July 2, 1935. J. FROMMHERZ 2,006,889

HAND PRESS

Filed Nov. 20, 1933 2 Sheets-Sheet 1

Fig.5

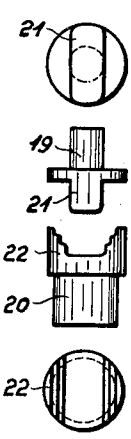


Fig.10

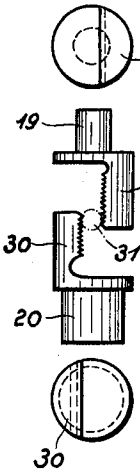


Fig.11

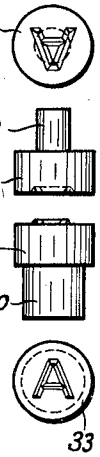


Fig.1

Fig.2

Fig.3

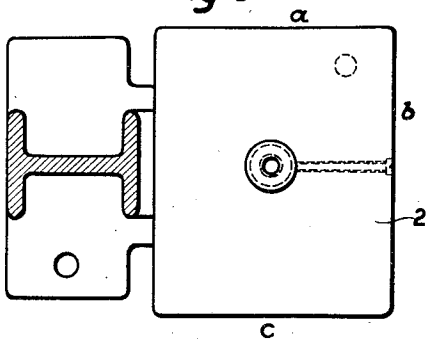


Fig.4

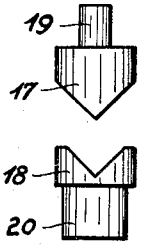
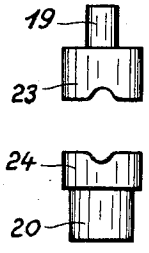


Fig.6



Inventor:
J. Frommherz
By: Marks & Clerk
Attys.

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Fig.7

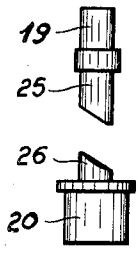


Fig.8

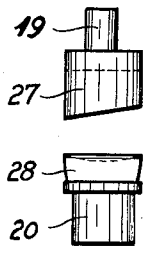


Fig.9

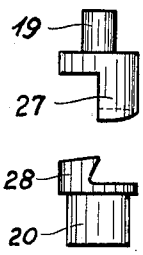


Fig.15

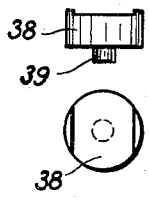
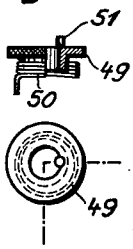


Fig.19



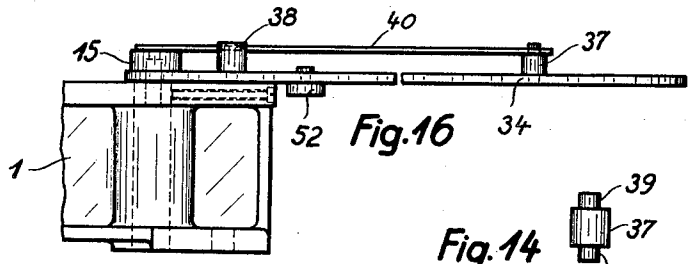


Fig.16

Fig.14

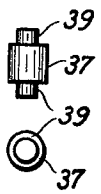


Fig.13

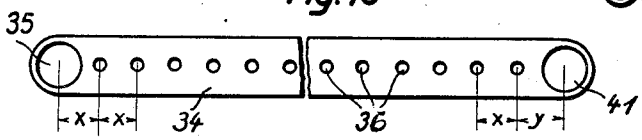


Fig.12

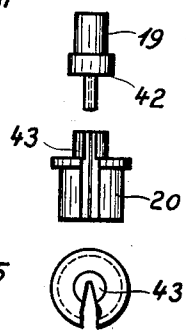


Fig.17

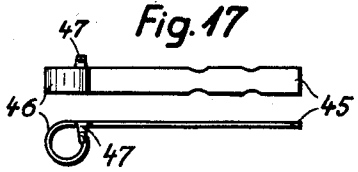


Fig.18

Inventor:
J. Frommherz
By: Marks & Clark
Attys.

