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PUNCHING MACHINE

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Fig. 1

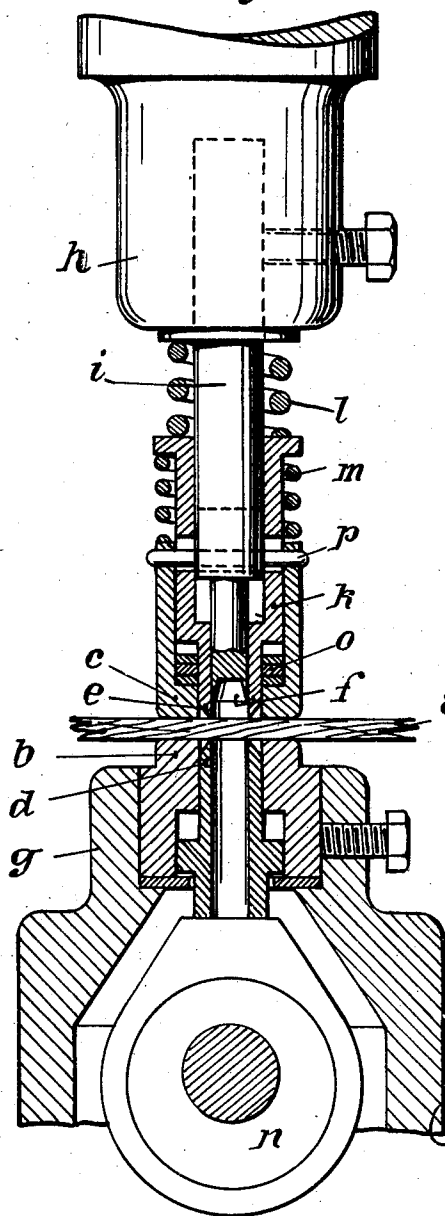
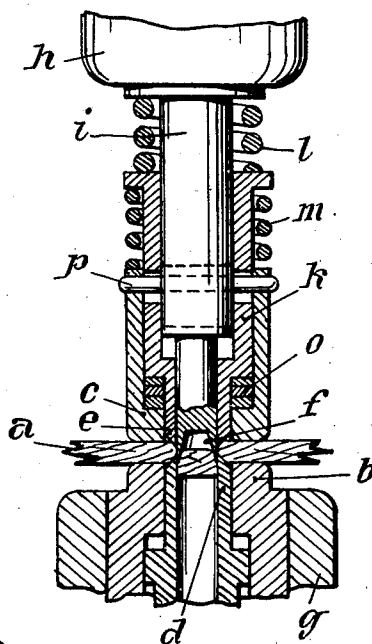


Fig. 2



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UNITED STATES PATENT OFFICE

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PUNCHING MACHINE

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My invention refers to the punching of holes and ornamental patterns in plates or slabs of wood, celluloid, or other perforatable material, and more especially to a machine adapted for the production of open-work ornamental and fancy articles, such as boxes, lids, and the like. It is an object of my invention to provide means whereby holes or other perforations can be produced with sharp clean edges in contradistinction to the perforating of wood and other fibrous materials as hitherto effected.

In consequence of the fibrous character and the flexibility of wood, the perforating of wooden plates or the like by acting thereon from one side results as a rule in the production of holes with unclean edges, and frequently a cracking of the wood will occur. On the other hand, if a wooden plate is acted upon from both sides by means of punch-like cutters meeting about in the middle of the plate, one of the cutters or punches being hollow and the diameter of the other being so chosen as to allow this cutter to enter the hollow one, the material acted upon as well as the punches are liable to suffer. For in view of the wedge-like action of the inner punch its cutting angle must be very small and in consequence thereof its cutting edge is too weak and, if acting on hard wood, will be forced outwards, whereby the top and bottom punches or cutters are caused to meet, so that their cutting edges are destroyed.

In the punching machine according to the present invention the punches can be made strong enough to exclude all danger of their being damaged during their operation and the several parts of the machine are arranged for cooperation in such wise that wooden or other plates or slabs of material thickness can be perforated easily and quickly, while both edges of the perforations are entirely smooth and clean.

To this end two substantially identical top and bottom punches are provided, these two punches cooperating in punching substantially one half of the thickness of the plate or slab, with their cutting edges meeting substantially in the middle. With these two punches acting as roughing punches is com-

bined a finishing punch exerting a shearing action on the piece of wood enclosed between the edges of the roughing punches, this finishing punch moving within one of the roughing punches and being merely required to completely sever the portion of the wood enclosed between the two roughing punches. In consequence of this combination of parts the punching angle of the two roughing punches can converge towards the centre and can be large enough to exclude any danger of the cutting edges being damaged in the operation of the machine. The inner finishing punch which exerts the shearing action is also secured against deformation, being surrounded on all sides by one of the roughing punches and having to do only light work.

