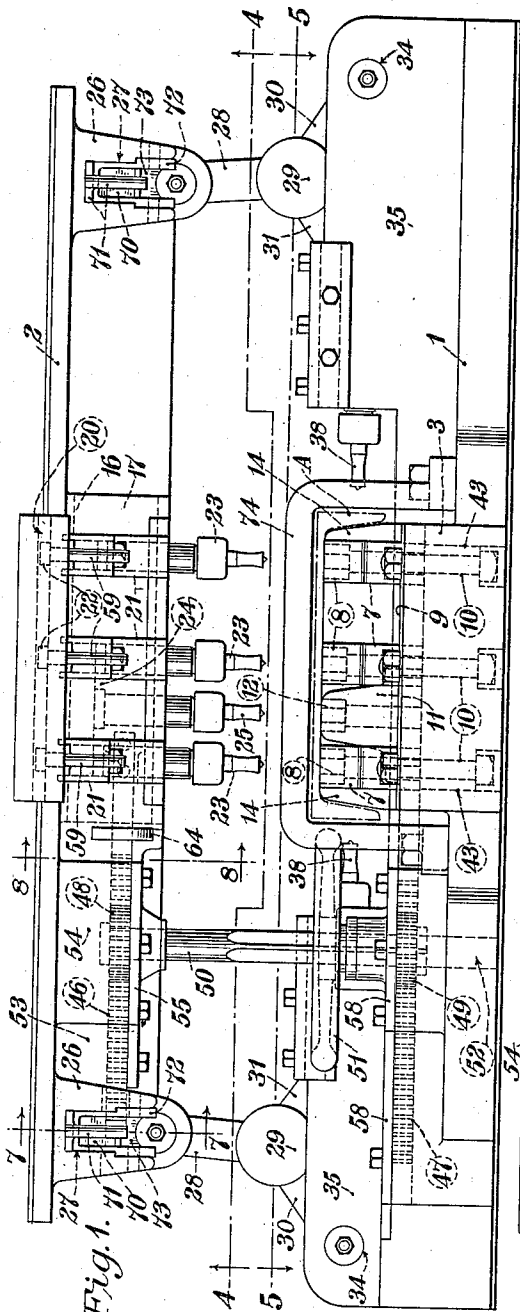


1,164,027.

F. A. STEVENSON.
CHANNEL PUNCHING MACHINE.
APPLICATION FILED FEB. 10, 1914.

Patented Dec. 14, 1915.
3 SHEETS—SHEET 1.



WITNESSES:

C. L. Betcher
Wm. M. Hara

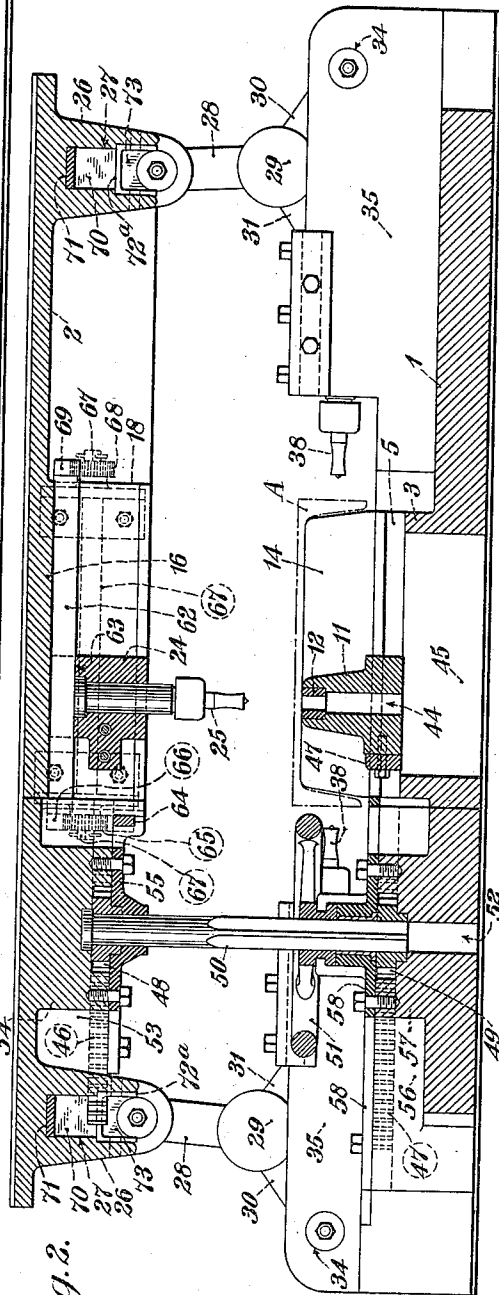


Fig. 2.

