F. E. WHITNEY & A. K. EDWARDS.

PUNCHING MACHINE.

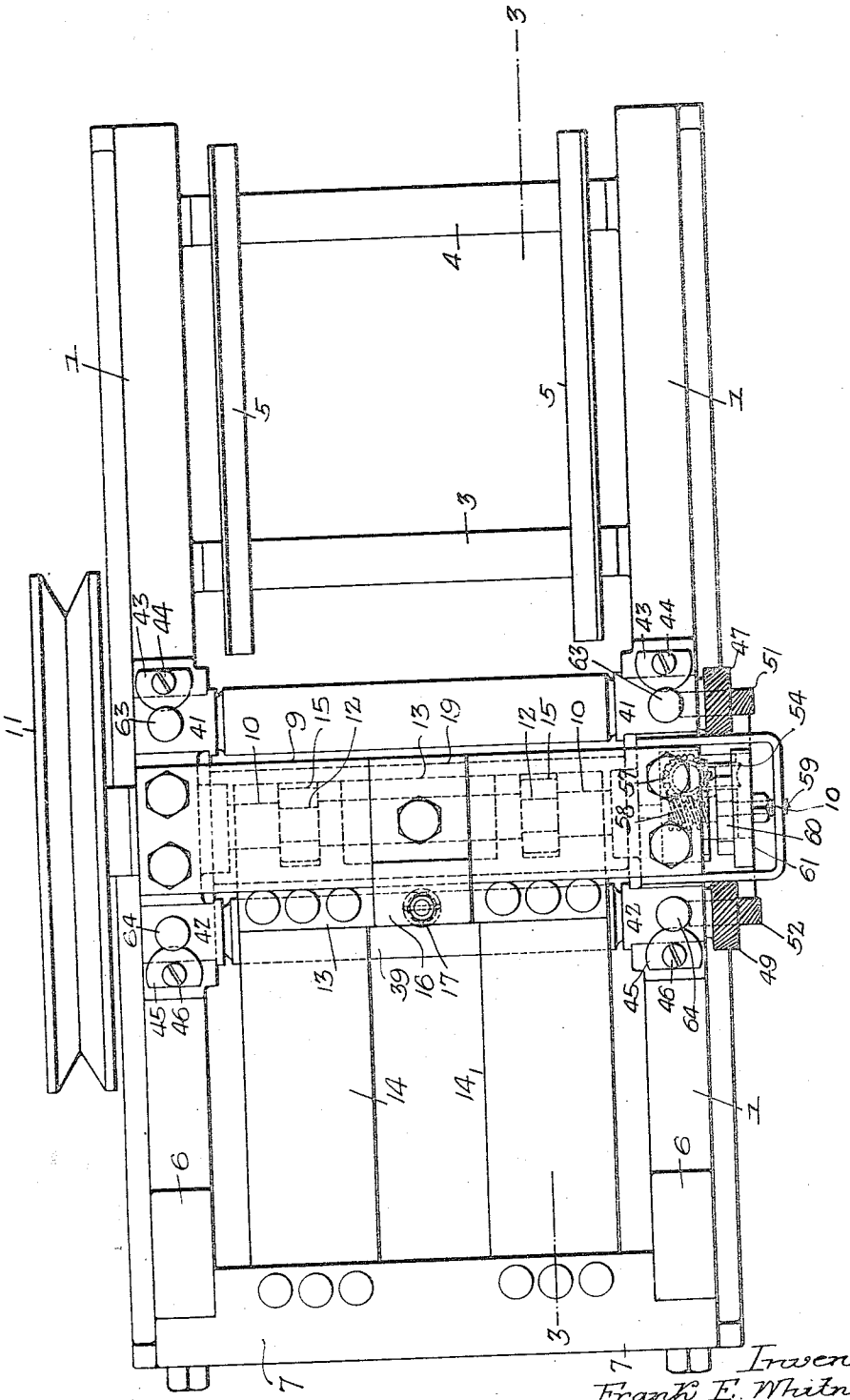
APPLICATION FILED AUG. 2, 1916.

1,272,747.

Patented July 16, 1918.

5 SHEETS—SHEET 1.

Fig. 1.