Patented July 2, 1935 2,006,889

UNITED STATES PATENT OFFICE

2,006,889

HAND PRESS

Julius Frommherz, Baden, Germany

Application November 20, 1933, Serial No. 698,889
In Germany July 7, 1932

6 Claims. (Cl. 153—21)

This invention relates to a device with which a great variety of work can be carried out, more particularly punching, stamping, pressing, flanging, cutting along straight or curved lines, cutting out teeth and the like, and its main object is to facilitate the manufacture of the individual parts required for constructional toys and for building models.

It has already been proposed, for the purpose of facilitating the manufacture of toy structural units as required, to assemble tool boxes which contain the requisite implements, more particularly a small stamping machine and a cutting device. Under these circumstances, however, the various kinds of work required were not carried out by one and the same device, and the applicability of the individual appliances was very limited, a separate complete piece of apparatus being needed for almost every variety of work.

The production of an implement equally adapted for effecting the various kinds of work mentioned has apparently not hitherto been contemplated, owing to the fact that such a device would be too complicated and too expensive. The device according to the present invention, however, which is substantially of the nature of a small punch is provided with a number of mutually exchangeable tools co-operating with one another in pairs and serving for punching, stamping, pressing, bending, drawing, rolling, flanging, cutting, embossing and so forth, of which all the punches or counter-dies and all the matrices or dies have preferably cylindrical shanks of the same diameter. The exchangeability and also the substantially cylindrical shape of the various tools, which permits of their being manufactured on turret or automatic lathes, simplify and cheapen the manufacture.

For the various operations the hand lever of the device is preferably provided with two different cam faces or is so constructed as to enable it to be fitted with a plurality of different exchangeable cam guides, so that the ram carrying the counter-die tool can execute either a full working stroke or part of such a stroke.

For such devices, to be operated more particularly by children, a drill gauge of angle iron or the like is known, which has a number of holes spaced at equal distances apart, and with which the work to be done can be rigidly connected. As compared with this, the present invention comprises a bar, which is provided with a row of holes and is rockable round the tool dies, and which carries bolts or studs adapted to be set up thereon for supporting and guiding the work, and also stops for limiting the rocking movement. Owing to the construction of the tools with a shank which can be put through a bore provided at the end of the bar, the rotatable fastening of the bar to the work table can be effected in a simple manner.

Such a bar is furthermore provided with auxiliary devices which enable toothed wheels to be produced.

The invention is illustrated by way of example in the accompanying drawings, in which

Figures 1 and 2 are side and front elevation views respectively of a punch-like machine;

Figure 3 shows a section on the line III—III in Figure 1;

Figures 4 to 12 show on a somewhat larger scale the exchangeable tools for the various kinds of work,

Figures 4 to 7 being side views of a die and counter-die for bending, pressing, and flanging,

Figures 8 and 9 being front and side views of the die and counter-die of a cutting tool,

Figure 10 comprising a front view and an under side view of the counter-die and a front view and plan of the die of a tool serving for rolling or knurling,

Figure 11 comprising similar views of an embossing tool, and

Figure 12 comprising a front view of the die and counter-die of the tooth-cutting tool and a plan of the die thereof;

Figure 13 is a plan view of a bar to be rotatably secured to the work table;

Figures 14 and 15 show in side elevation and in plan bolts or studs adapted to be mounted upon this bar for the purpose of supporting or guiding the work;

Figure 16 illustrates in side elevation on the same scale as Figures 1 and 2 the fitting of the bar, together with the supporting and guiding bolts, to the work table;

Figure 17 shows in side elevation and in plan an auxiliary device for a tooth-cutting tool,

Figure 18 is a plan view showing the method of working of the tooth-cutting tool; and

Figure 19 shows in elevation in the left hand half and in sectional elevation in the right hand half and also in plan another form of construction of the auxiliary device for the tooth-cutting tool.

The punch-like device 1 is constructed with a work table 2, having a vertical bore 4, in which the tool matrices or dies are inserted by their cylindrical shanks, and fastened by means of a screw 5. Above this bore the device 1 is pro-

vided, in an overhanging arm, with a guide 6, which is prevented from rotating, and in which slides a ram 7, which carries the counter-die and is held fast by a screw 16. The ram is kept pressed against the work by any convenient spring, not shown, on a hand lever 8. This lever is provided with two different cam faces 9 and 10, by means of which the ram can be caused to execute a complete or partial stroke by rocking the lever down either on one side or on the other. The device is preferably mounted by means of screws 11 and 12 upon a wooden base 13, which projects on both sides.