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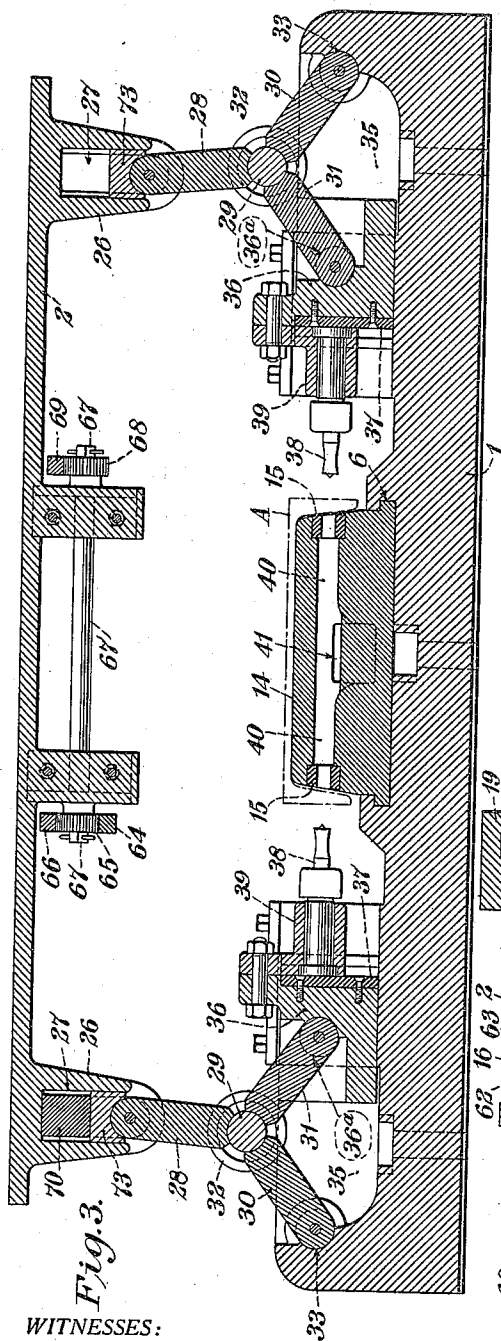


Fig. 3.

WITNESSES:

C. L. Belcher
[Signature]

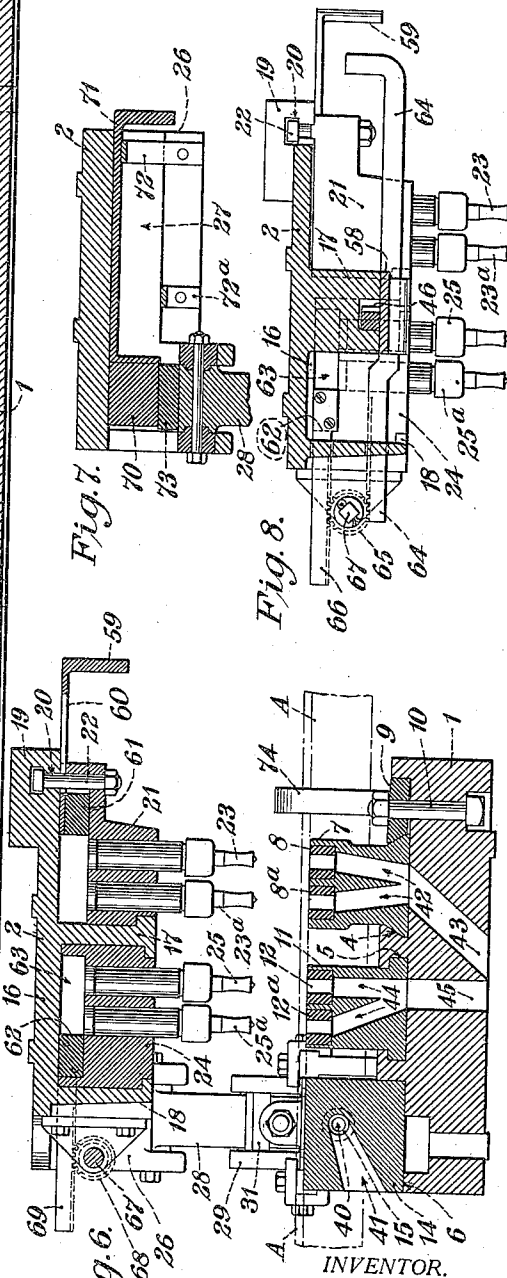
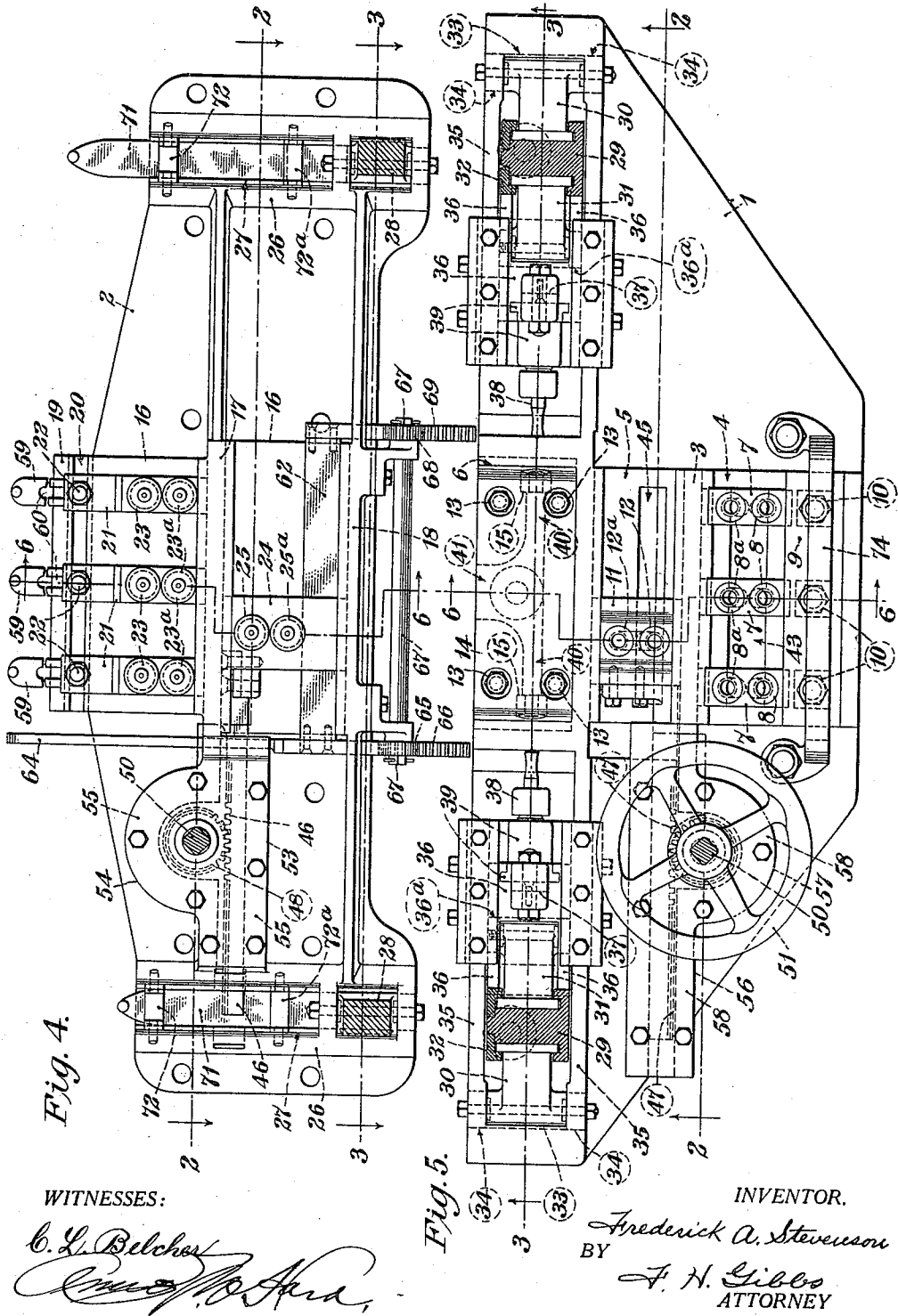


Fig. 6.

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Patented Dec. 14, 1915.
3 SHEETS—SHEET 3.



UNITED STATES PATENT OFFICE.

FREDERICK A. STEVENSON, OF DETROIT, MICHIGAN, ASSIGNOR TO AMERICAN CAR AND
FOUNDRY COMPANY, OF ST. LOUIS, MISSOURI, A CORPORATION OF NEW JERSEY.

CHANNEL-PUNCHING MACHINE.

1,164,027.

Specification of Letters Patent.

Patented Dec. 14, 1915.

Application filed February 10, 1914. Serial No. 817,799.

To all whom it may concern:

Be it known that I, FREDERICK A. STEVENSON, residing at Detroit, Michigan, and being a citizen of the United States, have
5 invented certain new and useful Improvements in Channel-Punching Machines, of which the following is a full, clear, and exact description, such as will enable others skilled in the art to which it appertains to
10 make and to use the same, reference being had to the accompanying drawings, which illustrate the preferred form of the invention, though it is to be understood that the invention is not limited to the exact details
15 of construction shown and described, as it is obvious that various modifications thereof will occur to persons skilled in the art.