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5 SHEETS—SHEET 2.

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Fig. 2.

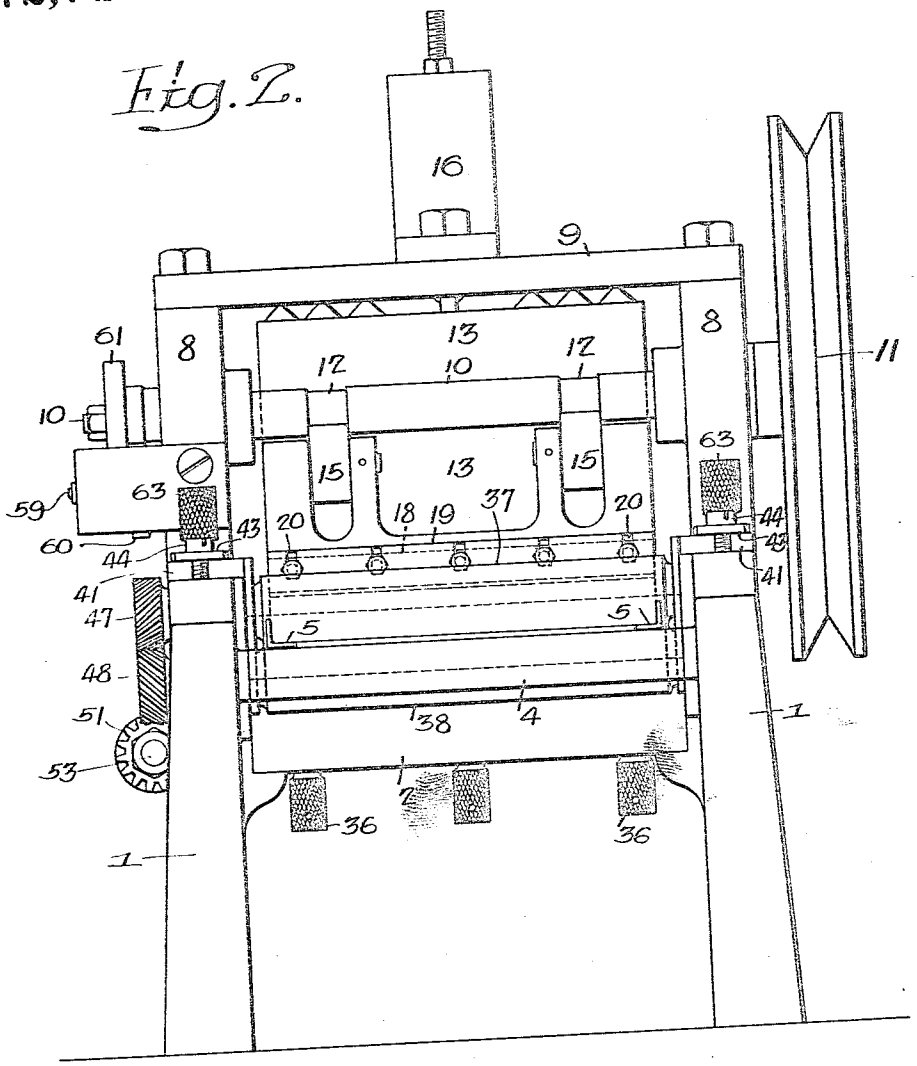


Fig. 7.



