No. 849,267. PATENTED APR. 2, 1907.

D. A. RITCHIE.

APPARATUS FOR FORMING PERFORATED STRIPS OR SHEETS.

APPLICATION FILED NOV. 14, 1906.

2 SHEETS—SHEET 1.

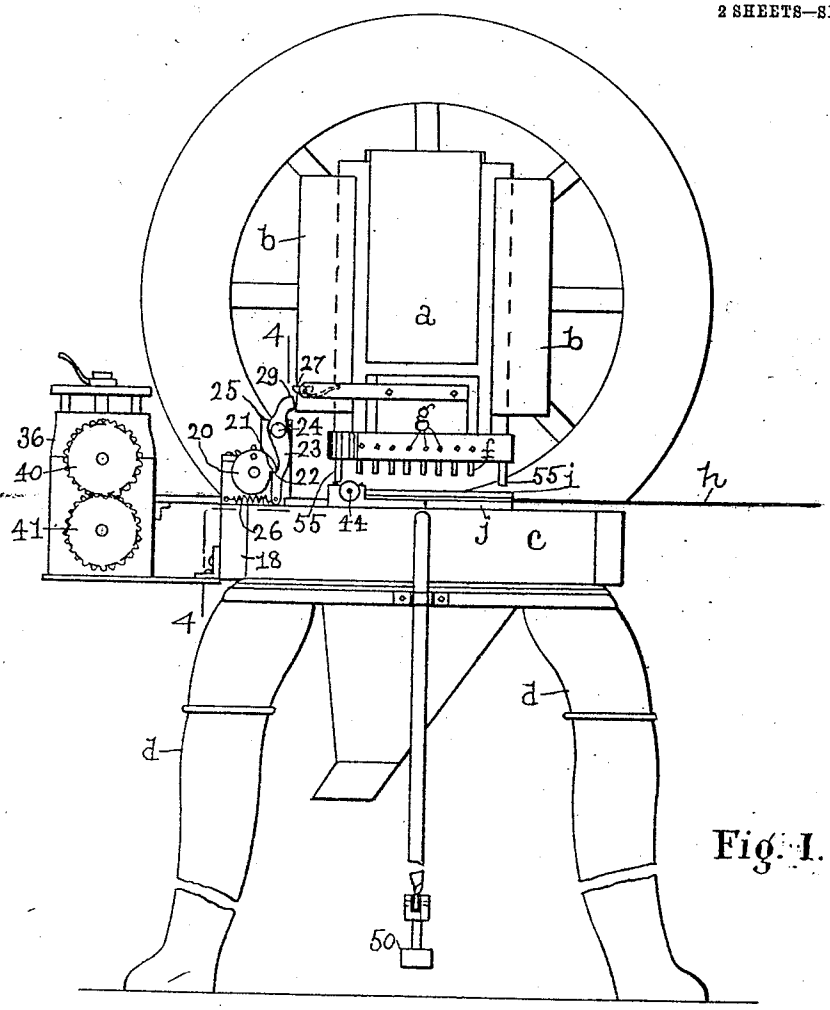


Fig. 1.

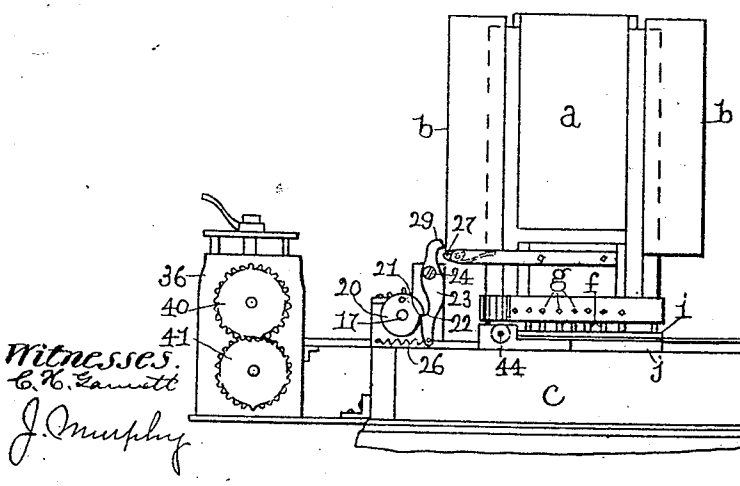


Fig. 2.