In said drawings: Figure 1 represents a front elevation of the machine. Fig. 2 is a longitudinal vertical sectional view along the lines 2—2 of Figs. 4 and 5. Fig. 3 is another longitudinal vertical sectional view but in a plane further removed as indicated by lines 3—3 of Figs. 4 and 5. Fig. 4 is an
25 inverted plan view of the upper part of the structure of the machine above the line 4—4 of Fig. 1, and Fig. 5 is a plan of the lower part of such structure below the line 5—5 of Fig. 1. Fig. 6 is a vertical transverse view along the lines 6—6 of Figs. 4 and 5. Fig.
30 7 is a detail transverse view through the upper part of the machine along the line 7—7 of Fig. 1, showing the means for gagging the horizontal punches; and, Fig. 8 is a further detail transverse view along the line 8—8 of Fig. 1, whereby the manipulation of the gag for the vertical adjustable punches is made clear.

The object of the present invention is to
40 simplify the perforation of U-shaped structures, and the particular application of the invention is to the punching of holes in commercial channels, though channel pressings and other pieces with webs having angularly
45 disposed flanges are susceptible to treatment by machines embodying the principles herein disclosed.

With more particularity, the object is the construction of a machine adapted to be set
50 into a multiple punch, and which shall coöperate therewith, so as to punch holes in flanges or walls which lie in substantially vertical planes, and also those holes which lie in straight longitudinal lines in the web,
55 and further, holes located in the web out of

alignment with said rows of holes disposed in straight lines. All holes required in a given channel can therefore be produced with this machine.

Considering the various views, 1 indicates 60 the lower plate, which is provided with certain integral blocks and walls to be referred to later. Upper plate 2 also has blocks, walls and ribs integral with it.

Disposed symmetrically each side of the 65 center of the lower plate 1 is the raised portion or block 3, which contains grooves 4 and 5, that are parallel with the front edge of plate 1, and a grooved recess 6 at the rear of said block. In the groove 4 are set up 70 ordinary die blocks 7, carrying dies 8 and 8^a, the blocks being flared outwardly at the bottom that they may possess a dovetail retention in block 3, the inner wall of the groove 4 following the inner flare of the 75 die blocks 7 and a retaining plate 9, beveled to agree with the outer flare of the die blocks, being clamped by means of bolts 10 between the outer sides of die blocks 7 and the outer wall of groove 4, thereby rigidly securing 80 the die blocks with their dies to the block 3 of plate 1.

Immediately back of groove 4 is groove 5, in which slides the adjustable die block 11, carrying dies 12 and 12^a, the adjustable die 85 block having a tongue and groove connection with the block 3 of plate 1. Back of groove 5 is recess 6, retaining, by a tongue and groove connection and also bolts 13, a horizontal die block 14 in which is seated at 90 each end a die 15, the axis of whose hole is horizontal and parallel to the rear edge of plate 1. Suspended above the lower plate 1 is upper plate 2, also provided with a centrally positioned area 16 of slightly in- 95 creased cross section, in a measure corresponding to block 3 of lower plate 1, and having depending vertical walls 17 and 18 which run parallel with the front and rear edges of plate 2. The plate 2, upon its upper 100 surface and within the limits of the area 16, is provided along its front edge with a block 19 containing an ordinary T-slot 20.

Punch blocks 21 are attached at their outer ends to the upper plate 2 by means of 105 bolts 22, the heads of which rest in the slot 20 of the block 19. The inner ends of these punch blocks rest on a flange of the wall 17, and when the nuts of bolts 20 are tightened the punch blocks 21 are rigidly secured to 110

upper plate 2. The punch blocks 21 carry punches 23 and 23^a which are in vertical alinement with their respective dies 8 and 8^a located in the die blocks 7. Each of the walls 17 and 18 at its lower extremity is provided with a flange for retaining the adjustable punch block 24 which is located between them. Said punch block is provided with punches 25 and 25^a, the vertically disposed axes of which are in coincidence with the vertical axes of the dies 12 and 12^a of the adjustable die block 11, and are always so maintained, as will be later made clear.

At each end of the upper plate 2 on its under side, is a prismoidal integral block 26 containing a relatively deep longitudinal channel or recess 27. The bottoms of these channels 27 are closed at the rear of each, and again at a short distance in advance of the rear, by loops, whereby bearings are created for the upper cylindrical ends of nearly vertically disposed toggle members 28. Lower ends of toggle 28 bear upon a horizontal cylindrical pivot 29, as best seen in Figs. 3 and 5, and, with their inner ends also bearing on each pivot 29, two other similar toggle members 30 and 31 of each toggle mechanism, inclined downwardly and outwardly, are held in operable relationship at this point by a cap 32, screwed onto one end of the pivot 29, which at its opposite end has a flange similar in form to the cap.