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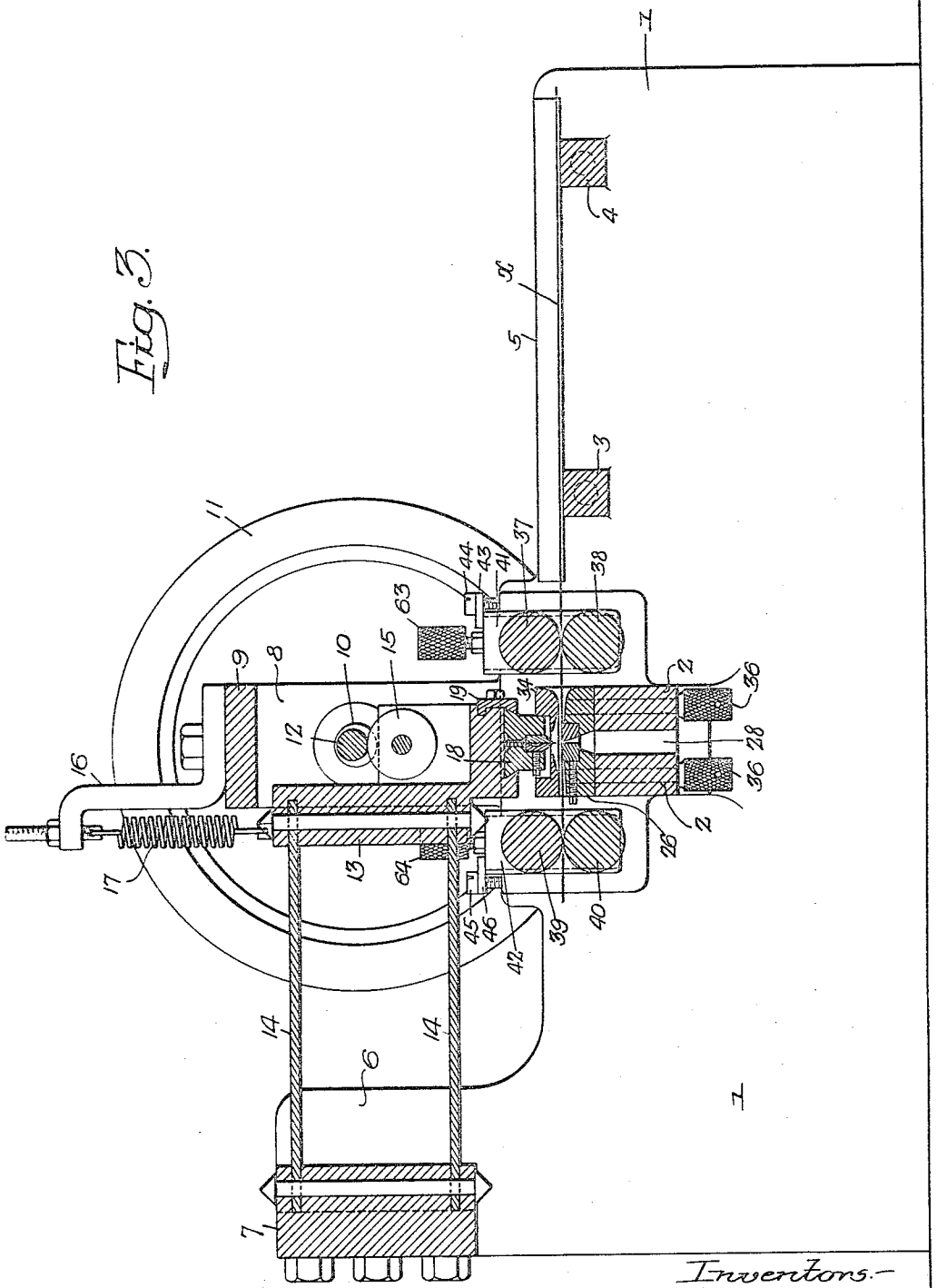
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5 SHEETS—SHEET 3.

Fig. 3.