Witnesses.
C. H. Lamott
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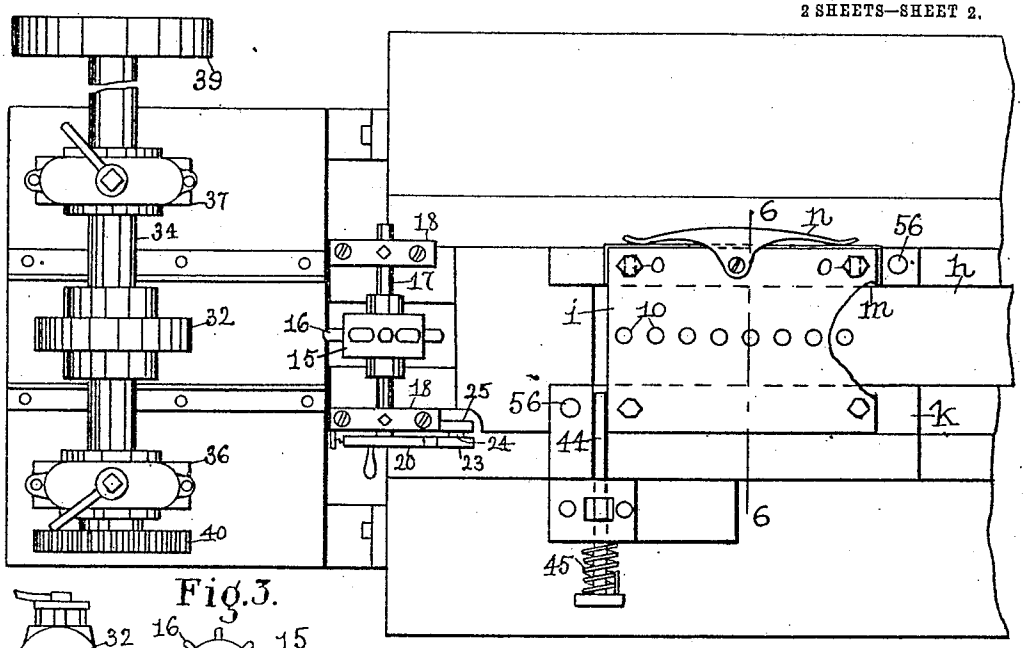


Fig. 3.

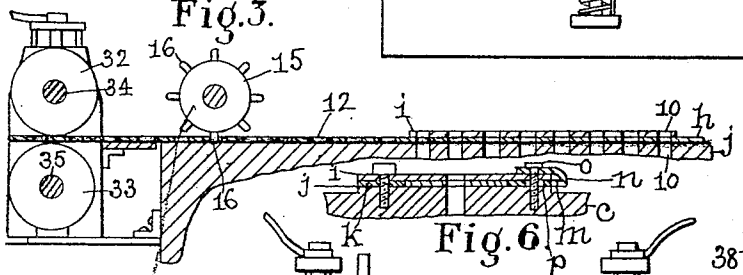


Fig. 6.

Fig. 5.

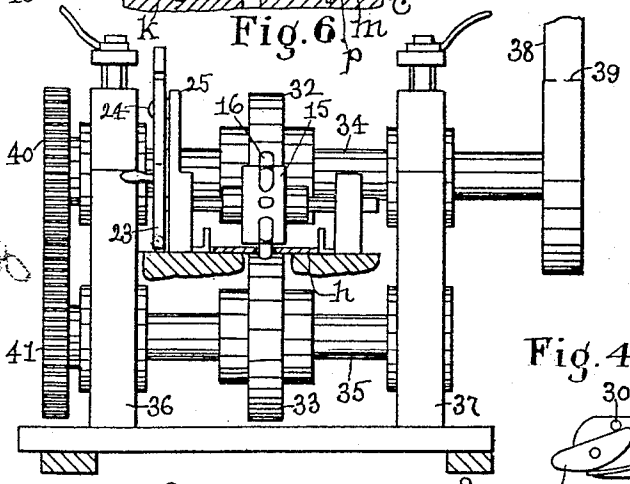


Fig. 4.

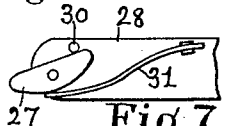


Fig. 7.

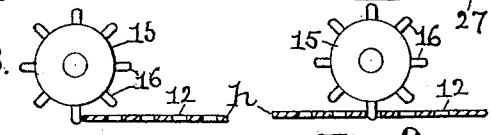


Fig. 8.