Both the flange of the pivot 29 and the cap 32 are annularly grooved for the reception of the ends of the arcuated flange present at the pivot bearing ends of each toggle member, and, in overlapping these flanges, the cap and the pivot flange keep them in proper contact with said pivot 29. The lower outer ends of toggle members 30 are seated as at 33, in end walls of the lower plate 1, their cylindrical ends or projections being retained in holes 34 in the vertical walls 35 at and near the rear of lower plate 1, said toggle members 30 being thus confined to a rotary movement. The lower ends of toggle members 31 project oppositely to the corresponding ends of toggle members 30, and are seated in horizontal movable heads 36, that have vertical side walls in which are holes 36^a to receive and restrain the lower cylindrical ends of toggle members 31. The lower ends of toggle members 30 and toggle members 31 are seated and restrained in substantially the same manner. To each horizontal head is secured a backing plate 37, against which bears the punch stem of each horizontal punch 38, the latter being carried by horizontal punch block 39 bolted to horizontal head 36.

Upon the descent of upper plate 2, the toggles 30 and 31 assume an approximately horizontal position, the horizontal heads 36

move toward horizontal die block 14, carrying horizontal punches 38 with them. In performing work, these punches penetrate the flanges of the channel, shown at A in dot and dash lines, perforate it and enter the dies 15. The resultant slugs find an exit through passages 40, which merge and have an outlet at 41, from whence the slugs drop to a scrap pile. Said horizontal die blocks 14 not only assist in guiding the work, but also hold the channel in position so as to strip it from the punches upon withdrawal of the latter. Slugs from dies 8 and 8^a escape through passages 42 in die blocks 7 and 43 in lower plate 1. From dies 12 and 12^a in die block 11, passages 44 in the latter and 45 in lower plate 1 constitute the path of egress.

In its travel through the machine, the channel A is guided by the horizontal die block 14 which conforms to the concave outline of the said channel and also by a wiper 74, which is bolted to lower plate 1 near its front edge. In most cases where a channel is to be punched, there will be certain proposed holes located in straight longitudinal lines. For punching these holes, punch blocks 21 and die blocks 7 may be adjusted so that the punches 23 and 23^a and the dies 8 and 8^a are centered upon the longitudinal lines. The punch blocks 21 and die blocks 7 may then be clamped in place, so to remain throughout the particular job in hand, as before described. But every here and there will be found indicated on a guide template a hole out of alinement with such longitudinal rows of holes. To punch these the adjustable punch block and adjustable die block, 24 and 11, respectively, are moved laterally across the channel web, to come over the transverse position of the intended hole. The longitudinal position of said hole having been secured through the feed of the channel A through the machine, the punch 25 or 25^a, according to the size the hole is to be, will then be directly over the hole location in the web, and its respective die 12 or 12^a directly under it.

Means for moving adjustable block 24 and adjustable die block 11 consist of rack 46 for block 24 and rack 47 for die block 11, pinions 48 and 49, 48 meshing with rack 46, and 49 with rack 47, a vertical shaft 50 which rotates the pinions and a hand wheel 51, which has a square aperture in its hub which surrounds the squared portion of the vertical shaft 50 and turns the latter whenever the hand wheel is given rotary motion.

Pinion 48 is keyed to the upper end of shaft 50 while pinion 49 has a square hole at its center which surrounds the squared portion of the shaft, and therefore each responds to any rotative movement of said shaft 50. Upon the downward thrust of upper plate 2, the shaft 50 is carried down,

taking with it pinion 48. Pinion 49 is capable only of rotary movement and shaft 50 simply slides through it into hole 52 in lower plate 1, positioned to receive it. Upper plate 2 is furnished with an integral rectangular block 53, having a semi-cylindrical protuberance 54, the part 53 being recessed to receive and guide rack 46 and part 54 to accommodate pinion 48 and the top of shaft 50. A cover plate 55 bolted to block 53 and protuberance 54 completes the housing of the movable parts just referred to, and, when in place, establishes a bearing for the upper end of shaft 50. A similar rectangular block 56 and semi-cylindrical protuberance 57 is formed on lower plate 1, and the former is recessed for the reception and guidance of rack 47, while the latter receives pinion 49 and the lower end of shaft 50. A cover plate 58 is employed to complete the housing of the parts last described. The cover plate 58 also forms, by a vertical extension, a bearing for the shaft 50, and here it is internally fitted with a wearing bushing, as will be seen in Fig. 2.