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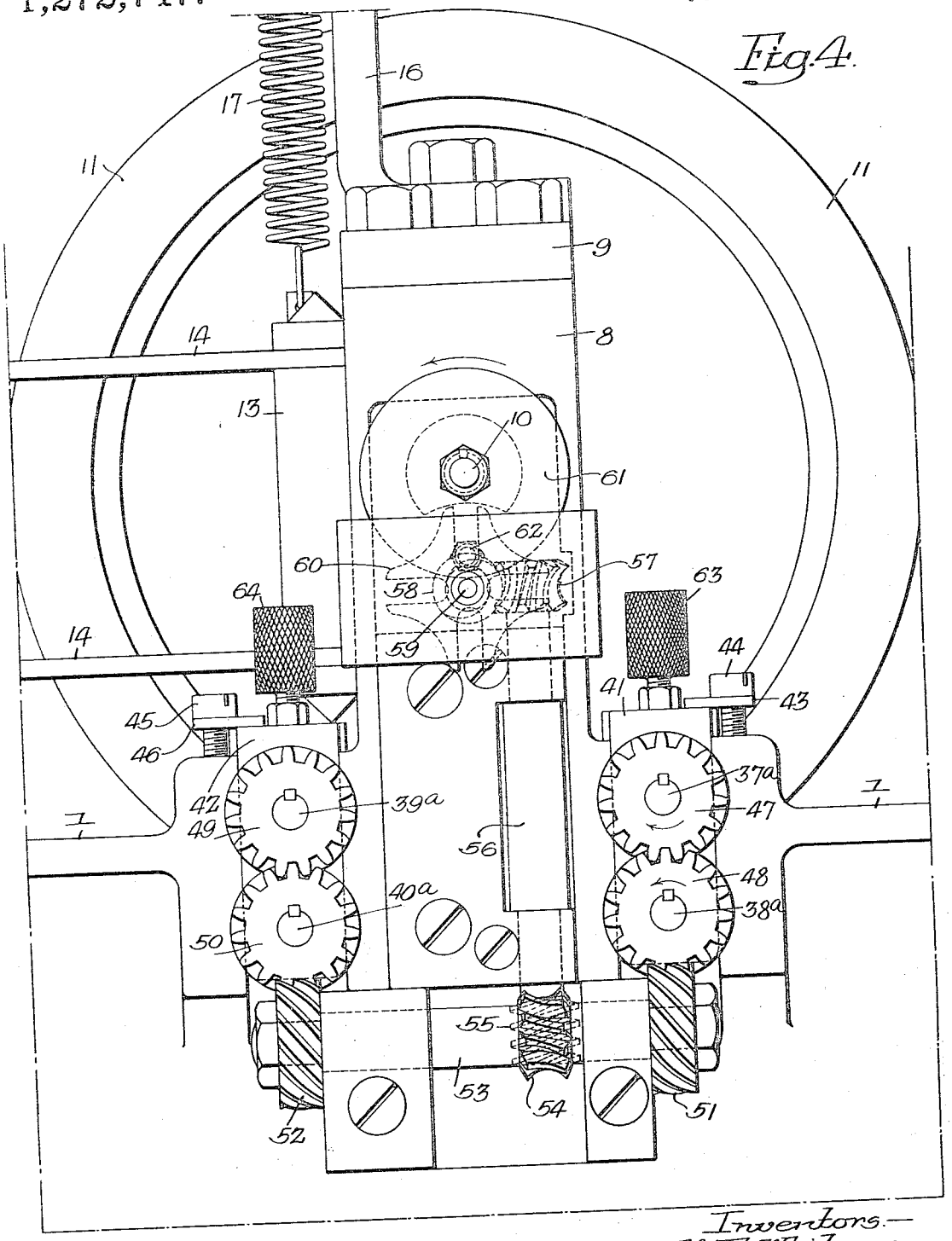
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5 SHEETS-SHEET 4.

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Fig. 4.



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5 SHEETS—SHEET 5.

Fig. 5.

