H. HILL.

MACHINE FOR CUTTING SHEET METAL.

APPLICATION FILED JULY 24, 1908.

960,014.

Patented May 31, 1910.

3 SHEETS—SHEET 3.

FIG. 10

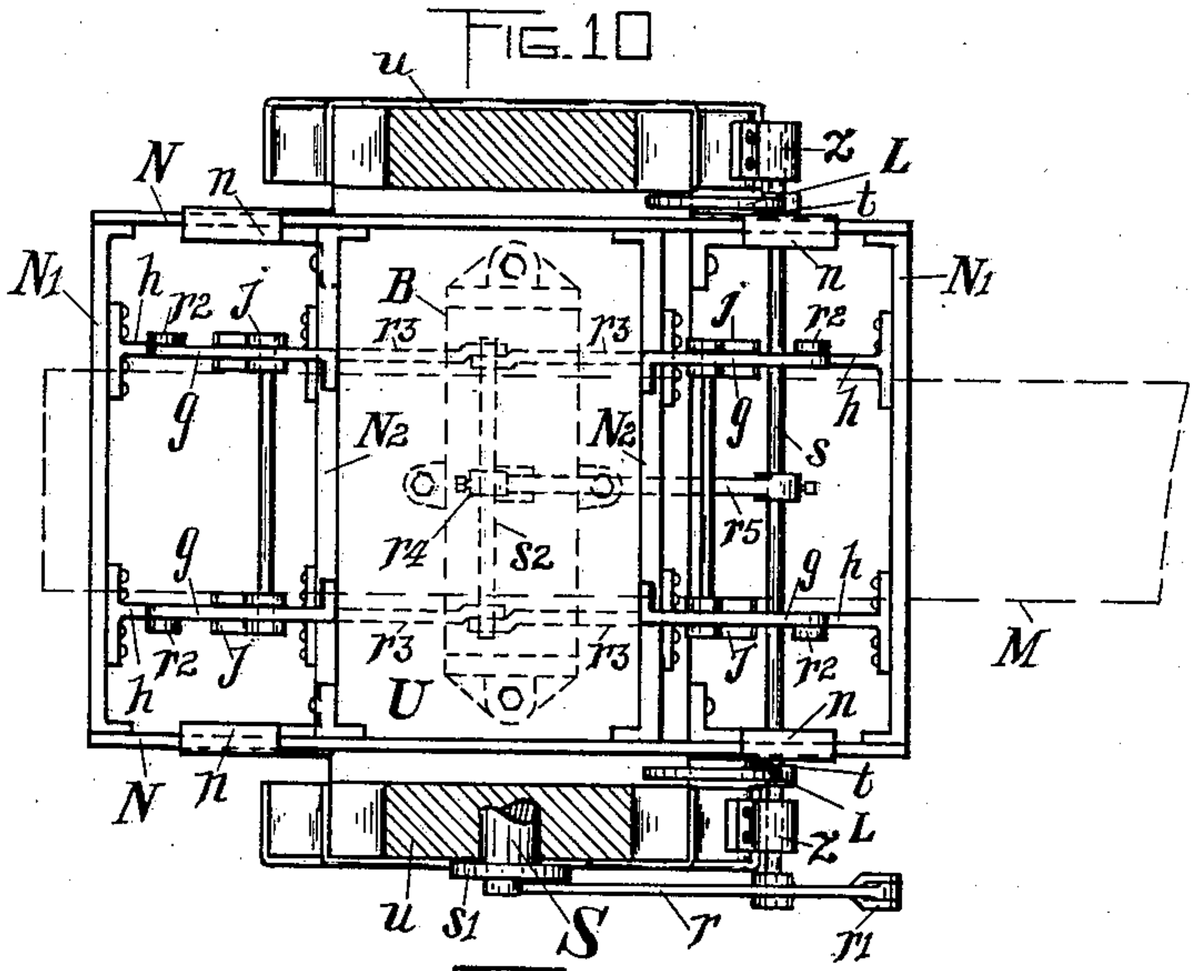
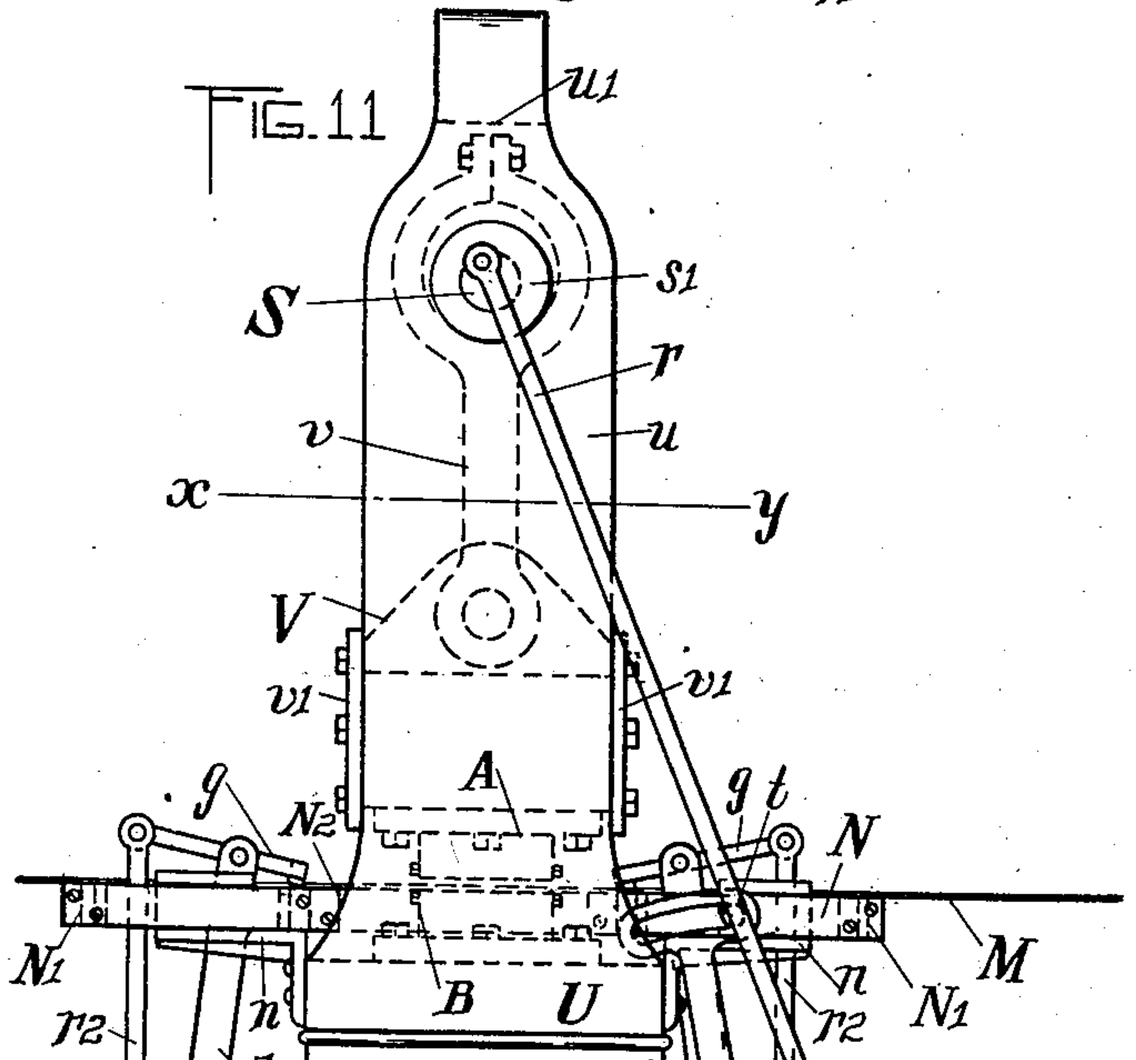