According to Figures 1 and 2 there are inserted in the device 1 the counter-die 14 and matrix 15 of a punching tool known in itself. In place of the punching tool there may similarly be inserted any of the tools illustrated in Figures 4 to 12.

The counter-die 17 and the die or matrix 18, shown in Figure 4, which serve to bend a right angle out of a strip of sheet aluminium or the like, are provided for this purpose, like all the other tools that are exchangeable for the stamping tool 14, 15, with cylindrical shanks 19 and 20.

The counter-die 21 and the die or matrix 22 (Figure 5) form a tool for pressing, for instance for imparting to a strip of sheet metal the form of a channel.

The tool 23, 24 (Fig. 6) serves more particularly for the further treatment of a channel produced with the tools 21, 22, and renders possible the production of a tube or a shaft.

By inserting the counter-die 27 and the matrix 28 (Figure 9), the device becomes a pair of shears, with which sheet metal strips or plates can be cut, and even circular discs. When cutting in a straight line a full stroke is imparted to the counter-die 27 by means of the cam face 9, but when cutting along a curved line a partial stroke is employed, which is obtained by means of the cam face 10.

The knurling tool 29, 30 (Figure 10) is adapted for example to roughen a shaft 31, such as may be manufactured by means of the tool 23, 24, (Fig. 6), upon a part of its length, or to provide it with longitudinal grooves, which is advantageous for the purpose of securing a pulley or a wheel thereto.

The embossing tool 32, 33 (Figure 11), the counter-die 32 of which may be provided with a recessed letter and its die 33 with a raised letter, enables small name plates and the like to be embossed out of sheet metal strips, or enables work to be provided with an inscription, a separate tool being of course required for each letter.

For almost all the kinds of work described it is advantageous to employ an auxiliary device consisting essentially of a bar 34, shown in Figures 13, 16 and 18. The bar is provided at one end with a circular hole 35, the diameter of which corresponds to that of the shanks 20 of the various dies. Upon introducing the particular die into the bore 4 of the work table, the shank is first passed through the hole 35, whereby the bar 34 becomes oscillatably secured to the work table, as shown in Figure 16. The bar 34 is provided with a row of holes 36 spaced at equal distances apart, in which fixing bolts 37 (Fig. 14) or guiding bolts 38 (Fig. 15) are inserted by means of pegs 39, the diameter of which preferably corresponds to that of the punching counter-die 14. By mounting the workpiece 40, for instance a sheet metal strip perforated by means of the punching tool 14, 15, upon the fixing bolt 37, which in its turn is inserted in a suitable hole 36 in the bar 34, the distance at which the treatment, for instance the punching of a second hole, is to be effected, is accurately determined. The strip of sheet metal is supported and centered in the guiding bolt 33.

If the treatment of the work is to be effected at a somewhat greater distance than is given by the row of holes in the bar 34, the latter is oscillatably secured to the work table by the other end, at which it has a second hole 41, the distance of which from the nearest hole 36 is somewhat greater than that of the hole 35. For the purpose of making toothed wheels the distance y of the bore 41 from the last hole 36, serving for cutting round a curve, is preferably equal to the radius of the addendum circle of the smallest toothed wheel to be made, and the distance of the bore 35 from the hole 36 nearest to it (as well as the distance of the holes 36 from one another) is made equal to the radius of the pitch circle of the smallest toothed wheel to be made. By inserting the counter-die 42 and the die 43 (Figure 12) of the tooth-cutting tool it is then possible to produce toothed wheels of which the numbers of teeth are in a simple ratio to one another.

The production of a toothed wheel, as illustrated in Figure 18, is effected by first providing a piece of sheet metal with a hole 44, which is mounted upon a fixing bolt 37 on the bar 34. After the sheet metal plate has been cut circular by means of the tool 27, 28, the latter is exchanged for the tooth-cutting tool 42, 43, and the first tooth gap is cut in the circular disc 53 is obtained. For the purpose of producing the correct tooth pitch there serves a dividing pawl 45, illustrated in Figure 17, and dimensioned to correspond to the pitch, the neck portion of this dividing pawl being mounted upon the die 43. The projecting tooth 47 on the dividing pawl is placed in the first gap already cut, and the pawl is swung through an angle, the work 53 being drawn into the correct position and placed upon the tool 42, 43. The second tooth gap is thereupon punched out, and the same process is continued until the entire periphery is uniformly toothed. The placing of the tooth 47 of the tooth pawl 45 in the preceding gap is facilitated by connecting the dividing pawl by a tension spring 48 or the like (Figure 18) with a hole in the bar 34.

