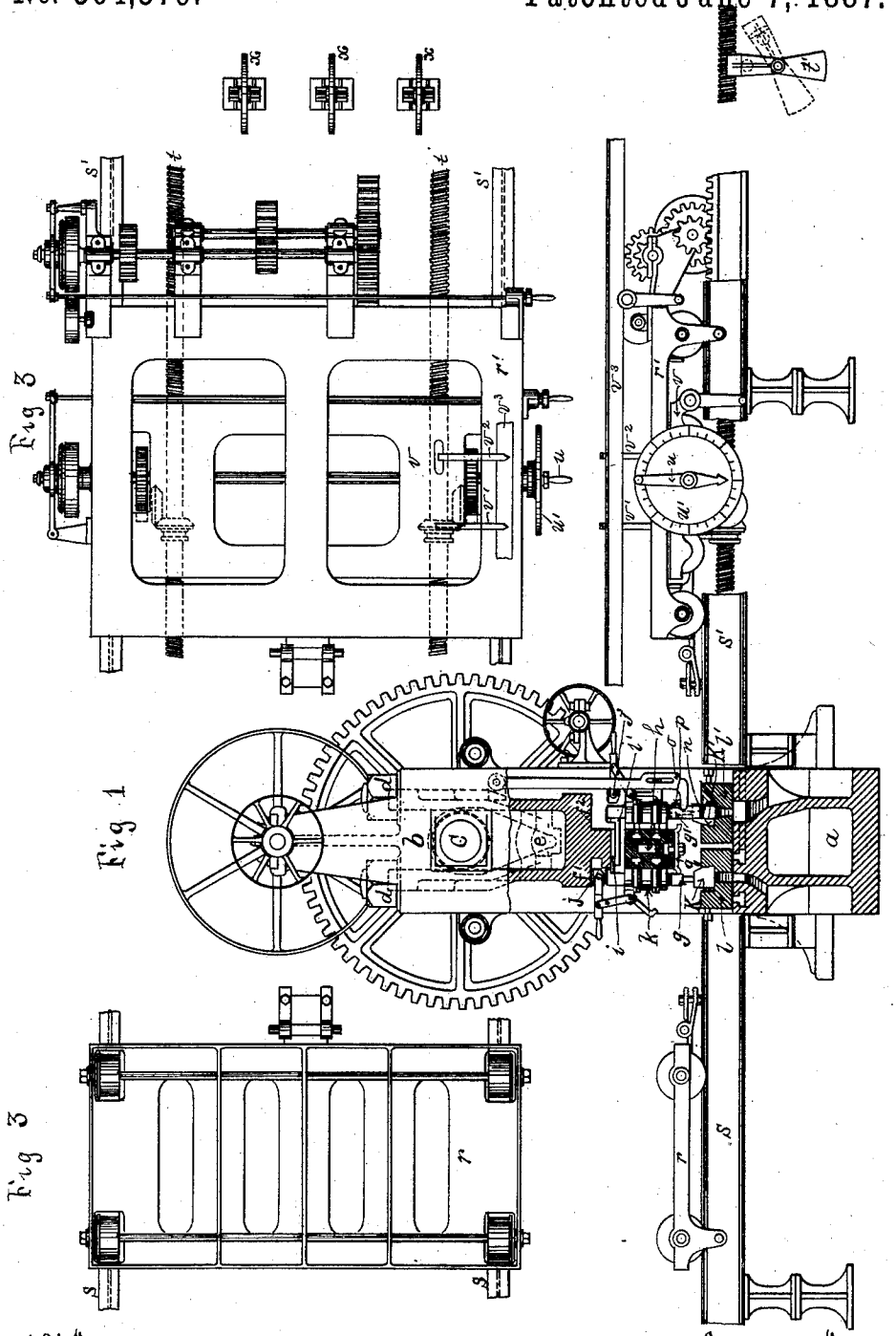
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F. J. SLADE.

PUNCHING MACHINE.

No. 364,379. Patented June 7, 1887.