FIG. 11



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3 SHEETS—SHEET 2.

FIG. 6

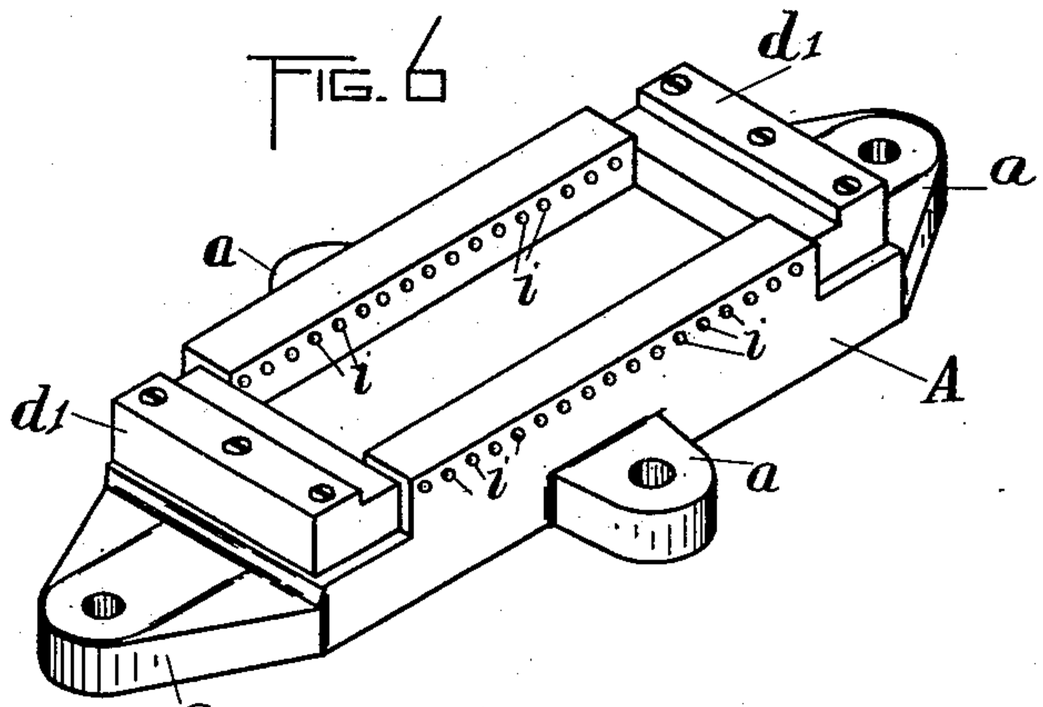


FIG. 8

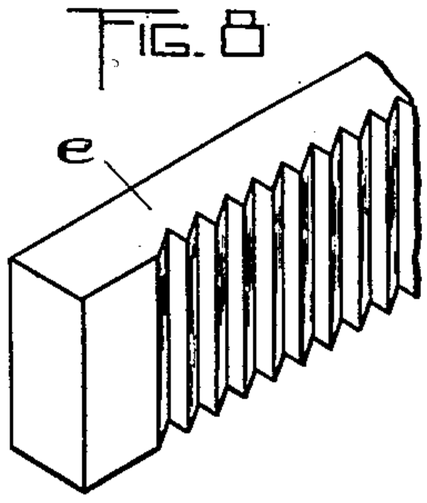


