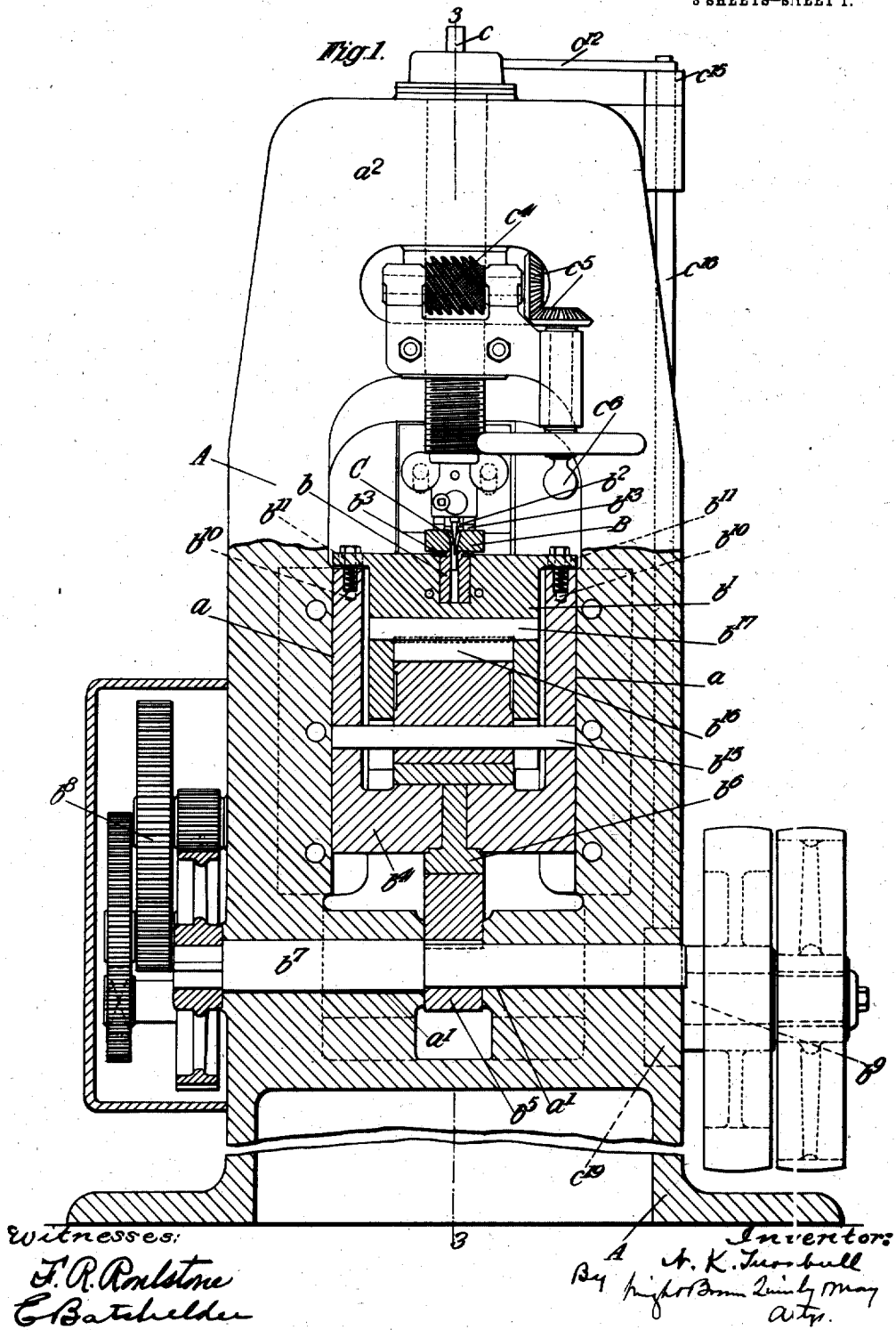


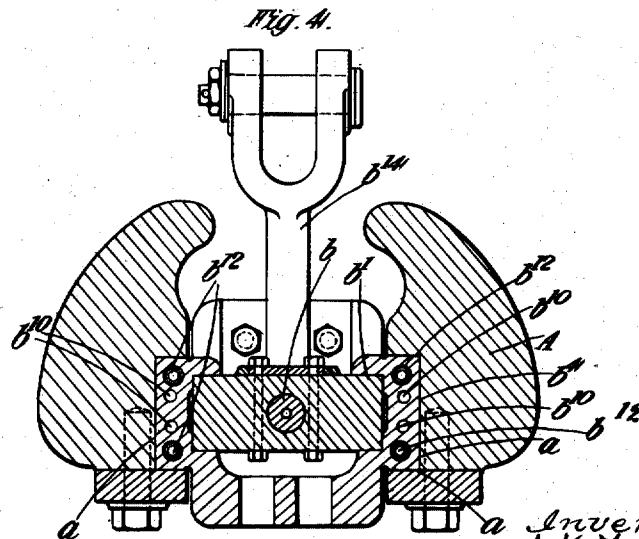
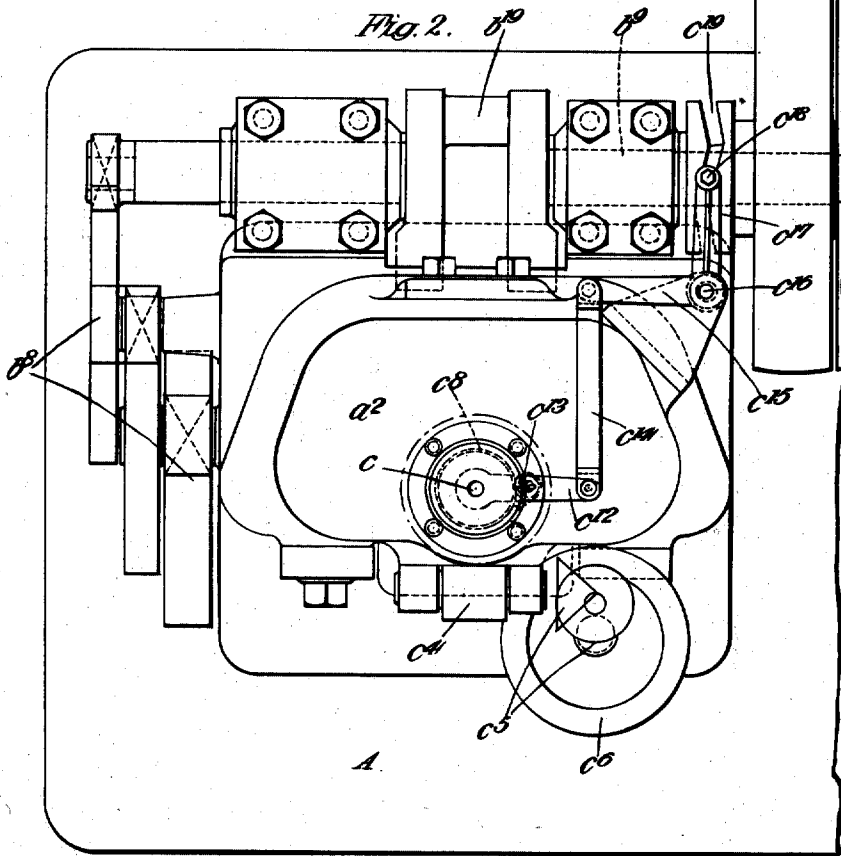
N. K. TURNBULL.
MACHINE FOR FORMING WIRE DRAWING DIES OR PLATES.
APPLICATION FILED FEB. 27, 1911.

1,008,442.

Patented Nov. 14, 1911.

3 SHEETS-SHEET 1.





Witnesses:

J. R. Ricketts
E. B. Batchelder

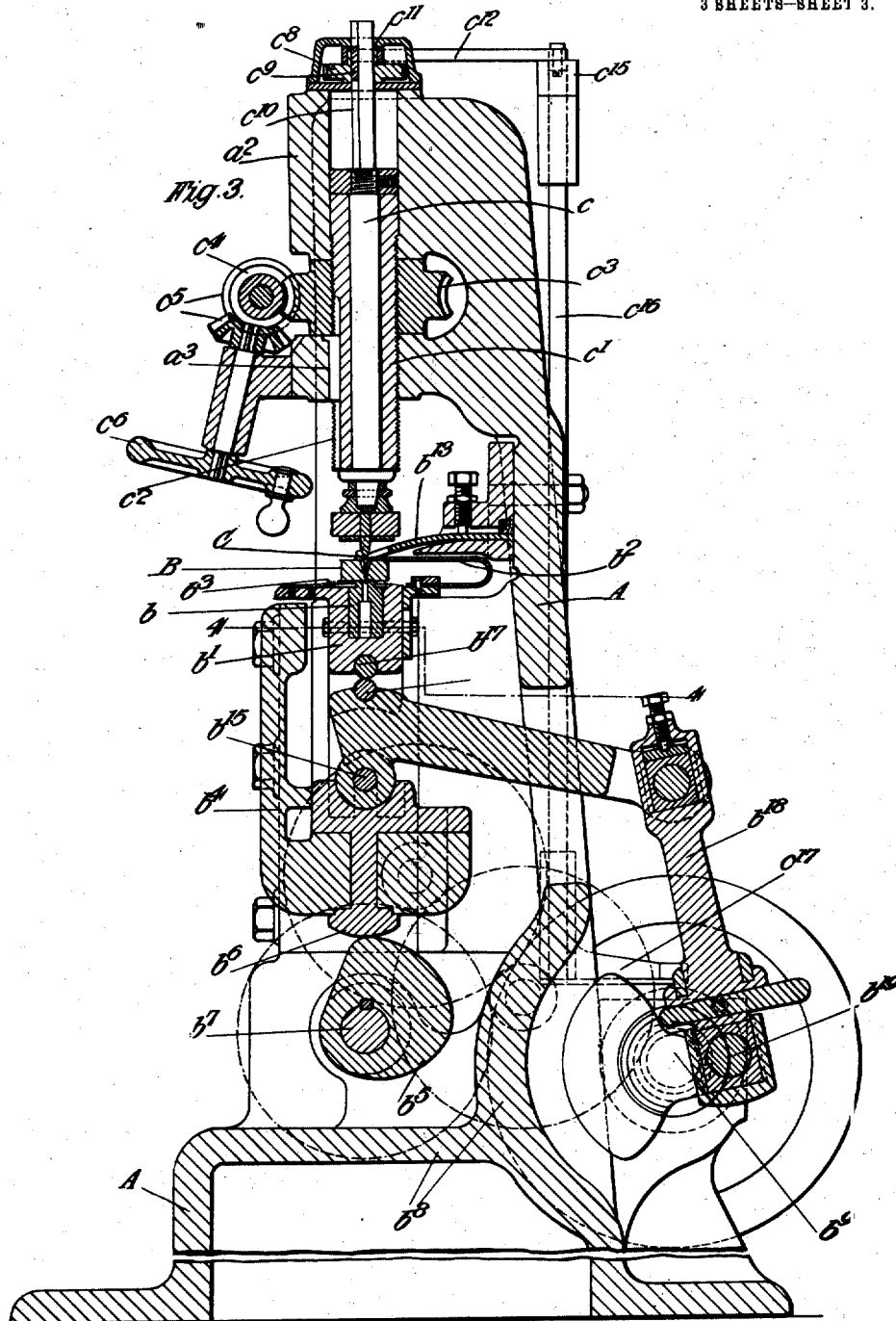
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3 SHEETS—SHEET 3.



Witnesses:

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UNITED STATES PATENT OFFICE.

NICHOLAS KING TURNBULL, OF MANCHESTER, ENGLAND.

MACHINE FOR FORMING WIRE-DRAWING DIES OR PLATES.

1,008,442.

Specification of Letters Patent. Patented Nov. 14, 1911.

Application filed February 27, 1911. Serial No. 611,074.

To all whom it may concern:

Be it known that I, NICHOLAS KING TURNBULL, a subject of the King of Great Britain, residing at Wire Works, Trafford Park, Manchester, in the county of Lancaster, England, have invented certain new and useful Improvements in Machines for Forming Wire-Drawing Dies or Plates, of which the following is a specification.

This invention relates to a machine for expanding or swaging the die openings in wire drawing dies or plates. For effecting this purpose it has hitherto been proposed to employ a machine provided with a tapered punch and a die support mounted upon a rising and falling carrier by means of which the die was raised into contact with the punch, the hammering operation being effected by imparting a reciprocating movement to the die support or to the punch.