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(No Model.)

4 Sheets—Sheet 2.

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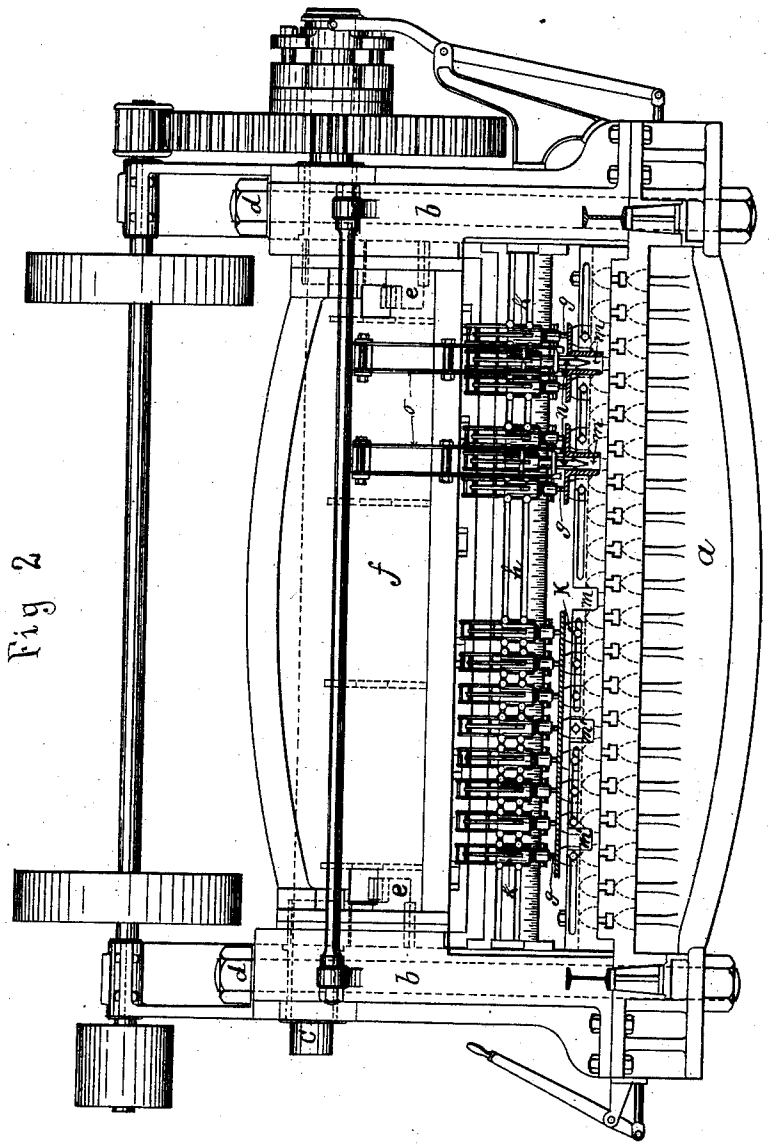