FIG. 7

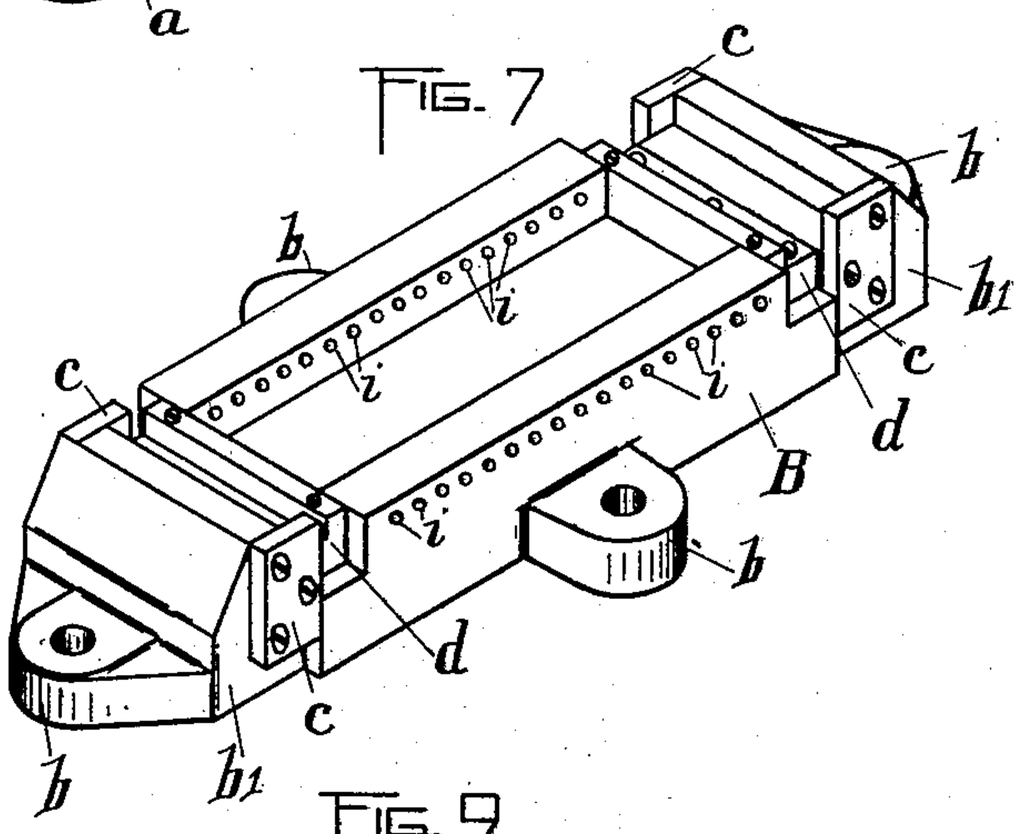
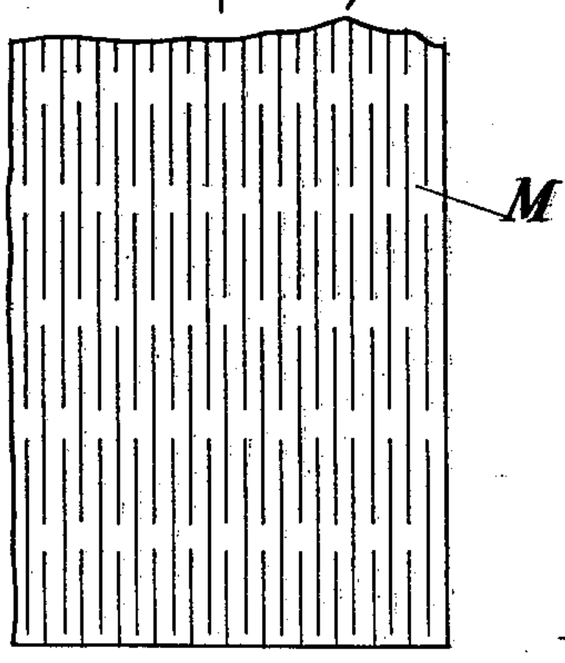


FIG. 9



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3 SHEETS—SHEET 1.

