrees must of course be at least equal to the breadth of the base of the groove to be cut.

Figs. 1, 2, in the annexed drawings are perspective views of the machine. Fig. 3, represents the cutter F, its frame and supporting fixture. Fig. 4, represents the position of the cutters in cutting a groove or tongue. E and F, in blue color, give their relative position in cutting a groove and in pink color their position in cuttng a tongue. D is the line of the plane of the mitering saw. Fig. 5, represents a section of the dovetail joint.

In the improved machine as above described the said DAVIS claims as his invention and the subject of a patent the following improvements to the original machine, for which a patent was issued to him on the sixth day of September, A. D. eighteen hundred and thirty-three, viz:

What I claim as my invention and desire to secure by Letters Patent, is—

The combination of the supports and frames of the cutters, constructed and operating as herein described for the purpose of adjusting and shifting the cutters to cut either a tongue or a groove as herein described, and also the mode of adjusting the saw for the purpose of mitering the board in combination with the method of cutting the tongue and groove as herein described.

Said DAVIS does not, however, claim the idea of shifting the cutters as herein described, as original but only the arrangement and adjustment of the shifting cutters combined with the mitering saw abovenamed.

In testimony whereof I, the said ARI DAVIS, have hereto subscribed my name in the presence of the witnesses whose names are hereto subscribed, on this thirtieth day of July, A. D. eighteen hundred and thirty-nine, at Boston.

ARI DAVIS.

Witnesses:
I. W. P. LEWIS,
JOSEPH WILLARD.