The manner of selecting and rendering the punches operative, or the reverse, is as follows: First taking under consideration punches 23 and 23^a, carried by punch blocks 21, being the first row of vertical punches encountered from the front of the machine, at the center, it will be noted by reference to Figs. 1, 4, 6 and 8, that each is provided with a gag handle 59. This gag handle is L-shaped and in its longer and horizontal leg is provided with a longitudinally extending slot 60. The bolts 22 pass through the slots 60 and prevent the accidental complete removal of any of the gags 61, which latter are fastened to the inner ends of gag handle 59 as disclosed in Fig. 6. With all the gag handles 59 in the position shown in Fig. 6, none of the punches 23 or 23^a will be operative, but should it be desired to employ one or more of punches 23, the gag handle or handles 59 associated with such punches are pushed part way in until the gag or gags 61 fill the space immediately over the top of such punch or punches 23. Thereupon, the downward stroke of upper plate 2 carries downwardly both the punches 23 and 23^a, but, upon reaching the web of the channel A to be punched, only the punch or punches over which the gag or gags 61 are positioned will be caused to penetrate the work and enter the die or dies 8. The other punches 23 will recede into the space above the top of their punch stems, there being sufficient clearance between the top of the punch stems and the underside of plate 2 to prevent contact of the punch stems and said underside of plate 2. Thus only when the gags 61 are interposed will the punches become operative. By a further inward movement of any gag 61, the space above the stem

of the punch 23^a with which such gag is associated will be occupied by said gag and such punch 23^a caused to become operative, in quite the same way that punches 23 were rendered so. Punches 25 and 25^a, adapted to travel across the web of the channel A to reach any hole in the web out of alinement with the punches 23 and 23^a are controlled by gag 62. Gag 62 lies in a broad groove or recess 63 in the top of the adjustable punch block 24. In the position shown most clearly in Fig. 6, neither of the punches 25 or 25^a is operative. But, by pushing in the adjustable punch gag handle 64, part way, gag 62 is brought over the stem of punch 25^a, which will then produce a hole in the web of the channel upon the downward thrust of upper plate. The rear end of gag handle 64 is provided with teeth constituting a rack which meshes with pinion 65, the latter being rotated by the former when it is moved in or out. Pinion 65 also meshes with a rack formed in another bar 66 which is screwed to one end of gag 62 and imparts motion to the latter when handle 64 is moved. Pinion 65 is provided with a central square hole which fits about a squared end of shaft 67, causing this shaft to rotate with it. At the opposite squared end of the same shaft is secured a similar pinion 68, meshing with a rack bar 69, which is screwed to the other end of gag 62. Hence, when the adjustable punch gag handle 64 is pushed inwardly the rack on its rear end revolves pinion 65, thus impelling rack bar 66 which results in carrying gag 62 to the desired position. The auxiliary pinion 68 revolving in unison with pinion 65 and the shaft 67 which carries both, impels the auxiliary rack bar 69 that is attached to the end of the gag 62 opposite that to which rack bar 66 is screwed, thus preventing any deflection of the gag 62. A further inward thrust of gag handle 64 will cause gag 62 to come over punch 25, which will then be effective and punch 25^a goes out of service.

To use one of the horizontal punches 38, which are similar in design, a gag 70, having a gag handle 71, is pushed inwardly. See Figs. 1, 2, 3, 4 and 7. The gag handles 71 are supported toward their outer ends by U-shaped brackets 72, while further back in the slots 27 of the prismatic blocks will be found other somewhat similar brackets 72^a. The function of the latter is to receive and support the gags 70 before they have been entirely withdrawn from over the toggle bearing blocks 73, and thereafter. Toggle blocks 73 are always resting upon the upper ends of vertical toggle members 28, and, when one or both of the horizontal punch gags are inserted above them and beneath the underside of upper plate 2, the downward thrust of said plate is communicated

to gag 70, toggle bearing blocks 73, vertical toggle members 28 and pivot 29. The downward movement of pivot 29 tends to straighten out toggle members 30 and 31, thereby forcing the horizontal heads to travel toward the horizontal die block 14. The horizontal punch blocks 39, bolted to the horizontal heads carry the punches 38 to and through the flanges of the channel A and into the dies 15 in horizontal die block 14.