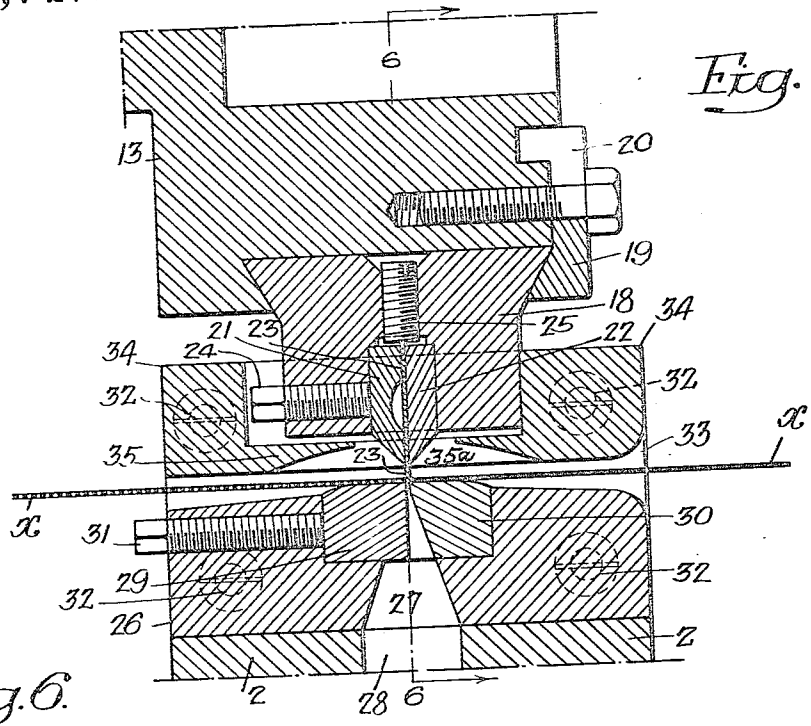
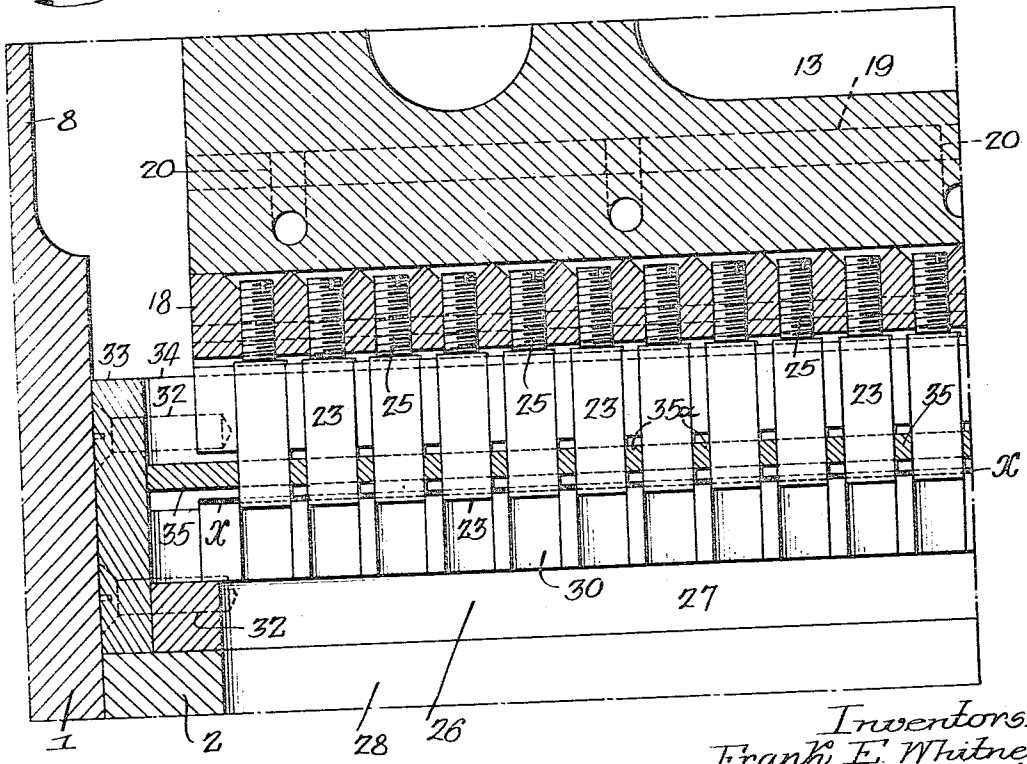


Fig. 6.



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UNITED STATES PATENT OFFICE.

FRANK E. WHITNEY AND ALFRED K. EDWARDS, OF PHILADELPHIA, PENNSYLVANIA, ASSIGNORS TO COMMERCIAL TRUCK COMPANY OF AMERICA, OF PHILADELPHIA, PENNSYLVANIA, A CORPORATION OF PENNSYLVANIA.

PUNCHING-MACHINE.

1,272,747. Specification of Letters Patent. Patented July 16, 1918.

Application filed August 2, 1916. Serial No. 112,712.