Fig 2

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Fig 7

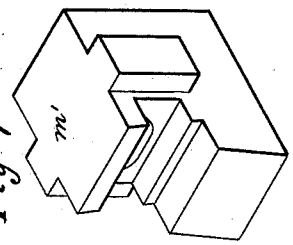


Fig 6

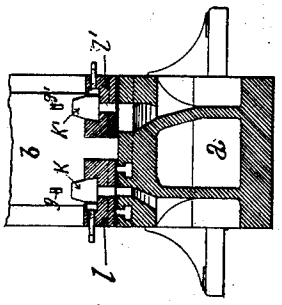


Fig. 5

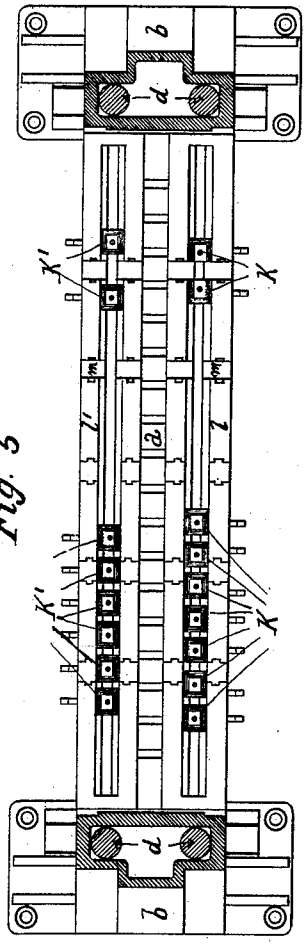
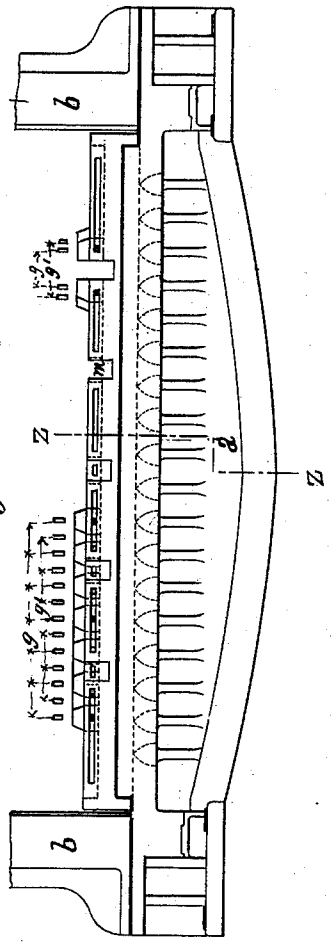


Fig. 4



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PUNCHING MACHINE.

No. 364,379. Patented June 7, 1887.

Fig. IX.

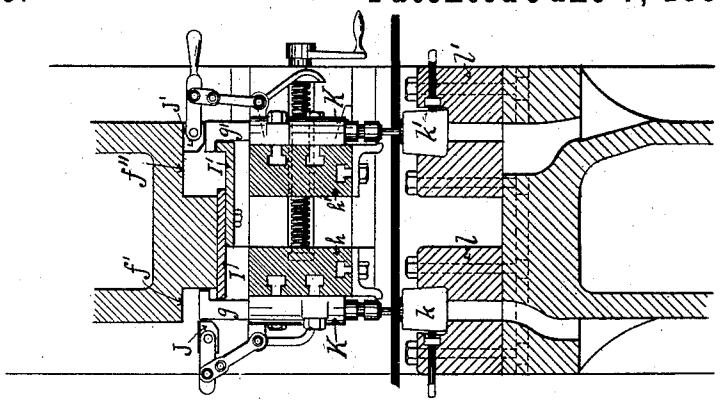
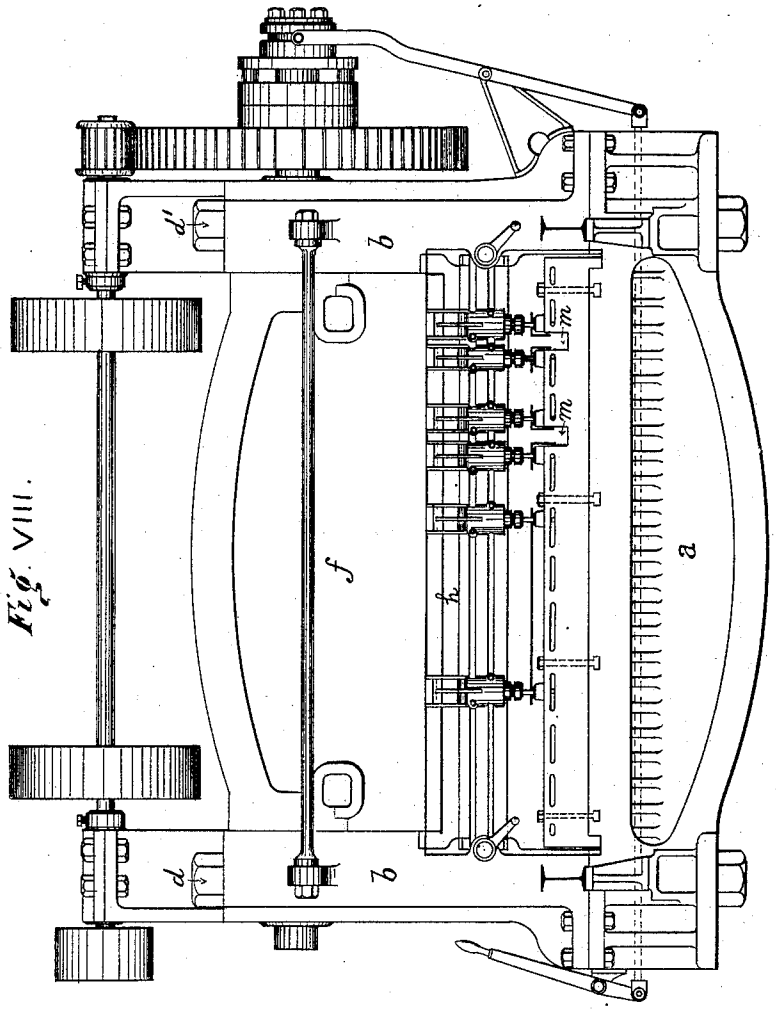