In the drawings affixed to this specification and forming part thereof the essential parts of a punching machine are illustrated diagrammatically by way of example.

In the drawings

Fig. 1 is a side elevation, partly in axial section, of the clamping jaws, punches, and principal operating parts of the machine in the position which the parts assume before operation, while

Fig. 2 is a similar view of the jaws and punches in the position in which the roughing punches have acted on the wood and the finishing punch is about to sever the inner part of the work piece.

Referring to the drawings, *a* is the wooden plate to be operated upon, and *b* and *c* are clamping jaws serving for securing the work piece in position to be acted upon by the punches. The jaws are hollow and serve for guiding the roughing punches, *d* being the bottom punch and *e* the top punch. The bottom roughing punch *d* is acted upon by an eccentric *n*, while the top roughing punch *e*, which is guided in the top jaw *c* is depressed by the reciprocating die *h* carrying the finishing punch *f* and acting on a coil spring *l*, the bottom end of which rests on the top edge of the tubular extension *k* of the top roughing punch *e*, so that the top roughing punch *e* is forced into the wood under resilient pressure. The extension *k* also acts on the top jaw *c* by means of a coil spring *m* inserted

between them, so that this jaw is also pressed onto the work piece from above under resilient pressure.

The shaft *i* of the finishing punch *f* is slotted axially and embraces a pin *p* supported in the upper end of the top jaw *c*. Washers *o* exchangeably disposed in the hollow jaw *c* below the shoulder of the extension *k* of the top roughing punch *e* serve for varying the stroke of this punch in correspondence to the thickness of the wood to be acted upon.

This device operates as follows:—

The bottom jaw *b*, rigidly mounted in the chuck *g*, serves as work table upon which the work piece *a* is placed, when the bottom roughing punch *d* is in its lowermost position shown in Fig. 1. If the die *h* is now lowered it exerts pressure on the powerful spring *l* resting on the extension *k* of the top roughing punch *e*, whereby this latter is forced into the wood. At the same time the eccentric *n* forces the bottom roughing punch *d* into the wood from below. The spring *m*, being compressed between the extension *k* and the jaw *c*, holds this latter down upon the work piece, which is thus securely clamped between the jaws during the operation of the punches. On the die *h* descending further, the finishing punch *f*, in descending, acts on the punched-out portion of the wood by severing the thin ridge of wood which still connects the punched-out part with the remaining part of the work-piece, the punched-out part being forced into the tubular bottom punch *d*. The washers *o* limit this downward stroke of the finishing punch.

When the die *h* rises again, the pin *p* is carried along and serves for lifting the jaw *c* off the work piece.

I wish it to be understood that I do not desire to be limited to the exact details of construction shown and described for obvious modifications will occur to a person skilled in the art.

I claim:—

1. A punching machine comprising a pair of roughing punches, each having a cutting edge at one end, means for imparting motion to each of said punches whereby their cutting edges are moved toward each other, a finishing punch slidably mounted within one of said roughing punches, and means for imparting motion to said finishing punch.

2. A punching machine comprising a pair of tubular roughing punches, each having a cutting edge at one end, means for imparting motion to each of said punches whereby their cutting edges are moved toward each other, a finishing punch slidably mounted within one of said roughing punches, and means for imparting motion to said finishing punch.

3. A punching machine comprising a pair of roughing punches each having a cutting edge at one end, means for imparting motion

to each of said punches whereby their cutting edges are moved toward each other, one of said roughing punches being tubular, a finishing punch movable within said tubular punch, and means for imparting motion to said finishing punch.

4. A punching machine comprising dies for holding a blank, a roughing punch in each die, said punches having cutting edges at either end, means for imparting motion to said punches whereby their edges are moved toward each other, a finishing punch slidably mounted within one of said roughing punches, and means for imparting motion to said finishing punch.

5. A punching machine comprising a pair of roughing punches each having a cutting edge at one end, a finishing punch slidably mounted within one of said roughing punches, and means for first imparting motion to said roughing punches whereby their cutting edges are moved toward each other, and for thereupon operating said finishing punch.

6. A punching machine comprising a pair of roughing punches, each having a cutting edge at one end and one being hollow, a finishing punch slidably mounted within said hollow roughing punch, a die head, and means under the control of said die head for operating first said roughing punches and thereafter said finishing punch.

In testimony whereof I affix my signature.

REINHARD WILLY BECKERT.