According to this invention the die support hereinafter referred to as the die holder is provided with means for imparting a vibratory movement thereto in relation to the aforesaid carrier during the time that the latter is in its uppermost position. This is conveniently effected by a lever fulcrumed in the aforesaid carrier, and means for imparting a vibratory movement to the said lever for causing a projecting surface thereon to oscillate from side to side or at one side of a projecting surface on the carrier in accordance with the position thereof the particular arrangement of the carrier, the die holder, the vibratory lever and the cam for raising the carrier to its uppermost position, being such that these parts are put into compression during the die swaging operation and are not subjected to any deflection or bending action.

In order that the said invention may be clearly understood and readily carried into effect I will describe the same more fully with reference to the accompanying drawings, in which:—

Figure 1 is a front elevation, part of which is shown in section, of a die swaging machine constructed in accordance with this invention. Fig. 2 is a plan of the machine with certain parts removed for the sake of clearness. Fig. 3 is a vertical section taken approximately on line 3, 3 of Fig. 1. Fig. 4 is a horizontal section taken approximately on line 4—4 of Fig. 3.

A represents the machine frame, B the die, and C the punch. The die B is sup-

ported by an anvil b that constitutes a part of a table or die holder b' and is maintained in position thereon by springs b^2 b^3 . The die holder b' is supported by a carrier b^4 that is mounted in vertical guides a and is capable of being raised to a suitable position for enabling the die swaging operation to be performed and also of being lowered through a space that is somewhat greater than the thickness of the die or plate to permit of the insertion and removal thereof when the carrier is in its lowermost position. In the example shown this movement of the carrier b^4 is effected by a cam b^5 arranged to engage directly with a bearing surface b^6 on the carrier b^4 . The aforesaid cam is keyed upon a shaft b^7 that is rotated at a slow speed through gearing b^8 from a main driving shaft b^9 . The shaft b^7 is supported in bearings a' forming part of the machine frame, and arranged as close to the opposite faces of the cam b^5 as is practicable in order to prevent any deflection of the shaft b^7 during the die swaging operation. When the carrier b^4 has been raised to bring the die into close proximity to the punch C the die swaging operation is effected by imparting a vibratory motion to the table or die holder b' in a vertical direction until the carrier b^4 has arrived at its uppermost position whereupon the forming or expanding of the die opening is completed. For enabling the vibratory movement of the table or die holder b' to be effected, such holder is slidably mounted in the carrier b^4 and is connected thereto by screws b^{10} and distance bushes b^{11} which regulate the amount of relative movement of the die holder and carrier. The die holder is normally retained in its uppermost position in relation to the carrier b^4 by springs b^{12} Fig. 4, until the carrier arrives at such a position that the upper surface of the die comes into contact with a spring b^{13} carried by the frame A. This spring is sufficiently strong to overcome the resistance of the springs b^{12} and to force the die holder into its lowermost position in relation to the carrier. The vibratory movement of the table or die holder is effected by means of a lever b^{14} that is fulcrumed at b^{15} in the carrier b^4 . This lever is provided with a centrally arranged projecting surface b^{16} adapted to engage with a similar projecting surface b^{17} on the die holder b' . An oscillatory movement is imparted to the lever b^{14} from a

connecting rod b^{18} and crank b^{19} carried by the aforesaid driving shaft b^9 . When the carrier b^4 is in its lower position the lever b^{14} oscillates without imparting any motion to the die holder b' . This is due to the fact that the projecting surface b^{10} oscillates to one side of the projecting surface b^{17} and without coming into contact with the latter. When the table approaches its uppermost position due to the action of the cam b^5 , the position of the lever b^{14} changes, with the result that its projecting surface is caused to oscillate from one side to the other of the projecting surface on the die holder and with the assistance of the spring b^{13} to impart to the die holder a vibratory motion in a vertical direction. This motion is continued as long as the carrier is retained in its uppermost position, the cam b^5 and the gearing b^8 being so arranged as to retain the carrier in this position for a sufficient period of time to complete the die swaging operation. The parts of the machine that are subjected to any material stress by the swaging operation are all put into compression and are not subjected to any bending or deflection action.