Fig. VIII.



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UNITED STATES PATENT OFFICE.

FREDERICK J. SLADE, OF TRENTON, NEW JERSEY.

PUNCHING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 364,379, dated June 7, 1887.

Application filed March 6, 1885. Serial No. 157,900. (No model.)

To all whom it may concern:

Be it known that I, FREDERICK J. SLADE, of the city of Trenton, county of Mercer, and State of New Jersey, have invented a new and useful Improvement in Machines for Punching Holes in Plates, Angles, and other Bars or Shapes; and I do hereby declare that the following is a description of the same.

In the method usually employed for such work, templets are made giving the position of all the holes to be punched in each piece, and from these templets, when laid on the separate pieces, the centers of the holes are marked on the piece and the holes afterward punched by machines punching a single hole at a time, the center mark for each hole being brought as near as may be under the center of the punch. Sometimes, but more rarely, the holes are punched by machines provided with automatic spacing devices which move the piece to be punched a certain distance, as required, by mechanical means. Both these methods are liable to inaccuracies from various causes, such as inexact adjusting of the piece in the first method, or errors of operation by the workman in the second, and, as a consequence, when the several parts intended to be riveted together are assembled in position, it usually occurs that the holes in the various pieces do not perfectly match, thus causing expense in reaming and variations in the size of the reamed holes.

My invention relates to the class of machines in which the holes are punched by a number of punches acting one or more at the same time, and the devices which I have invented are such that the various pieces which, when put together, form a girder or other structure, may be punched simultaneously by a single passage of the parts through the machine, thus making the spacing of the holes in the component parts absolutely the same in each piece, so that when the parts are assembled the holes must match perfectly.

In carrying out my invention I arrange the punches in two separate rows or sets on two faces of a frame running across the machine, and one sufficiently in advance of the other, so that the individual punches, being movable independently, can be placed so that the center lines passing longitudinally through the several punches of one row can be brought to any desired degree of closeness to those passing through the punches of the other row, whereby holes can be punched as close together laterally as may be desired, which cannot be done where the punches are arranged in a single row, the diameter of the punch-holder in that case limiting the degree of proximity that can be obtained. By this means, also, and by making the distance between the two rows of punches variable at will, I can so arrange the punches as to punch a greater number of holes at a single stroke of the machine than where all are in a single row. My invention includes devices for regulating the spaces through which the work shall be moved and for avoiding errors on the part of the workman, which will be referred to in the following description of my invention.