The operation of the machine is as follows: A channel A is fed forwardly, being guided by the horizontal die block 14 and the wiper 74, until the position of the first hole to be punched is reached. If this hole is one of a number that are located in a straight line, to produce which punches 23 and 23^a were provided, the gag handle 59 for the punch over the position of the proposed hole is pushed inwardly. For one sized hole it is moved until its gag 61 is over punch 23, and for another sized hole it is pushed in still farther until its gag is over punch 23^a, it being understood that punches 23 and 23^a are of different diameters. The upper plate 2 is then caused to descend by the actuation of the multiple punch slide which carries it. Whichever punch is gagged is forced through the web of the channel A and into its die 8 or 8^a, as the case may be. At such times as hole positions are encountered during the passage of the channel through the machine that are not in line with any of the punches 23 and 23^a, hand wheel 51 is rotated sufficiently to cause the squared vertical shaft 50 to drive pinions 48 and 49 the requisite amount to impel their racks 46 and 47, which in turn will bring the adjustable punch block 24, carrying punches 25 and 25^a, and adjustable die block 11 with its dies 12 and 12^a, to a point where the proper punch will be in a position to produce the hole desired. Gag handle 64 is then pushed in (see Fig. 8) and its rack revolves pinion 65 with which also turns shaft 67 and auxiliary pinion 68. The two pinions just mentioned drive rack bars 66 and 69 thereby carrying gag 62 over punch 25 or 25^a, as desired, and in accordance with the amount of movement of the hand wheel 51.

It is to be noted that, as best disclosed in Figs. 2 and 4, the gag 62 is of greater length than the distance punches 25 and 25^a are capable of traveling transversely of the web of the channel. For this reason, no matter what transverse position these punches occupy the gag 62 can always be brought over either one of them. As hole location in the flanges of the channel A come opposite the horizontal punches to produce the holes, the gag handle 71 of the horizontal punch to be operated is pushed in. This places gag 70 over toggle bearing block 73

and under upper plate 2. A downward stroke of this plate, as before described, propels the punch 38 toward and through the flange of the channel and into its die 15. This, of course, is accomplished through the action of the toggle mechanism in driving the horizontal head 36. Upon the withdrawal of the gag 70 from over the toggle bearing block 73, the horizontal punch is rendered ineffective.

What I claim is:

1. In a device of the character described, a group of fixed vertical punches, selective means for rendering same operable, a plurality of slidable vertical punches movable parallel thereto, controlling means for said slidable punches separate therefrom but attached thereto, means rendering any of said slidable vertical punches operable, a plurality of oppositely disposed horizontal punches, selective means for rendering same operable, and means for operating selected punches.

2. In a machine of the character described, a group of fixed vertical punches, selective means for rendering same operable, said fixed punches being arranged transversely of channel-shaped work and being adapted to punch all holes in alinement, a plurality of slidable vertical punches movable parallel to said fixed punches to punch various sized holes out of alinement with the holes punched by said fixed punches, controlling means for moving said slidable punches transversely of the work separate therefrom but attached thereto, selective means rendering any of said slidable vertical punches operable, a plurality of oppositely disposed horizontal punches for punching holes in both flanges of said channel-shaped work, means adapted to actuate said horizontal punches and means for operating selected punches.

3. In a punch of the character described, an upper plate and a lower plate, a plurality of selective vertical punches and dies positioned, respectively, in the former and latter, certain of said vertical punches being carried in different planes in a punch block slidably retained in said upper plate, and certain dies in a slidable die block in said lower plate, controlling means for moving said slidable punch and die blocks transversely of the work, separate therefrom but attached thereto, a gag lying in a recessed portion of said punch block and being restrained from movement therewith, said punch block being capable of traveling only within the limits of said gag, said gag being adapted to slide across said punch block and over the punches in any of said different planes, said upper plate being adapted to operate selected punches.

4. In a machine of the character described,

an upper plate and a lower plate; a plurality of selectable vertical punches and dies positioned, respectively, in the former and latter, certain of said punches occupying 5 fixed positions and others being located in different planes in a punch block retained in said upper plate and slidable parallel to said fixed punches and certain dies in a slidable block in said lower plate, controlling 10 means for moving said slidable punch and die blocks transversely of the work, separate therefrom but attached thereto, means for rendering operable any punch in said slidable punch block, said means comprising: a 15 gag lying in a recessed portion of said punch block, said gag being independent of the movement of said punch block and adapted to slide thereacross to rest over any punch carried thereby, bars containing racks secured to opposite ends of said gag, a shaft 20 supported from said upper plate, pinions on said shaft meshing with said racks, and an operating handle with a rack meshing with one of said pinions, said upper plate being 25 adapted to cause the operation of selected punches.

5. In a machine of the character described, an upper plate and a lower plate, horizontal punches slidably retained in said lower 30 plate, a work-guiding and punch-stripping double die block secured in said lower plate, said punches and said die block being alined in a single direction, a work-guiding and punch-stripping wiper, actuating means for 35 each horizontal punch, and selective means for rendering operable one or more of said punch actuating means, said upper plate being adapted to cause the operation of punches affected by said selective means.

