E. B. & A. B. WILDER.

DIE FOR CUTTING WOOD AND SIMILAR MATERIALS.

APPLICATION FILED NOV. 9, 1912.

1,082,986. Patented Dec. 30, 1913.

2 SHEETS—SHEET 1.

Fig. 1.

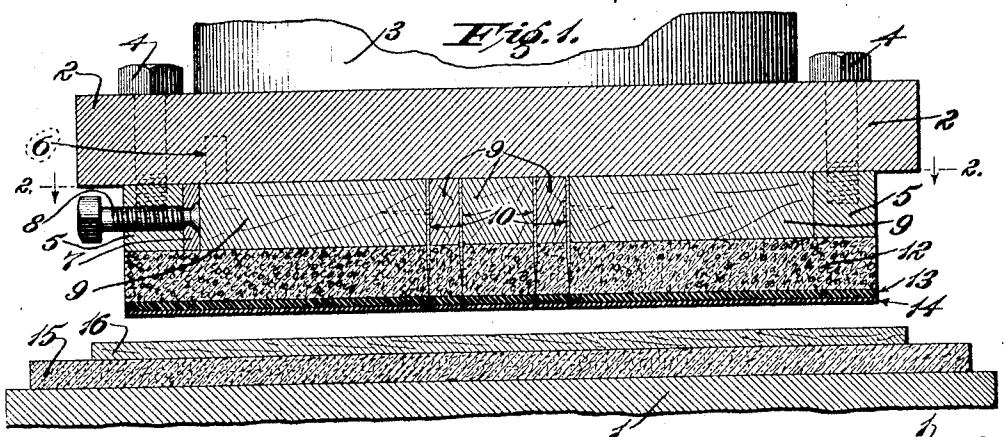
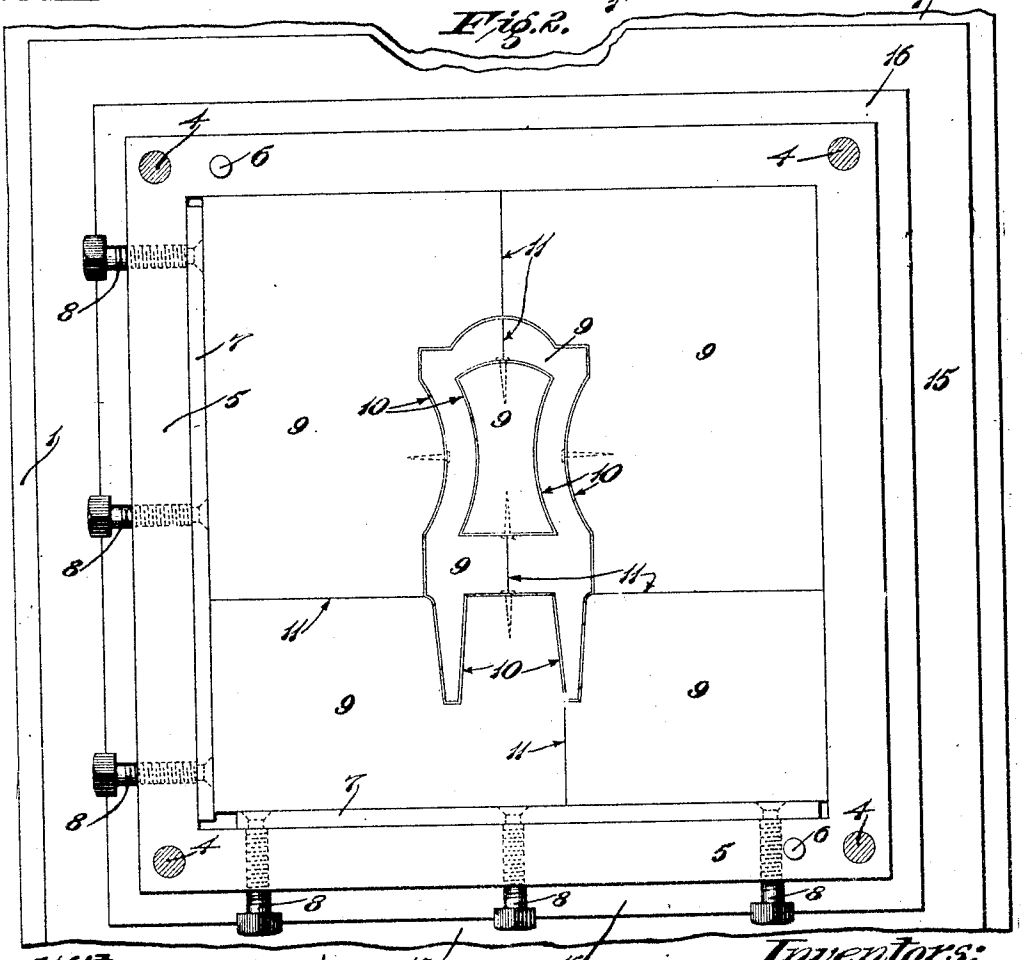