In the accompanying drawings, Figure I shows a side elevation of the machine; Fig. II, an end elevation; Fig. III, a partial plan. Fig. IV is an elevation of the lower portion of the machine; Fig. V, a horizontal section showing the arrangement of the dies on the machine. Fig. VI is a vertical section through the line *z z*, Fig. IV; and Fig. VII, an isometric view, on a larger scale, of a block, *m'*, fitting into the space *m*, shown in Figs. IV and V. In Fig. VIII is shown an end view, and in Fig. IX a longitudinal section, of the body of the machine arranged with rows of punches on a single face of separate frames *h* and *h'*, which frames are adjustable toward or from each other.

In the different views, *a* represents a heavy transverse girder, made sufficiently strong to resist, with safety, the action of all the punches, if acting at one time.

b b represent two upright posts, which support the bearings for the main shaft *c*, and through which pass stout steel bolts *d d*, also capable of resisting the strain produced by all the punches. The cam shaft *c*, by means of pintles *e e*, gives motion to a large and deep cross-head, *f*, which imparts motion to the punches *g g g* and *g' g' g'*, which are arranged in two rows on the cross-frame *h*, supported by the posts *b b*. The distance apart longitudinally of the rows of punches on the faces of this frame may be varied either by providing blocks to be placed between the punch-holders on one face and the face of the frame

h, thus blocking out that row to any convenient distance from the face of the frame and thus from the other row; or the punches could be arranged on a single face of a number of independent frames, as shown by Figs. VIII and IX, each adjustable longitudinally to any desired position. In this way, also, if desired, more than two rows of punches could be provided and adjusted to any desired distance apart, though in practice two rows will usually be sufficient. The frame *h* is provided with T-grooves on each face, in which tongues formed on the punch-holders *k* slide, and which receive the heads of the bolts, by which these are held in position. By slacking these bolts the punch-holders can be quickly slid on the face of the frame *h* to any desired position, the tongues fitting into the grooves maintaining the holders in a vertical position, and the bolts being again tightened, the holders are securely held in place. A graduated scale is also provided on each face of the frame *h* to facilitate setting the individual punches in their desired positions.

The punch-plungers *g g'* are formed with a lip catching over projecting plates *i i'* on the lower edge of the cross-head *f*, so that as the latter rises the punches are drawn out of the holes which they have made.

Between the top of the punch-plungers and the faces *f' f²* of the cross-head *f* there is a space which allows the cross-head to descend to the bottom of its stroke without forcing the punch down to the level of the die. So long, therefore, as this space remains unfilled, no holes will be made by the punches. When it is desired to punch a hole, the block *j* is thrown into this space, so that as the cross-head descends the punch will be forced down into the die and the hole formed in the work.

The dies K K K' K' are held in castings *l l'*, resting on the transverse girder *a*, suitable openings being provided both in these castings and in the girder to let the punchings drop through. The casting *l'* is movable in the same direction as the punches *g' g'*, so that the dies may be brought under the punches in whatever position they may occupy. Through these castings *l* and *l'* are grooves *m m* deep enough to allow the vertical flanges of the largest angle or other shape that it is intended to punch to pass when the horizontal flange is resting upon the dies, so that bars of such shape may be passed under the punches at the same operation with flat bars or plates or shaped bars of other form; or the castings *l l'* may be made in separate sections, with spaces left between them equivalent to the grooves *m m*. This groove or space is of such width that a wedge, *n*, may enter between a pair of bars which are being punched, for the purpose of pressing them against the sides of the groove before the punches descend, so that the holes may be made at a uniform distance from the back of the bars. This wedge may be made with a longitudinal opening in the center, so as to allow it to be slightly compressed in case the bars exceed their supposed thickness. When the holes have been punched, the block *j* is thrown out and hooks *o* thrown by the same operation, so as to catch under pins *p* on the wedge, and thus as the cross-head rises the wedge is raised also and the pressure on the bars relieved, so that they can be freely moved to their next position. As the wedge is not again forced between the bars until the operator again throws the block *j* in position over the wedge, the freedom of the bars to move is not interrupted by the movements of the cross-head while they are being moved to their next position. Instead of a wedge arranged to be moved by the cross-head, a cam or lever operated by hand may be used to force the bars to their position against the sides of the grooves. Removable pieces *m' m'* (shown in Fig. VII of the drawings) are provided, fitting into the grooves *m m*, and so shaped that when inserted in place the grooves *m m* will be filled up, leaving the channel in the castings *l l'* continuous and uniform from end to end, so that when plates or bars having no vertical flanges are being punched the dies may be placed at any point in the castings *l l'* as if the grooves *m m* did not exist. Suitable strippers, *q q*, are bolted to the frame *h* to strip the work from the punches.