Fig. 9.

Witnesses.
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UNITED STATES PATENT OFFICE.

DAVID A. RITCHIE, OF CAMBRIDGE, MASSACHUSETTS.

APPARATUS FOR FORMING PERFORATED STRIPS OR SHEETS.

No. 849,267. Specification of Letters Patent. Patented April 2, 1907.

Application filed November 14, 1906. Serial No. 343,384.

To all whom it may concern:

Be it known that I, DAVID A. RITCHIE, a citizen of the United States, residing in Cambridge, in the county of Middlesex and State of Massachusetts, have invented an Improvement in Apparatus for Forming Perforated Strips or Sheets, of which the following description, in connection with the accompanying drawings, is a specification, like letters on the drawings representing like parts.

This invention relates to an apparatus for perforating metal strips or sheets, and more particularly substantially long metal strips in which it is desired to form a plurality of holes or openings which are separated from one another by a substantially uniform distance or space. For this purpose the apparatus is provided with a plurality of dies or punches, which are moved toward the metal strip to form a plurality of holes therein less in number than the number to be formed in the finished strip and which are then moved away or withdrawn from said holes to permit the metal strip to be moved or fed so as to bring another portion of the said strip into operative position with relation to the dies or punches, which are again moved to punch another set or series of holes.

Provision is made for controlling or regulating the distance the metal strip can be fed after each punching operation, whereby the said strip is properly positioned with relation to the punches to insure the holes being formed at substantially equal distances apart throughout the length of the strip or sheet. Provision is also made for initially positioning each strip or sheet with relation to the punches so that the holes in different strips may be located at the same or substantially the same distance from the front ends thereof. Provision is also made for automatically feeding or moving the strip or sheet with relation to the dies or punches, the effective operation of which feed mechanism is governed by the means controlling the positioning of the strip with relation to the punches or dies.

These and other features of this invention will be pointed out in the claims at the end of this specification.

Figure 1 is a front elevation of one form of apparatus embodying this invention, the dies or punches being shown in their withdrawn position; Fig. 2, a view similar to Fig. 1 with the dies or punches in their operative position; Fig. 3, a plan view of the apparatus shown in Fig. 1 with the dies or punches and their carrier removed; Fig. 4, a vertical cross-section on the irregular line 4 4, Fig. 1, looking toward the left; and Figs. 5 to 9, inclusive, details to be referred to.

In the present instance I have shown the invention as embodied in one form of apparatus, which comprises, essentially, a slide-block or carrier *a* movable in suitable guideways in an upright frame *b*, supported upon a suitable bed *c*, herein shown as provided with legs *d*. The carrier *a* may be reciprocated in its guideways by power after the manner of the well-known power-operated punching-machines, and as the manner in which the carrier is reciprocated forms no part of the present invention it is not deemed necessary to show the same in detail.

The carrier *a* has secured to its bottom or lower end a plurality of punches or dies *f*, herein represented as cylindrical in shape and detachably secured in suitable sockets in the carrier by set-screws *g* or in other suitable manner. The punches or dies *f*, as herein shown, are arranged in line with one another and are equal or substantially equal distances apart and may be of any shape in cross-section to correspond to the shape it is desired to impart to the holes in the metal strip or sheet *h*. The punches *f* on their downward movement punch or form a plurality of holes, one for each punch, in the portion of the metal strip *h* located below said punches and preferably between two stationary die members *i j*, (see Fig. 6,) suitably secured to the bed *c* of the machine and separated from each other by spacing-pieces *k m* to permit of the passage of the metal strip or sheet *h* between them. The spacing-piece *m* is movable laterally and is engaged by a spring *n*, which serves to press the piece *m* against the metal strip *h*, and thus force the latter against the stationary spacing-piece *k*. The spacing-piece *m* is guided in its lateral movement by screws *o*, which pass through slots *p* in the piece *m*. The stationary die members *i j* are provided with holes or openings 10 for the passage through them of the punches *f* and of the blanks or pieces of metal removed from the strip or sheet *h* to form the perforations or holes 12 therein.