Fig. 2.



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2 SHEETS—SHEET 2.

Fig. 3.

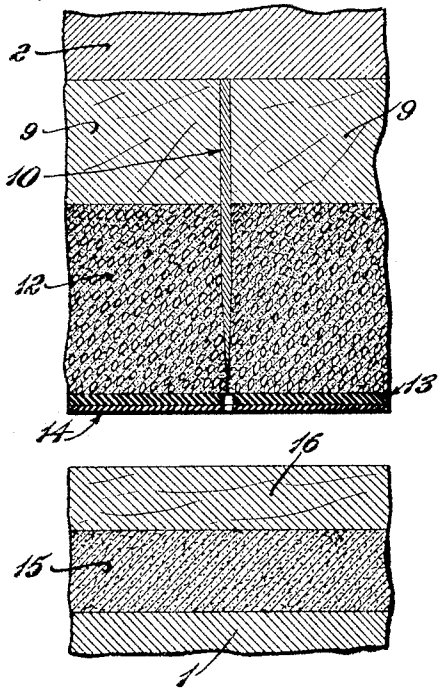


Fig. 4.

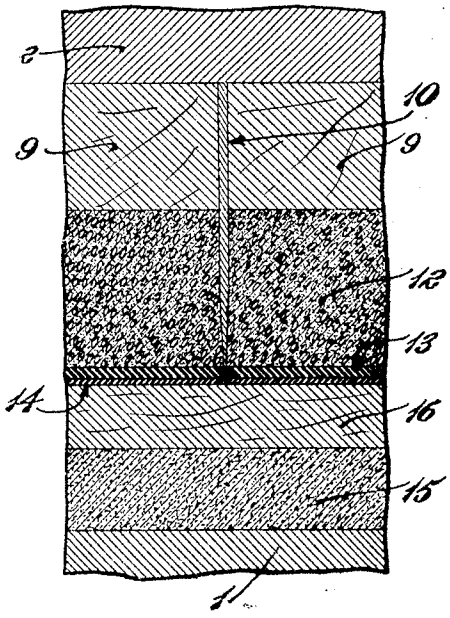


Fig. 5.

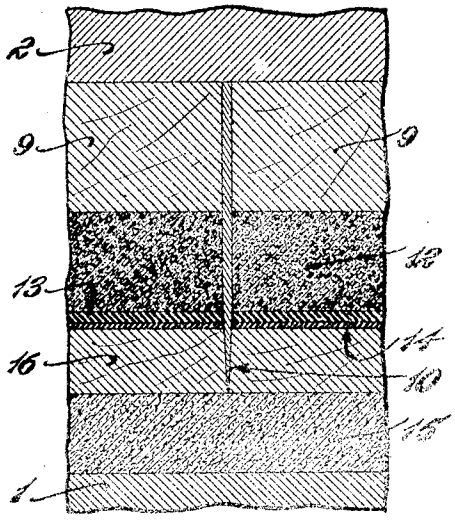
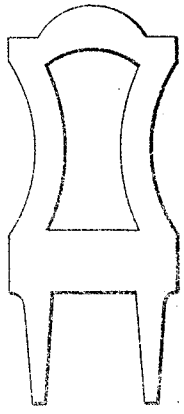


Fig. 6.