The work to be punched is supported on suitable carriers, *r r'*, at each end, traveling on the tracks *s s'*, which guide their motion.

The position of the holes can be marked on the work by means of templets, if it be desired; but I prefer in most cases, instead of this, to secure the stopping of the work in the desired positions for punching by mechanical means, which I will now describe.

Between the tracks *s' s'* are two stationary screws, *t t*, of convenient pitch—say, for example, one thread per inch. On these are nuts, which are provided with gearing, so that they may be caused to revolve by means of the handle *u*. If in the case supposed the gearing is so proportioned that each revolution of the handle *u* causes one revolution of the nut, then for each such revolution the nuts will travel exactly one inch. These nuts are connected to the adjustable stop *v*, so that their motion is imparted to the latter. Behind the handle *u* is a dial-plate, *w'*, divided into any desired number of equal spaces, and the motion of the handle over any number of these will indicate the motion of the adjustable stop through an equal number of such parts of an inch. The handle *u* is provided with an index-pointer, *w²*, so that its motion on the dial may be accurately noted, and if we suppose the circumference of the dial to be divided into sixteen equal parts, then the motion of the pointer over each of these will indicate the motion of the adjustable stop one-sixteenth of an inch. Thus the latter may be moved through any desired distance with great accuracy.

The adjustable stop occupies a position in an opening eight or ten inches wider than it-

self in the carrier r', and is planed on its edges so that the carrier when moved up to it will bear fairly against it. The screws t t are supported by swinging bearings t' t', which are pushed over out of the way by guards surrounding the nuts as the latter travel along the screw, and rise again into position when they have passed. The weight of the screw in the vicinity of the nuts is supported by a bearing on the adjustable stop, thus relieving the swinging bearing for the time of any weight, and leaving it free to swing freely out of or into its usual position, ready to support the weight of the screw when the stop has passed along to another point.

To direct the workman operating the machine how far to move the adjustable stop so that the holes shall be punched in the work at the points desired, a wooden strip, v^3, is prepared of any convenient width, but of a length equal to or greater than that of the work to be operated on, on which are ruled longitudinal parallel lines equal in number to the individual punches which are to be employed and of a length equal to that of the work. Each one of these lines refers to one of the punches which is to be operated, and at the proper intervals along its length points are marked, showing the distances apart at which the holes to be formed by the punch to which such line refers are to be made. Thus all the holes to be punched in the work will be represented by marks made on this strip, those to be made by each punch being marked on the line representing that punch, the distances longitudinally of these marks on the strip being precisely the same as the distances longitudinally of the holes to be made in the work.

On the adjustable stop v are two pointers, v' v^2, which are so placed as to pass along over the face of the strip v^3 as the stop is moved, and thus enable the workman to see when he has moved the stop the distance from one hole to the next, as marked on the strip. The pointer nearest to the cross-frame h is used to determine the proper position of the stop when the punches on the nearer side of the cross-frame h are about to be operated. The pointer farthest from the cross-frame h governs the position of the stop when the punches on the farther side of the cross-frame h are about to be operated. The distance between the pointers must be the same as that between the two rows of punches; and as this distance may be varied, the pointer indicating for the punches g', whose distance from the face of the cross-frame h can be varied, must also be movable longitudinally to the same extent.