To all whom it may concern:

Be it known that we, FRANK E. WHITNEY and ALFRED K. EDWARDS, citizens of the United States, and residents of Philadelphia, Pennsylvania, have invented Punching-Machines, of which the following is a specification.

One object of this invention is to provide a machine which shall be primarily capable of forming a succession of elongated, relatively narrow slots in thin sheets of vulcanized rubber for the purpose of providing separators such as that illustrated in the application of Frank E. Whitney, filed June 17, 1915, Serial No. 34,705;—the machine being especially designed to operate at a high speed without becoming choked by the punchings resulting from the sheets operated on.

It is further desired to provide a punching machine which shall include novel means for movably supporting the punch carrying head with a view to preventing injury to the punches and dies which would otherwise certainly occur owing to lost motion from wear and other causes occurring between the various parts.

Another object of the invention is to provide a punching machine for simultaneously making a series of relatively narrow slots in a body of sheet material which shall include novel means for intermittently feeding the sheet in timed relation with the punching mechanism:—the invention contemplating novel means for rigidly yet adjustably holding and properly supporting a punch or punches capable of making narrow elongated slots of relatively small dimensions.

It is also desired to provide a machine of the character described with a novel means for holding and supporting the punches as well as a novel structure for stripping the sheets from said punches.

These objects and other advantageous ends we secure as hereinafter set forth, reference being had to the accompanying drawings, in which,

Figures 1 and 2 are respectively a plan and an elevation of a punching machine constructed according to our invention;

Fig. 3 is a vertical section on the line 3—3, Fig. 1;

Fig. 4 is an enlarged end elevation of certain of the gearing for driving and regulating the operation of the feed rolls, together with the parts associated therewith;

Fig. 5 is a transverse vertical section on a somewhat enlarged scale, illustrating the detail construction of the punches and dies with their associated structures;

Fig. 6 is a vertical section on the line 6—6, Fig. 5; and

Fig. 7 is a plan of a portion of one of the rubber separator sheets formed by our machine.

In the above drawings 1 represents the two substantially parallel side members of a supporting frame which is horizontally elongated and about its middle point has a transversely extending bar 2 rigidly connecting said side members. These latter are also rigidly connected by a pair of parallel bars 3 and 4 which serve to support sheet guides 5. At one end of the machine the side members are upwardly extended as indicated at 6 and are rigidly connected by a heavy plate 7 which is bolted to them, while in addition said members have at substantially their middle points, upward extensions 8 rigidly connected by a cross bar 9 as shown in Fig. 2.

Journaled in these extensions 8 is a horizontally extending shaft 10 which outside of the frame has fixed to it a driving pulley 11, connected to any suitable source of power and which between the extensions has a pair of eccentric portions 12 for actuating a vertically movable punch head 13. This latter consists of a structure of substantially L-shaped section operative between the extensions 8 and having its vertical portion 13 fixed to a pair of spring plates 14, one at its top and one adjacent its bottom, which are rigidly fixed in the transverse frame element 7, so as to project horizontally therefrom. Said plates are preferably made of spring steel and normally maintain a pair of rollers 15 on the head 13 in engagement with the eccentric portions 12 of the shaft 10. While we have shown the spring plates 14 as riveted to the head 13 and to the frame member 7, it is obvious that they may be connected to these structures by any other suitable means.

At about the central part of the cross member 9 is fixed an upwardly projecting bracket 16 between which and the punch head 13 is mounted a coil spring 17 for as-

sisting the spring plates to return said head to and normally maintain it at, its upper limit of movement.

From Figs. 3, 5 and 6, it will be seen that we provide a punch holding block 18 carried by the punch head 13 which is formed with a longitudinally undercut recess in its under face for the reception thereof. One side of this recess is provided by a plate 19 having a series of vertically extending slots 20 for the reception of bolts threaded into the punch head 13 and which when slightly loosened, will release said plate and permit the removal of the block 18. The latter has in its under face a relatively narrow, longitudinally extending recess designed for the reception of a pair of clamping bars 21 and 22 which grip a series of punches 23 made of short lengths of strip spring steel, though obviously other materials might be employed for the purpose without departing from our invention. These punches all lie in substantially the same plane and are removably yet rigidly held between said clamping plates under the action of clamping screws 24, of which one is shown in Fig. 3.