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UNITED STATES PATENT OFFICE.

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DIE FOR CUTTING WOOD AND SIMILAR MATERIALS.

1,082,986. Specification of Letters Patent. Patented Dec. 30, 1913.

Application filed November 9, 1912. Serial No. 730,340.

To all whom it may concern:

Be it known that we, EDWARD B. WILDER and ALLEN B. WILDER, citizens of the United States, and residents of the city of St. Louis and State of Missouri, have invented a new and useful Improvement in Dies for Cutting Wood and Similar Materials, of which the following is a specification.

This invention relates to die-cutting and more particularly to devices for cutting pieces or articles out of wooden boards or sheets of laminated wood, such as toys, furniture parts, scrolls and other pieces, and also for cutting relatively thick cardboard, pressed fiber, leather, rubber and the like.

Our die-cutting devices are also adapted to cutting composite patterns such as are used in inlay and similar work.

Attempts to cut wood or other compressible materials by the ordinary die-cutting or punching methods have resulted in splitting and splintering the wood, or crushing the material along the lines of cut, and if the material has any appreciable thickness the edges of the cut pieces are not clean cut and true. Other disadvantages and difficulties have arisen in such methods of die-cutting wood, cardboard, pressed fiber, leather and the like of substantial thickness. For instance, if a thin cutting blade is used, the blade buckles and twists and also sticks to the material being cut.

The principal objects of this invention are to minimize labor and cost; to avoid splitting and splintering the wood; to prevent injury to the surface of the wood; to avoid crushing the material along the lines of cut; to secure clean cut edges to the cut-out objects; to overcome other obvious disadvantages of the above mentioned methods; and to attain certain advantages which will hereinafter more fully appear.

The invention consists in the parts and in the arrangements and combinations of parts hereinafter described and claimed.

In the accompanying drawing which forms part of this specification and wherein like symbols refer to like parts wherever they occur, Figure 1 is a vertical section showing the bed and movable head of a press equipped with a cutting die illustrating an embodiment of the invention; Fig. 2 is a horizontal section on the line 2—2 of Fig. 1; Fig. 3 is a fragmentary view, on an enlarged scale, showing the parts in normal positions; Fig. 4 is a similar view showing the positions of the parts as the cutting blade is about to enter the material to be cut; Fig. 5 is a similar view after the cutting blade has passed all the way through the material; and Fig. 6 is a plan view of the cut out piece.

Referring to the drawings, particularly Figs. 1 and 2 thereof, there is shown a cutting-die and parts associated therewith for operation on a sheet of material arranged in a vertically moving plunger press. Above the bed 1, the press has a movable head or plate 2 which is mounted on a vertical reciprocatory plunger 3. The plunger may be operated by any suitable toggle or other obvious power mechanism (not shown), according to the type of press to be used.

Secured to the under side of the head 2 of the press, as by screws 4, is a chase or rectangular frame 5 adapted to receive and hold the die to be presently described. This frame or holder is provided with dowel pins 6 which enter holes provided therefor in the head 2 so as to position said holder properly to receive the securing screws 4. The holder is also provided with follower bars 7 which have the inner ends of screws 8 swiveled thereto so as to clamp the die in place.

The die comprises a block or backing 9 which may be of metal or wood, as desired. If the die block is made of wood, a continuous cut is made therein with a band saw or scroll saw, said cut being of the same contour as the article to be formed. A thin cutting blade or knife 10 is fitted around the cut and the cut out piece is placed back in the opening within the blade. The blade may be tacked at intervals to the block, but this is not absolutely necessary as the blade may be made to bear against the under side of the head 2; the tacks being used merely to hold the blade from pulling out of the block 9 while the cut material is being stripped therefrom and also to hold the blade in place on the block when the latter is detached from the chase or holder 5.

The cutting blade or knife 10 may be made to conform to any desirable contour, as for

example, the outline of a toy figure or image; or, as shown in the drawing, a back section for a toy chair. The arrangement shown in the drawing illustrates that a plurality of cutting blades may be arranged the one within the other, whereby the outer one is adapted to cut the outline or outer margin of the article and the other is adapted to cut openings in said article simultaneously.