In place of the dividing pawl 45, an annular body 49 (Fig. 19) may be employed, which is mounted upon the die 43, and to the under side of which is secured a spiral spring 50, which engages with one end in a notch in the die 43. The spring then serves to rotate the body 49 and to place the pin 51, provided on the upper side, in the tooth gap that is already completed.

The bar 34 may furthermore be provided with a stop 52 (Figs. 16 and 18), to be secured on the under side with a screw for instance, this stop co-operating with one of the three free edges a, b, c of the work table 2, which are at different distances from the bore 4. By swinging the bar 34 round until the stop 52 bears against the appropriate edge of the work table, and repeatedly cutting one and the same tooth gap, the accurate involute shape of the flanks of the teeth can be produced. The distances of the three edges of the work table from the tool are so selected that accurately shaped teeth for toothed wheels of three different but definite diameters can be produced.

In connection with the foregoing it is to be particularly observed that the upper surface of the work table is uniformly flat so as to effective-

ly support the bar 34 when the latter is used and engaged about the circular head of the shank 20 of the die which is engaged in the bore in the table. Obviously the bore is adapted to receive the shank of any of the various dies while the cross section of the inner end of each die is cylindrical in cross section and in each instance forms a stud adapted to be engaged by the opening 35 in the bar 34 when the latter is used.

By the aid of the tools and auxiliary device described, and of further tools, not illustrated, numerous varieties of work can be carried out with careful accuracy. The applicability of the device is not restricted to the constructional example described and to the possibilities mentioned.

What I claim is:—

1. A punch-like device comprising a base, a work table thereon having a uniformly flat upper surface and having a vertical bore, an upright arm rising from the base to one side of the work table and terminating in an offset portion disposed over the bore, a guide formed with the offset portion and likewise arranged over the bore, a ram slidable in the guide, a pair of metal working tools removably mounted respectively in the bore and ram, at least one of the pair of tools having a head which is cylindrical in cross section forming a stud adapted to receive a bar, the bore and ram being adapted to receive metal working tools, the bottom of each of which in each instance forms a stud, spaced ears rising from the guide, a hand lever pivoted between the ears, at least two cam guides on the inner end of the hand lever for cooperating with the ram and by means of which the ram can be caused to execute a complete or partial stroke by rocking the hand lever down on either one side or the other.

2. A punch-like machine comprising a base, a work table thereon having a vertical bore, an upright arm rising from the base to one side of the work table, a guide supported by the arm and arranged over the bore, a ram slidable in the guide, a pair of metal working tools removably mounted respectively in the bore and the ram, a hand lever mounted above the guide and acting on the ram to move the latter relatively to the platform, the pair of exchangeable tools being adapted for cutting gear teeth, a bar perforated at definite intervals and capable of oscillating about the axis of the shanks of the tools, fixing bolts adapted to be fitted into any one of the perforations in the bar for mounting and guiding the work to be operated upon by the device, the work table being capable of supporting the perforated bar and having at least three edges at different distances from the axis of the tool shanks, and a stop adapted to be fitted into one of the perforations in the bar and to co-operate with any one of the edges of the work table so as to limit the oscillation of the bar.

3. A punch-like machine comprising a base, a work table thereon having a vertical bore, an upright arm rising from the base to one side of the work table, a guide supported by the arm and arranged over the bore, a ram slidable in the guide, a pair of metal working tools removably mounted respectively in the bore and the ram, a hand lever mounted above the guide and acting on the ram to move the latter relatively to the platform, a bar perforated at definite intervals and having at one end a hole large enough for the shank of the tool die to pass through with but little clearance, so that the said shank forms a pivot about which the bar can oscillate, fixing bolts adapted to be fitted into any one of the perforations in the bar for mounting and guiding the work to be operated upon by the device, and the work table being capable of supporting the perforated bar.