In the present instance the carrier *a* is pro-

vided with a series of punches, eight in number, and consequently at each downward movement of the said carrier a series or set of eight holes is formed in the metal strip or sheet *h*. After one set of holes has been punched in the metal strip or sheet and the punches *f* have been elevated into their starting position (shown in Fig. 1) the metal strip or sheet is fed forward so as to bring a solid portion of it beneath the punches, so as to form another set or series of holes therein. It is very desirous that the holes of each set or series should not only be uniformly spaced from one another, but that the last hole of one set should be separated from the first hole of the next succeeding set or series of holes by a distance or space equal or substantially equal to the distance or space between any two holes of any set or series of holes, so that after the metal strip or sheet has passed through the machine all the holes therein may be uniformly spaced. To this end I have provided means for regulating or controlling the feed of the strip or sheet, which means consists, as herein shown, of a sleeve, hub, or disk 15, provided with a series of spokes, arms, or projections 16 and fast on a shaft 17, journaled in uprights 18, supported by the bed of the machine. The spokes or arms 16 correspond in number to the number of punches *f* and are arranged about the hub 15, so that when the strip or sheet *h* is fed at the proper rate or in the proper manner the spokes or arms 16 enter the holes 12 in the strip or sheet and do not interfere with the feed or movement of the same; but if the strip or sheet is not being fed or moved in the proper manner a spoke or arm on the hub will engage a solid portion of the strip or sheet and arrest the same in its movement. The controlling device or spoked wheel or hub 15 is rotated by the strip or sheet, the walls of the openings or holes 12 in which make contact with the spokes and turn the said hub as the punched strip is fed forward,

The feed-controlling device is itself governed by the movable carrier for the punches, and to this end means are provided for locking the controlling device against rotation until released by the carrier. For this purpose the shaft 17 has fast on it a disk 20, provided with a tooth or projection 21, which is normally engaged by a tooth or projection 22 on a locking-lever 23, pivoted at 24 to an upright 25, supported by the bed of the machine.

The lever 23 is normally held in engagement with the tooth or projection 21 on the disk 20 by a spring 26 (see Fig. 1) and is disengaged therefrom by a pivoted dog 27 (see Figs. 1 and 7) on an arm 28, attached to the carrier *a* and adapted to pass by an arm 29 of the lever on the downward movement of the carrier and on the upward movement of said carrier to engage said arm and turn the lever 23 against the action of the spring 26, and thereby disengage the said lever from the toothed disk 20, thus leaving the controlling device free to be rotated by the punched strip or sheet *h* as the latter is fed forward. The dog 27 is free to be turned on its pivot on the downward movement of the carrier *a* and is prevented from turning on the upward movement of the carrier by a stud or pin 30 (see Fig. 7) on the arm 28. The dog 27 is normally held in engagement with the stud 30 by a spring 31.

The metal strip may be fed forward by hand, or, as is preferred, it may be fed by suitable feed-wheels 32 33, (see Fig. 4,) mounted upon shafts 34 35, supported in uprights 36 37, suitably attached to or connected with the framework of the apparatus. The upper shaft 34 may be driven continuously by a belt 38, passed about a pulley 39 on one end, and the lower shaft 35 may be driven from the shaft 34 by gears 40 41. Provision is also made for initially positioning each strip or sheet, so that the first set or series of holes punched in each strip may be the same distance from the front end of the strip or sheet, thereby securing uniformity in the different perforated strips or sheets. For this purpose I have provided a movable gage or stop, shown as a bar or rod 44, (see Fig. 3,) which is mounted to slide transversely of the bed and into the path of movement of the strip or sheet to be punched, so that when the front end of the strip is passed or moved by the operator into position for the initial punching it will be arrested or stopped by the bar or rod 44, and after the initial strip or sheet has been thus positioned and punched the stop 44 may be released by the operator and removed from the path of the strip or sheet by a spring 45 encircling it. (See Fig. 3.)

The operation of the machine or apparatus may be briefly described as follows: Assume the machine to be in the position shown in Fig. 1, which may be considered the starting position. The operator takes a metal strip or sheet *h* and inserts its front end between the lower die members *i j* until its front end abuts against the stop 44, which he has in the meantime pushed into position to arrest the metal strip or sheet and properly position it below the punches *f*. The machine is then started in the usual manner by depressing a foot-treadle 50, whereupon the carrier *a* is moved downward and the punches *f* pass through the holes 10 in the upper die member *l* and force portions of the metal strip or sheet through corresponding holes 10 in the lower die member *j*, thereby forming the first set or series of holes 12 in the metal strip. The carrier *a* then rises and withdraws the punches from the holes in the metal strip or sheet, which is then fed for-