Each of the metal strips constituting the punches 23 has operative upon its upper edge, which projects above the bars 21 and 22, a set screw 25 mounted in the block 18 whereby any one of said punches may be independently moved longitudinally.

The transverse frame member 2, as shown in Fig. 3, is provided with a vertical slot 28 and supports a block 26 held in place by two sets of knurled head screws 36 extending upwardly through said member. Said block has in its upper face a longitudinally extending recess into which opens a slot 27 and within this recess has a die formed by a pair of elongated bars 29 and 30 rigidly clamped by a suitable number of bolts or set screws 31 threaded horizontally into the block 26. While the die bar 29 has a plane vertical face coacting with the punches 23, the adjacent vertical face of the die bar 30 is formed with downwardly flaring recesses for the reception of the punches respectively and as shown in Fig. 5, said recesses open into the slot 27 of the block 26.

Held to the ends of the block 26 by screws 32 (Figs. 5 and 6) are two upwardly extending plates 33 which serve to support a cross plate 34 immediately over the block 26 but spaced away from it, thus providing a laterally elongated, relatively narrow and horizontally extending space designed for the passage of the rubber or other sheets x which it is desired to punch. This plate 34 has in its upper face a relatively deep, longitudinally extending recess designed to receive the block 18 of the punch head 13 and the bottom of said recess is transversely slotted to permit of the close passage of the punches 23 with the downwardly projecting extensions of the clamping plates 21 and 22 which are designed to support said punches as near as possible to their cutting edge or end.

These openings through this relatively thin part 35 of the plate 34 are widely flared from above downwardly toward both the front and rear so as to prevent catching of the sheet x, said part also serving as a stripper to remove said sheet from the punches as these are drawn upwardly, since the bridge pieces 35^a bear upon that part of said sheet between the punched portion.

For intermittently feeding a sheet of material x through the machine we provide two sets of nip rolls 37—38 and 39—40 having adjacent their ends reduced portions rotatably mounted in pairs of bearing blocks 41 and 42 vertically slidable in suitable guideways formed in the side frame members 1. The blocks 41 are respectively retained in their guideways by bolts 44 having extensions 43 while the blocks 42 are similarly held in place by bolts or screws 45 having extensions 46.

The spindles 37^a and 38^a of the rolls 37 and 38 have fixed to them adjacent one end a pair of coacting inclined tooth gear wheels 47 and 48 and similarly the spindles 39^a and 40^a of the rolls 39 and 40 have fixed to them two similarly coacting gears 49 and 50. The gears 48 and 50 are respectively engaged by a pair of similar gears 51 and 52, fixed to the shaft 53, which also has fixed to it a worm wheel 54 driven by a worm 55 on a vertically extending spindle 56;—the latter having fixed to its upper end a worm wheel 57 engaged by a worm 58 fixed to a spindle 59 which also carries one member 60 of a Geneva gear.

The second member 61 of this gear is fixed to one end of the driving shaft 10 so that its pin 62 will periodically enter one of the slots of the member 60 and rotate the shaft 59 a quarter of a revolution for each full revolution of said driving shaft. In the present instance the gearing above described is so proportioned that each of the nip rolls is given one revolution for each hundred revolutions of the driving shaft 10, it being possible to adjust the distance between the nip rolls of the respective pairs by knurled head bolts or screws 63 and 64.

With the above described arrangement of parts the rotation of the pulley 11 causes the eccentric portions 12 of the shaft 10 to so act on the rollers 15 that the punch head is reciprocated, the supporting spring plates 14 being bent downwardly at each stroke of said head and being assisted by the spring 17 in returning the latter to its normally raised position. A sheet of relative thin rubber delivered to the rolls 37 and 38 is intermittently fed forward by them through the passage between the die block 26 and the stripper plate 34, and is ultimately engaged

by the line of punches 23 which simultaneously form in it a series of elongated relatively narrow slots extending for practically its entire width.