The tapered punch C is carried by a vertical spindle c mounted in the head portion a^2 of the frame A. In the arrangement shown the spindle together with the punch are capable of vertical adjustment relatively to the die or plate and are also adapted to receive a partial rotary motion each time the die B is lowered out of contact with the punch. For this purpose the spindle c is rotatably mounted in a sleeve c' that is slidably mounted in the aforesaid head portion a^2 and is prevented from rotation in relation thereto by a key a^3 engaging with a key way c^2 formed in the spindle. The outer surface of the sleeve is threaded for the greater portion of its length to engage an internally threaded worm wheel c^3 to which motion is imparted from a worm c^4 through the intervention of bevel gearing c^5 and a hand wheel c^6 when it is desired to produce a different size of die opening in another set of dies or plates. By employing a stationary or non-reciprocating punch, the depth to which the latter must enter the die in order to produce the required size of opening, can be more readily ascertained owing to the facility with which such punch can be adjusted in accordance with a gage placed upon the machine frame.

To produce the aforesaid partial rotary movement of the punch, a ratchet wheel c^8 is mounted upon the upper portion of the spindle c and is provided with a key c^9 engaging with a keyway c^{10} formed in the spindle. Rotatably mounted upon a boss c^{11} projecting from the ratchet wheel is an arm c^{12} carrying a spring controlled pawl c^{13} which engages with the teeth of the ratchet

wheel. This arm is connected by a link c^{14} to an arm c^{15} that is fixed upon a shaft c^{16} . On the lower end of such shaft is also fixed an arm c^{17} carrying a pin or projection c^{18} that engages with a cam c^{19} fixed upon the shaft b^9 . This cam imparts an oscillatory movement to the arm c^{12} through the aforesaid connections with the result that the pawl c^{13} advances the ratchet wheel through a predetermined space at each revolution of the cam; consequently a slight angular displacement is imparted to the punch and the shape of the die opening is thereby improved even though the cross section of the punch is slightly imperfect or becomes so owing to wear.

The mechanism above described for imparting the aforesaid partial rotary movement to the punch is only put into operation when swaging circular holes in the dies or plates. To produce oval, square, rectangular or otherwise shaped holes in the dies or plates a correspondingly shaped punch is employed and the ratchet wheel c^8 for imparting the aforesaid partial rotary motion to the punch is put out of operation in any suitable manner so that the punch will remain stationary during the die swaging operation.

What I claim and desire to secure by Letters Patent of the United States is:—

1. In a machine for forming wire drawing dies, a punch, a die holder, a carrier containing such die holder, means for raising and lowering the carrier and die holder, and means for imparting a vibratory movement to the die holder relatively to the carrier.

2. In a machine for forming wire drawing dies, a punch, a die holder, a carrier containing such die holder, a lever fulcrumed in the carrier and engaging the die holder to impart reciprocatory movements thereto relatively to the carrier, means for imparting a vibratory movement to the lever and means for raising and lowering the carrier.

3. In a machine for forming wire drawing dies, a punch, a die holder, a carrier containing such die holder, a lever fulcrumed in the carrier and engaging the die holder to impart reciprocatory movements thereto relatively to the carrier, means for imparting a vibratory movement to the lever, a cam for raising and lowering the carrier, and means for slowly actuating said cam.

4. In a machine for forming wire drawing dies, a punch, a die holder provided with a projecting surface, a carrier in which such die holder is slidably mounted, a lever fulcrumed in the carrier and provided with a projecting surface for engagement with the projecting surface on the die holder, means for imparting an oscillatory movement to the lever and means for causing its projecting surface to oscillate from one side to the

other of the projecting surface of the die holder.

5. In a machine for forming wire drawing dies, a punch, a die holder provided with a projecting surface, a carrier in which such die holder is slidably mounted, means for regulating the amount of movement of the die holder relatively to the carrier, means for normally retaining the die holder in a predetermined position in relation to the carrier, means for raising and lowering the carrier and die holder and means for imparting a vibratory movement to the die holder relatively to the carrier.

6. In a machine for forming wire draw-

ing dies, a punch, a vertically adjustable spindle carrying the punch, means for imparting an intermittent rotary motion to the spindle and punch, a die holder, a carrier containing such die holder, means for raising and lowering the carrier and die holder and means for imparting a vibratory movement to the die holder relatively to the carrier. 20

In testimony whereof I affix my signature 25 in presence of two witnesses.

NICHOLAS KING TURNBULL.

Witnesses:

NORMAN H. SHEARD,

JAS. STEWART BROADFOOT.

Copies of this patent may be obtained for five cents each, by addressing the "Commissioner of Patents, Washington, D. C."