ward by the operator until the front end of the metal strip engages a spoke or arm of the controlling device, which arm when the controlling device is in its locked position (shown in Fig. 1) projects downward into the path of movement of the metal sheet, as represented in Fig. 8, while the next adjacent spoke above the metal strip or sheet is in position to enter the first hole therein. The punches then descend and punch another set of holes in the strip or sheet *h* and again rise, and on the upward movement of said carrier the dog 27 turns the lever 23 and unlocks the controlling device, which is then free to be turned by the perforated metal strip or sheet after the manner represented in Fig. 9 until the toothed disk 20 is again engaged with the locking-lever. It will be observed that at this time two sets or series of holes 12 have been punched in the metal strip or sheet, and at such time the front end of the latter is engaged by the feed-wheels 32 33, which thereafter effect the feed of the metal strip when permitted so to do by the controlling device. The feed-wheels are rotated continuously, and while they may be engaged with the partially-perforated strip or sheet they do not move the same until the controlling device is released. It will thus be observed that notwithstanding the feed mechanism or wheels are driven continuously the partially-perforated metal strip is fed forward intermittently. The die carrying the punches *f* may be provided with guide-pins 55, which are adapted to enter holes 56 in the bed of the machine.

I have herein shown the invention as embodied in a machine provided with one set of punches arranged in a row; but I do not desire to limit the invention in this respect, as the machine may be provided with a plurality of rows of punches to simultaneously punch a plurality of rows of holes in the metal strip or sheet.

I claim—

1. In a machine of the character described, in combination, a movable carrier, a plurality of punches secured thereto to move therewith, a die member having a plurality of holes or openings coöperating with said punches to form a series of holes in a metal strip or sheet, a rotatable hub or disk provided with a plurality of spokes or radial projections capable of entering the holes formed in said metal strip or sheet, a shaft on which said hub is mounted, a device fast on said shaft, a lever coöperating with said device to lock said shaft and hub from rotation, and means movable with said carrier for disengaging said lever from said device to thereby release the said shaft and its hub, substantially as described.

2. In a machine of the character described, in combination, a movable carrier, a plurality of punches secured thereto to move therewith, a die member having a plurality of holes or openings coöperating with said punches to form a series of holes in a metal strip or sheet, feed-rolls for feeding said strip or sheet, means for rotating said feed-rolls continuously, and means governed by the said carrier and coöperating with the holes or openings formed in the metal strip or sheet for controlling the movement of said metal strip or sheet by said feed-rolls, whereby an intermittent feed is imparted to said strip or sheet by said continuously-rotating feed-rolls, for the purpose specified.

3. In a machine of the character described, in combination, mechanism for punching a plurality of holes or openings in a metal strip or sheet, and a rotatable device actuated by the perforated strip or sheet and controlling the feed or movement of the same, substantially as described.

4. In a machine of the character described, in combination, mechanism for punching a plurality of holes or openings in a metal strip or sheet, said mechanism including a movable carrier, a rotatable device actuated by the perforated strip or sheet and controlling the feed or movement of the same, means for locking said device against rotation, and means actuated by said movable carrier for releasing said locking means, substantially as described.

5. In a machine of the character described, in combination, mechanism for punching a plurality of holes or openings in a metal strip or sheet, means for initially positioning the front end of the said strip or sheet with relation to said punching mechanism, and a rotatable device located in the path of movement of said metal strip or sheet and provided with means which are extended across the path of movement of the metal strip or sheet in the rotation of said device, said means being capable of entering into the holes or openings in said strip or sheet to thereby permit the feed of the latter, substantially as described.

6. In a machine of the character described, in combination, mechanism for simultaneously punching a plurality of holes or openings in a metal strip or sheet, and a device for controlling the feed or movement of said strip or sheet, said device having means for entering the holes formed in the strip or sheet and movable with said strip or sheet to permit movement of the same, substantially as described.

7. In a machine of the character described, in combination, mechanism for punching a plurality of holes or openings in a metal strip or sheet, a positively-driven and continuously-rotated feed mechanism capable of engaging the perforated sheet to effect the feed thereof, and rotatable mechanism coöperat-

ing with the holes formed in the metal strip for controlling the movement of the metal strip or sheet by said feed mechanism to obtain an intermittent feed of said strip or sheet by said continuously-rotated feed mechanism, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

DAVID A. RITCHIE.

Witnesses:
JAS. H. CHURCHILL,
J. MURPHY.