The gearing is so proportioned that shortly after the withdrawal of the punches from the sheet, the latter is fed forward a predetermined distance preferably slightly greater than the thickness of one of the punches, which immediately thereafter again act to form a second line of slots in the sheet. In the finished sheet each slot is separated from that at either end of it by a relatively narrow, unpunched rib whose width is equal to the distance between adjacent punches, so that as shown in Fig. 7, said plate or sheet has a number of parallel lines of narrow, elongated slots spaced relatively close together, with each line separated from that adjacent it by a narrow unpunched rib.

By means of the peculiar punching and stripping arrangement shown, the punchings resulting from the formation of the slots are forced cleanly out of the sheet without the production of burs or rough edges, and by reason of the peculiar punch head support, which consists of the spring plates 14 with their coacting parts, the punches will at all times properly enter the dies without likelihood of breakage or injury.

In this regard we have found the machine above described to be a material improvement over existing punching machines, for in a relatively short time the wear between a slidable punch head and its guides is such as to make its use practically impossible when the dimensions of the holes to be made are relatively small and they are placed comparatively close together.

Further, with the peculiar construction of stripper and dies shown, we have found that relatively thin plates of hard rubber may be punched with great rapidity, since not only are the punches withdrawn without injury to the sheets but the punchings formed do not clog up the machine.

We claim;—

1. The combination of a supporting structure; a pair of spring plates fixed thereto at one end so as to be spaced apart and extending therefrom parallel to each other; a punch head carried by the free ends of said plates; a punch carried by said head; a die for the punch; and means operative on the punch head for forcibly moving the punch toward the die.

2. The combination of a supporting structure; a punch head; a plurality of laterally flexible parallel members spaced apart and extending between the punch head and the supporting structure; a series of punches carried by said head; a series of dies mounted to respectively coöperate with said punches; and means operative on the punch head to move it in a line substantially at right angles to the line of the flexible member to cause the punches to coöperate with the dies.

3. The combination of a supporting structure; two parallel spring plates projecting therefrom; a punch head carried by said plates; a roller on the punch head; a driven shaft having an eccentric operative on the roller to move the punch head in a line at right angles to the line of the spring plates; a punch carried by the head; and a die placed to coöperate with the punch.

4. The combination in a punching machine of a head; a punch holding block carried by the head; a pair of clamping bars mounted in a recess of the block and having a series of transverse recesses; a series of flat independent metal strips constituting punches mounted respectively in said recesses and clamped between the bars so as to project; a series of adjusting screws mounted in the block and respectively engaging the strips; with a die having openings for the reception of the strips.

5. The combination in a punching machine of a punch head; a pair of clamping bars mounted in said head; a series of parallel metal strips gripped by said bars and constituting punches; adjusting screws mounted in the head and each operative upon an end of one of said strips projecting above said clamping bars; with a die having openings for the reception of the opposite ends of the strips.

6. The combination in a punching machine of a punch head; a block mounted therein and having a recess; a series of adjusting screws in the block extending into said recess; a pair of clamping bars in the recess; a series of metal strips clamped between said bars and respectively engaged at one end by said screws; with a die having openings for the reception of the projecting ends of the strips.

7. The combination in a punching machine of a punching head; a pair of clamping bars each having extensions along one edge; a series of metal strips constituting punches gripped between said bars and respectively engaged by a pair of adjacent extensions thereof; a die having openings placed to receive said strips; with a stripper plate extending between the punch head and said die having openings to permit of the passage of the respective punches and of the extensions of the clamping bars in engagement therewith.

8. The combination in a punching machine of a head; a series of independent metal strips carried thereby and constituting punches; a die for said punches consisting of a bar having a substantially plane face parallel with the plane of the punches,

and a second bar with a face coöperating with the face of the first bar and recessed to receive the punches; a longitudinally recessed block holding said bars and having a slot extending from its recess for the discharge of the punchings from the die; and screws in said block for clamping the bars in position.

9. The combination in a punching machine of a supporting frame; a pair of parallel spring plates spaced apart and each rigidly connected thereto at one end; a punch head carried by said plates; a roller carried by the punch head; a driven shaft having an eccentric placed to coöperate with said roller to periodically depress the head; a series of punches carried by the head; a die having openings for the reception of said punches; and means for intermittently feeding a body of sheet material between the punches and the die.

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