In preparing the strip v^3, the distance of each mark from the point representing the end of the work is measured by means of a long scale graduated to inches and fractions of inches, and the fractional part of the inch is marked on the strip, so that the workman operating the handle u will see at exactly what point on the dial u' he should stop the index-pointer so as to move the adjustable stop v the exact distance required. Thus the workman has at all times under his eye a diagram of the work to be done, so that no effort of the memory or extraordinary care are required on his part, while the strip v^3 can be prepared with much less labor and material than would be required for a templet made to lay out the holes on the work itself in the ordinary way.

Rollers x x are provided to support the work as it lies in the machine.

Fig. II shows the machine arranged to punch at a single operation a plate and two pairs of angle-bars, which, when riveted together, will make a plate-girder. The blocks m' m' at the points where the angle-bars are placed are removed, while those in the grooves m beneath the plate are left in position, so as to fill these grooves.

The manner of operating the machine is as follows: The piece or pieces to be operated upon are laid on the rollers at the end of the machine, opposite from the adjustable stop, with their edges parallel to the tracks s, and made fast to the carrier r. The ends are then pushed under the punches and seized by the carrier r'. The adjustable stop v is now moved until the pointer v' or v^2 (according to which set of punches is first required) comes to its first mark on the strip, the index-pointer on the handle n being brought to the fraction on the dial corresponding to that marked on the strip. The carrier r' is now pulled firmly against the adjustable stop, the blocks j thrown in over the wedge n, so that as the cross-head descends the wedge is forced down between the bars, holding them firmly against the sides of the grooves m. The blocks j are now thrown in position over such of the punches as are required to make the intended holes. While this is being done, the workman who operates the adjustable stop moves it forward to the next position which it is required to occupy, as indicated by the marks on the strip. As soon as all holes are punched the block j over the wedge n is thrown out and the hooks o thrown in, so that as the cross-head rises the wedge n is released at the same time that the work is stripped from the punches, and the work is ready to be moved forward again, immediately on the punches becoming disengaged from the holes, to the next position already occupied by the adjustable stop. These operations are then repeated till all the required holes have been punched. The use of two rows of punches not only enables holes to be made in lines closely approaching each other, as is necessary with rows of staggered holes, but if the distance between the two rows of punches is properly adjusted to the pitch of the holes both sets can be brought into operation at the same time, and thus the number of movements of the adjustable stop be reduced one-half.

Having thus described the nature of my invention, I desire to say that I do not claim punching two or more bars of the same kind

at a single operation, since this, I am aware, is not new. Neither do I claim the arrangement of a series of punches in a single row and movable individually crosswise of the machine; but

What I claim is—

1. In a machine for punching holes, the combination of transverse rows of punches, the punches of each row being adjustable toward and from each other independently of those in any other row, the corresponding rows of dies with which the punches co operate, and mechanism for actuating said rows of punches, substantially as described.

2. The combination of two rows of punches supported by a transverse frame and made adjustable toward and from each other, the punches of each row being likewise adjustable toward and from each other, the corresponding rows of dies with which the punches cooperate, and mechanism for actuating said rows of punches, substantially as described.

3. In a machine for punching holes, the combination of rows of punches, each row supported on a transverse frame, which frames are adjustable toward and from each other, the punches of each row being likewise adjustable toward and from each other, the corresponding rows of dies with which the punches cooperate, and mechanism for actuating said rows of punches, substantially as described.

4. The grooves, openings, or spaces *m m* in or between the die-holders *l l'*, for the passage of the vertical flanges of shaped bars, arranged substantially as shown, so that flat bars or plates may be passed through the machine at the same operation with shaped bars.

5. The removable blocks *m' m'*, filling the openings *m m* in the die-holders *l l'*, substantially as described.

6. A wedge or other equivalent device for forcing the bars into a uniform position, acting only at the will of the operator, in combination with a punching-machine having a series of punches, substantially as described.

7. The adjustable stop *v*, movable independently of the work to be punched, in combination with the carrier *r'*, carrying the work, and governed in its motion by the adjustable stop *v*.

8. The combination of the figured strip v^3, the adjustable stop *v*, pointers *v'* and v^2, and the index-dial *u'*.

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