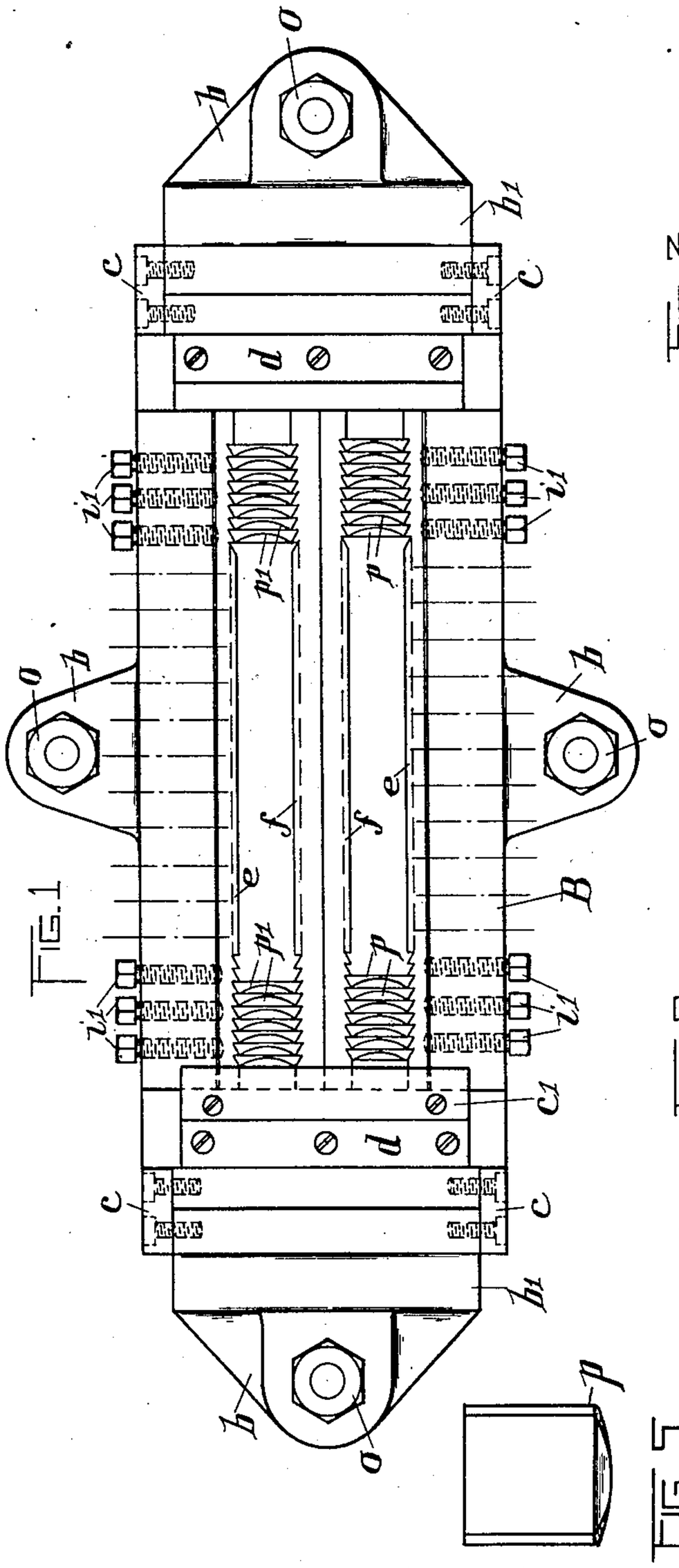

FIG. 1

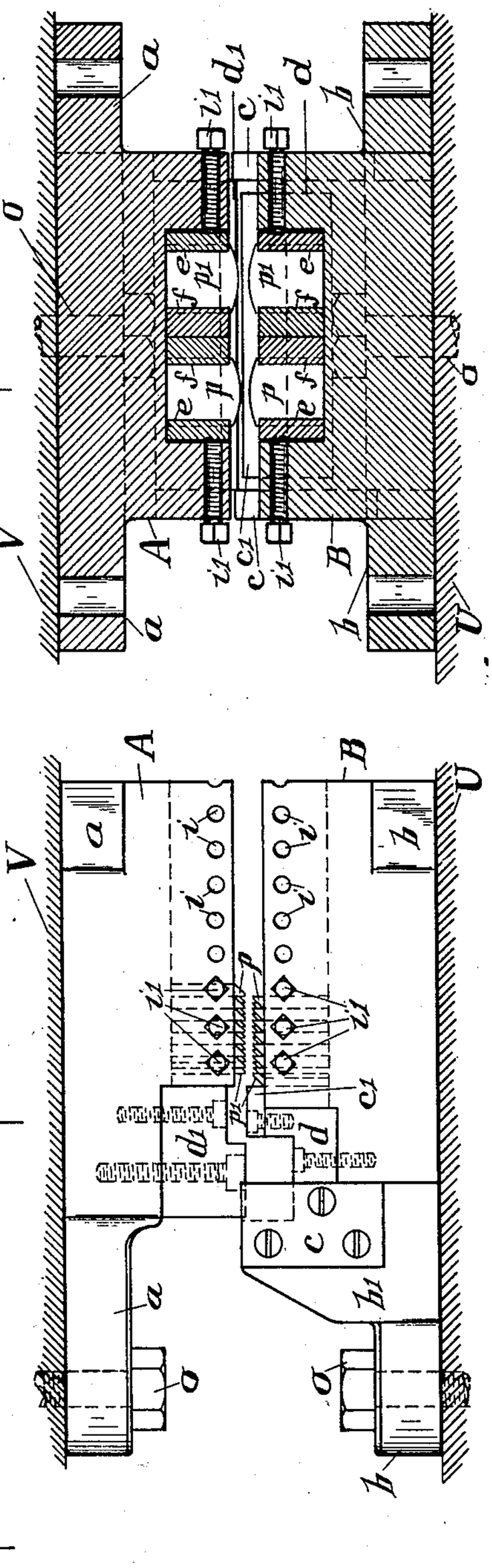

FIG. 2

FIG. 3

FIG. 5

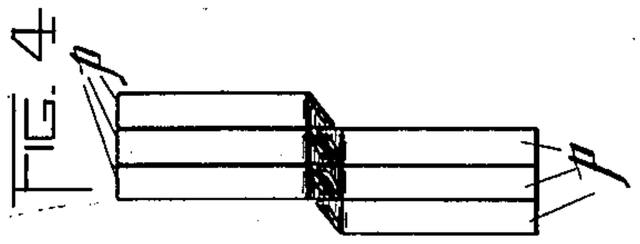

FIG. 4

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UNITED STATES PATENT OFFICE.

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MACHINE FOR CUTTING SHEET METAL.

960,014. Specification of Letters Patent. Patented May 31, 1910.

Application filed July 24, 1908. Serial No. 445,076.

To all whom it may concern:

Be it known that I, HERMANN HILL, a citizen of the United States, and a resident of West Haven, in the county of New Haven and State of Connecticut, have invented a new and Improved Machine for Cutting Sheet Metal, of which the following is a specification.

This invention relates to means for cutting sheet metal preparatory to expanding the same for various uses, such as metallic lathing or in reinforced concrete work and for similar uses.

The object of my invention is to provide a machine of the character described in which there may be used series of cutters arranged transversely of the sheet but with each individual cutter arranged longitudinally of the sheet and in which also such cutters are positively spaced the right distance apart by means of their holders rather than by being bolted together and built up one against the other in such a way as to multiply any error resulting from variations in the thickness of the cutters, as occurs when such cutters are built up and clamped together with or without spacing blocks between them.

Another feature of my present invention consists in the special conformation of the cutting edges of the cutters whereby a greater efficiency is secured and a cleaner cut is made and the tendency of the cutters to stick to the metal is reduced to the minimum.

Another feature of my present invention consists in the special arrangement of such cutters in two coöperating sets of two series each and in means for feeding the sheet thereto in a way to secure the proper cooperation of the cutters thereon.