4. A punch-like machine comprising a base, a work table thereon having a vertical bore, an upright arm rising from the base to one side of the work table, a guide supported by the arm and arranged over the bore, a ram slidable in the guide, a pair of metal working tools removably mounted respectively in the bore and the ram, a hand lever mounted above the guide and acting on the ram to move the latter relatively to the platform, the pair of exchangeable tools being adapted for cutting gear teeth, a bar perforated at definite intervals and having at one end a hole large enough for the shank of the tool die to pass through with but little clearance, so that the said shank forms a pivot about which the bar can oscillate, the distance between the centers of the perforations in the bar, and the distance between the center of the end hole and the center of the perforation nearest thereto each being equal to the radius of the pitch circle of the smallest toothed wheel to be produced by the machine, fixing bolts adapted to be fitted into any one of the perforations in the bar for mounting and guiding the work to be operated upon by the device, the work table being capable of supporting the perforated bar and having at least three edges at different distances from the axis of the tool shanks, and a stop adapted to be fitted into one of the perforations in the bar and to co-operate with any one of the edges of the work table so as to limit the oscillation of the bar.

5. A punch-like machine comprising a base, a work table thereon having a vertical bore, an upright arm rising from the base to one side of the work table, a guide supported by the arm and arranged over the bore, a ram slidable in the guide, a pair of metal working tools removably mounted respectively in the bore and the ram, a hand lever mounted above the guide and acting on the ram to move the latter relatively to the platform, the pair of exchangeable tools being adapted for cutting gear teeth, a bar perforated at definite intervals and having at one end a hole large enough for the shank of the tool die to pass through with but little clearance, so that the said shank forms a pivot about which the bar can oscillate, the distance between the centers of the perforations in the bar, and the distance between the center of the end hole and the center of the perforation nearest thereto each being equal to the radius of the pitch circle of the smallest toothed wheel to be produced by the machine, the other end of the bar being provided with a second hole, the distance between the center of this second hole and the center of the perforation nearest thereto being equal to the radius of the addendum circle of the smallest toothed wheel to be produced by the machine, fixing bolts adapted to be fitted into any one of the perforations in the bar for mounting and guiding the work to be operated upon by the device, and the work table being capable of supporting the perforated bar.

6. A punch-like machine comprising a base, a work table thereon having a vertical bore, an upright arm rising from the base to one side of the work table, a guide supported by the arm and arranged over the bore, a ram slidable in the guide,

a pair of metal working tools removably mounted respectively in the bore and the ram, a hand lever mounted above the guide and acting on the ram to move the latter relatively to the platform, the pair of exchangeable tools being adapted for cutting gear teeth, a bar perforated at definite intervals and having at one end a hole large enough for the shank of the tool die to pass through with but little clearance, so that the said shank forms a pivot about which the bar can oscillate, the distance between the centers of the perforations in the bar, and the distance between the center of the end hole and the center of the perforation nearest thereto each being equal to the radius of the pitch circle of the smallest toothed wheel to be produced by the machine, fixing bolts adapted to be fitted into any one of the perforations in the bar for mounting and guiding the work to be operated upon by the device, the work table being capable of supporting the perforated bar and having at least three edges at different distances from the axis of the tool shanks, and a stop adapted to be fitted into one of the perforations in the bar and to co-operate with any one of the edges of the work table so as to limit the oscillation of the bar, a dividing pawl adapted to be mounted for oscillation about the shank axis of the tooth-cutting tools, a projection on the guiding pawl adapted to fit into a tooth space cut by the tooth-cutting tool, and tension means secured at one end to the dividing pawl and at the other end to the bar to keep the projection engaged in the tooth space.

JULIUS FROMMHERZ.

CERTIFICATE OF CORRECTION.

Patent No. 2,006,889.

July 2, 1935.

JULIUS FROMMHERZ.

It is hereby certified that the residence of the inventor in the above numbered patent was eroneously described and specified as "Baden, Germany" whereas said residence should have been described and specified as Ettlingen, Baden, Germany, as shown by the records of the case in this office; and that the said Letters Patent should be read with this correction therein that the same may conform to the record of the case in the Patent Office.

Signed and sealed this 29th day of October, A. D. 1935.

(Seal)

Leslie Frazer
Acting Commissioner of Patents.