The die block 9 is preferably made out of a single piece, the cut out portion thereof being replaced and mounted in its original position; or it may be divided into sections, as indicated by the lines of division 11 shown in the drawing, and held together by the clamping elements 7, 8.

Glued or otherwise secured to the under side of the die block 9 is a body or layer of resilient compressible material 12 such as sponge rubber, or like substance, having a multiplicity of air or gas-filled pockets or cells so that it may be compressed like a pneumatic pad when confined between walls. The surface area of the layer of material 12 may be such that its marginal portions underlie the chase or holder 5. In some cases, the under side of the die block is flush with the under side of the holder and in other cases it may not be so thick. However, the required surface area is governed principally by the surface area of the object to be cut out and also by the surface area of the material from which the object is cut, as will hereinafter more fully appear.

The normal thickness of the layer of cellular substance 12 depends principally upon the thickness of the material from which the object is to be cut. With a sponge rubber cushion, it has been found expedient to have the body of sponge rubber of a thickness approximately three times that of a wooden board or sheet to be cut. For example, if the wood is one-quarter of an inch thick, the sponge rubber should be about three-quarters of an inch thick.

When the piece to be cut out has a surface area of more than five inches by five inches, the size of the piece is of but little consequence as far as the allowable pressure per square inch upon the material to be cut is concerned. With a sponge rubber cushion of the relative thickness above stated, the sponge rubber may be compressed to one-fourth of its normal thickness. However, this pressure is excessive and is liable to injure the surface of the wood. Hence, it is not desirable to compress to within less than five-sixteenths of its normal thickness, and a safe maximum compression has been found to be not less than three-eighths, while a satisfactory usual compression is one-half.

To keep the wood from splitting it is desirable that there should ordinarily be a pressure of about sixteen pounds per square inch before the blade enters the wood. With an ordinary grade of sponge rubber if the wood to be cut is one-fourth of an inch thick and the sponge rubber is three-fourths of an inch thick, the rubber should be compressed about one-eighth of an inch before the blade begins to enter the wood. Therefore, in case such sponge rubber be used, the edge of the blade should be normally one-eighth of an inch inward from the bottom face of the layer of sponge rubber. The above example is only typical with reference to sponge rubber, and where other similar substances are substituted the proportions may be varied; and the variations in the relative proportions will depend somewhat on the material to be cut.

To preserve the surface finish of the material to be cut and to build up the pressure on intricate cuttings where there is a tendency for the material to bind on the blade when stripping, it is preferable, in some cases, to provide a layer 13 of some relatively hard and inelastic substance, such as hard rubber, celluloid, or pressed fiber, on the under side of the layer 12 of the sponge rubber or other cellular substance. In other cases, a thin layer 14 of sheet rubber may be placed on said layer 13. The hard layer 13 serves as a binder for the under side of the layer 12; and the outer layer 14 acts as a cushion upon the surface of and also serves to frictionally hold the material being cut and thereby prevents shifting while the cutting blade is entering the material. When these two layers 13, 14, are provided, the edge of the blade 10 will be located approximately one-eighth of an inch inward from the bottom face of the outer layer, so that the compressible layer 12 will have the initial compression of one-eighth of an ich, as above set forth.

The sponge rubber or other cellular substance not only serves to exert a pressure or clamping action on the material being cut, but also supports the blade laterally throughout its length and width. Hence a relatively deep or wide and very thin blade may be used. The sponge rubber further acts as a stripper to remove the material from the blade after the cut has been made.