In my machine, I employ, as above noted, two series of upper, and coöperating therewith, two series of lower cutters spaced and supported in the manner briefly outlined above. The cutters of each series in each set are spaced apart from the cutters of the corresponding series in the other set a distance represented by half the length of one cut and the length longitudinally of the sheet of a key or space between two adjacent cuts in alinement with each other. The cutters are further so arranged that the first set of upper and lower cutters coöperate to cut a series of parallel slits across the sheet with the spaces between them twice the width of a bar or side wall of the meshes in the finished and expanded metal. The second set of upper and lower cutters are arranged to cut slits, the centers of which are disposed longitudinally on the sheet exactly in the centers of the spaces between the cuts formed by the first set of cutters and they are so disposed transversely of the sheet as to cut slits disposed centrally between the slits formed by the first set of cutters. As the result of this arrangement of cutters, the number of reciprocations of the cutters is greatly reduced. Take for instance expanded metallic lathing in which the side walls of the mesh are 1/16 of an inch wide, the keys 1/8 of an inch wide and the cuts or slits 7/8 of an inch long. The longitudinal feed of the sheet of metal between each cutting operation will be one inch with dies disposed as above described, whereas, with dies having their cutting edges arranged transversely of the sheet and arranged to cut and expand the metal at the same time, there would be necessitated 16 cuts per inch.

While by my method the number of cutting edges is increased, the work of each cutter is reduced to an equal extent, and as the cutters do not operate as expanders, the power which would be expended in expanding the metal as it is cut by the other style of machine referred to may be advantageously used in operating a greater number of cutters, resulting in greatly reducing the number of reciprocations and correspondingly also the time required to cut the entire sheet.