40 6. In a machine of the character described, an upper plate and a lower plate, selectable horizontal punches slidably retained in said lower plate, dies in a work-guiding and punch-stripping die block, blocks having a 45 plurality of recesses integral with and depending from said upper plate, separate actuating means for each horizontal punch, one element of which is slidably mounted in one of said upper plate blocks, there being in 50 each of the latter a bearing block borne upon said element, a gag for rendering said actuating means operable, a support for said handle and another support for said gag when said gag is in an ineffective position, 55 said upper plate being adapted to cause the operation of selective punches.

7. In a machine of the character described, an upper plate having integral depending parallel walls and an integral slotted block, 60 fixed punch blocks supported by one of said flanged walls and clamping means retained in said slotted block, punches in said fixed punch block, selective means for rendering any of said fixed punches operable, a slidable

punch block, a plurality of punches carried 65 thereby and retained between said flanged walls, said slidable punch block being capable of moving parallel to the punches in said fixed punch blocks, selective means for rendering operable any of the slidable 70 punches, a lower plate, fixed die-carrying blocks mounted thereon in vertical alignment with said fixed punch blocks, a slidable die-carrying-die block maintained in alignment with said slidable punch block, and 75 controlling means for moving said slidable punch and die block transversely of the work, separate therefrom but attached thereto, the said upper plate being adapted to cause the operation of selected punches. 80

8. In a machine of the character described, a grooved lower plate, fixed die-holding die-blocks with outwardly extending bottoms coöperating with said grooved plate, a retaining plate in the groove overlapping said 85 die-holding blocks and adapted to form with a wall of said groove a recess in which said die blocks are clamped by said retaining plate and means securing said retaining plate to said lower plate. 90

9. In a machine of the character described, a movable plate and a stationary plate, punches and dies fixed in the former and latter, respectively, a slidable punch block in said movable plate and a slidable die-block 95 in said stationary plate, a plurality of punches carried by the slidable punch block and dies carried by the slidable die block respectively, said slidable punch and die blocks being adapted to pass said fixed punches and dies, 100 controlling means for moving said slidable blocks in unison and selective means rendering desired punches operable, said movable plate being adapted to operate such punches.

10. In a machine of the character described, a movable plate and a stationary 105 base, punches and dies carried, respectively, by the former and latter, other differently directed punches and dies mounted in said stationary base and actuating means for the 110 last mentioned punches, said movable plate being adapted to operate said actuating means and the first mentioned punches.

11. In a machine of the character described, a movable plate and a stationary 115 base, punches and dies carried, respectively, by the former and latter, other differently directed punches and dies mounted in said stationary base, actuating means for the latter punches and a work-guiding die-block, 120 said movable plate being adapted to operate said actuating means and the first mentioned punches.

12. In combination in a punching machine, a movable plate and a stationary base, 125 punches and dies carried, respectively, by the former and latter, oppositely disposed sets of punches and dies mounted in said

stationary base, independently operable actuating means for the latter punches and selective devices, some adapted to cooperate with the actuating means and some with said first mentioned punches to render any punch operable, selected punches being operated by said movable plate.

13. In a machine of the character described, a movable plate and a stationary base, fixed and slidable punches in the former and fixed and slidable dies in the latter, means for synchronously moving said slidable punches and dies past said fixed punches, other differently directed punches and dies mounted in said stationary member, actuating means for the latter punches, and selective means for each of the punches, said movable plate being adapted to operate selected punches.

14. In a machine of the character described, a movable plate and a stationary base, synchronously movable punch and die blocks in the former and latter, respectively, differently positioned punches in the punch block and a gag immovable in the direction of the travel of said punch block but adapted to move transversely thereof to render any predetermined punch effective.

15. In a machine of the character described, a movable upper plate and a stationary lower base, a die-block also mounted in said base and common to both punch blocks, toggle mechanisms connecting each punch block with said base and said upper plate

and selective means for rendering each punch operable, said upper plate being adapted to operate any selected punch.

16. In combination in a punching machine, a stationary bed, a plurality of punches movable toward each other, a work holding member intermediate said punches, a movable slide, and toggle connections intermediate said stationary bed, movable punches and slide adapted upon movement of the slide to actuate the said plurality of punches.

17. In combination in a punching machine, a stationary bed having shouldered portions, a plurality of punches slidable on said bed, a movable slide, gags in said slide and a toggle connection from said slide in proximity to said gags adapted to force said toggle against the shoulders of the bed and to move said punches toward each other.

18. In combination in a punching machine, a fixed bed, a punch block movable thereupon, means for slidably locking the punch block in operative relation to said bed, a slide and a toggle operatively movable with said slide and punch block and held in fixed operative relation to said bed.

In witness whereof I have hereunto set my hand in the presence of two witnesses.

FREDERICK A. STEVENSON.

Witnesses:

ELIOT W. STUDER,
ARNOLD L. PIPPER.

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