It is desirable to create an equal support on both sides of the cutting blade so as to prevent it from buckling and twisting. This is accomplished satisfactorily when the blade is located so that there is a substantially equal mass of the sponge rubber or other cellular substance on either side thereof; but should the blade be located near to the margin of the body of sponge rubber or close to the side of the chase or holder, it will then be necessary to have the body of

sponge rubber extend under the chase, in which case the chase ought to be deeper than the thickness of the die-block and the rubber cut away or rabbeted so that normally the entire under face of the body of rubber is in the same plane. In this way, the reduced thickness of rubber under the chase is compressed to a greater density than the balance. Hence, the lateral support for the blade is equal on both sides. The quantity of the rubber removed is determined by the degree of compression to be given the main body of rubber, and, of course, the relative thickness of the die-block and depth of the chase or holder must correspond accordingly. So, too, in an intricate cutting where portions of the cut out piece are relatively narrow and necessitates locating two or more blades or rebent sides of a continuous blade close together, or where the different portions of the cut out object are of various proportions, a portion of the body of sponge rubber between the blades may be removed and a filler block or blocks of corresponding proportions placed on the under side of the die-block, so as to secure an equalized lateral support for the blades and also to insure the stripping of the cut out piece from between the blades.

A platen or backing 15 of hard rubber, celluloid, pressed fiber, or an equivalent substance that will not dull the cutting edge of the blade, is mounted on the bed 1 of the press to support the board or sheet of material 16 which is to be cut; and in some cases, the outline of the object to be cut out may be cut or grooved in the platen or backing 15 so as to make a clearance for the cutting edge of the blade.

Certain woods spread laterally under compression more than others and some have a certain resiliency which makes them have a greater binding effect on the cutting blade as it backs out of the work. However, this binding does not depend entirely upon the friction of the wood, but it is to be noted that the greater the cutting friction the more the wood binds. Therefore, it is obvious that well seasoned close grained wood is best adapted for treatment by the present process.

To get the best results the blade should have a long tapering cutting edge, and it should not pass into the wood beyond the termination of its bevel, for the reason that the wood wedges so tight that the blade would stick. So, too, clean cut edges are obtained by moving the blade relatively fast through the work; and in some cases the cutting edge of the blade may be scalloped, serrated, or otherwise irregularly shaped, as desirable.

By using the thin blades which the construction and arrangement of the device permits, pieces may be cut out for inlay work so as to fit with exact nicety. That is, a piece may be cut out of a board or sheet of material and a like piece cut out of another board or sheet with the same die, and the respective pieces will fit the opening in either of the boards or sheets.

What we claim is:

1. A die comprising a backing, a cutting blade, and a body of elastic material containing gas cells inclosing said cutting blade snugly on both sides thereof and extending beyond the cutting edge thereof, whereby said blade is supported by pneumatic pressure as set forth.

2. A die comprising a backing, a cutting blade, and a layer of sponge rubber on said backing inclosing said cutting blade snugly on both sides thereof, whereby said blade is supported as set forth.

3. A die comprising a backing, a cutting blade projecting therefrom, a body of resilient compressible material inclosing said cutting blade snugly on both sides thereof and extending beyond the cutting edge thereof, and means for unequally compressing said resilient material to create an equalized lateral support on both sides of said cutting blade.

4. In a device for cutting wood and similar materials, the combination with a support for the material to be cut, of a die comprising a cutting blade and a close fitting filling of a resilient compressible cellular substance for creating a pressure upon said material throughout the region of the cut and adapted to support the cutting blade laterally on both sides.

5. In a device for die-cutting wood and similar materials, a die comprising a backing having a body of resilient compressible cellular substance thereon, a layer of relatively inflexible substance secured to the outer face of said resilient substance, and a thin cutting blade embedded in said resilient substance with its cutting edge terminating inward from the outer face of said outer layer.

6. In a device for die-cutting wood and similar materials, a die comprising a backing having a body of resilient compressible cellular substance thereon, a layer of relatively hard and inelastic substance secured to the outer face of said resilient compressible substance, a relatively thin layer of elastic substance secured to the outer face of said layer of inelastic substance, and a cutting blade embedded in said resilient substance with its cutting edge terminating inward from the outer face of said outer layer.

7. A die for cutting pieces out of sheets of wood and similar materials, comprising a backing, a thin cutting blade projecting

therefrom, and a pneumatic pad on said backing snugly embedding said cutting blade, said die having means for equalizing the lateral pressure of said pneumatic pad on opposite sides of the blade for supporting the latter when said pad is compressed in contact with the material to be cut.

Signed at St. Louis, Missouri, this 1st day of November, 1912.

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