Essential features of my machine then consist in means for supporting the cutters in the way indicated and properly reciprocating them and for intermittently feeding the sheet thereto to secure the above outlined operation of the cutters thereon.

In the accompanying drawings I have shown my cutting dies and in two of the figures of such drawings I have shown in partial plan view and in side view an ordinary press with a feeding mechanism such as may be readily applied to such a press for intermittently feeding or advancing the sheet of metal to be acted upon by my dies. Obviously the feeding mechanism may be of

any desired form to especially adapt it to any such press in which my dies may be used. I have, therefore, shown such feeding mechanism diagrammatically. The drawings are as follows:

Figure 1 is a top view of the lower cutting die. Fig. 2 is a partial side view of the upper and lower cutting dies. Fig. 3 is a central transverse sectional view of the upper and lower cutting dies. Fig. 4 is an edge view of the cutters at the completion of a cut. Fig. 5 is a face view of one of the cutters and Fig. 6 is a perspective plan view, as seen from the under side, of the upper die holder. Fig. 7 is a perspective view of the lower die holder. Fig. 8 is an enlarged detail view of a part of one of the retaining racks. Fig. 9 shows diagrammatically the relative arrangements of the cuts formed by my dies in a part of a sheet of metal. Fig. 10 shows partially in section taken along the line x—y of Fig. 11 a press such as my dies may be used in and having attached thereto a feeding mechanism adapted to feed the metal intermittently to the cutting dies. In this figure the reciprocating parts of the press are removed and the die holders are shown in dotted outline. Fig. 11 is a side view of such a press and attached feeding mechanism.

Referring to the drawings, my lower die holder comprises a bed piece B, as seen in Figs. 1, 2, 3 and 7, consisting in a casting having ears b thereon in which holes are provided to receive bolts o, by means of which the same is attached to the bed piece U of the press. The casting B is recessed, as seen, between longitudinally extending side walls through which are provided a series of threaded holes i to receive a corresponding series of machine bolts 11, the inner ends of which engage against the rack bars e, an enlarged view of a portion of one of such bars being seen in Fig. 8. These rack bars have a series of beveled grooves therein equally spaced and adapted to receive the correspondingly beveled edges of the cutters p and p^1, arranged in two rows, as indicated in Figs. 1 and 2. The adjacent edges of these cutters p and p^1 engage within beveled slots in similar rack bars f. The length of these rack bars e and f is preferably the same as that of the side walls of the base piece B and they are held in place longitudinally by the end blocks d screwed to the base piece B, as indicated. The base piece B has near its end transversely arranged and upwardly extending projections b^1, upon the ends of which are screwed the blocks c in such a way as to form recesses between the blocks c and the upper ends of the projections b^1 between such blocks adapted to receive the projections on the blocks d^1 screwed to the base piece A of the upper die holder, and in which recesses the projecting portions of such blocks d^1 closely fit. The upper die holder A has also attaching ears a and has a similar pair of rack bars e and coöperating therewith a pair of rack bars f between which are clamped an upper series of cutters p and p^1, such cutters being clamped by means of the screws i^1, between the outer rack bars e and the inner and adjacent rack bars f. The rack bars on the upper cutter are prevented from longitudinal movement by the blocks d^1 and the side walls of the base piece A are the same length as the upper series of rack bars and also a little shorter than the side walls on the lower base piece B.

By providing the rack bars e and f with the beveled slots therein carefully fitted to the correspondingly beveled edges of the cutters p and p^1, I am enabled to properly assemble the cutters with their cutting edges evenly spaced regardless of variations in the thickness of the cutters, and in this way there is avoided the accumulated error which would result from clamping such cutters directly against each other in case of any unevenness in the thickness of the cutters.

The projections on the block d^1, when they engage within the recesses therefor already described, serve to properly aline the upper and lower base plates A and B in setting up the dies in a press.

The coöperating series of upper and lower cutters p, it will be noted, are arranged to cut a series of slits in the metal, the length of which equals that of two adjacent side bars and a connecting key between the adjacent ends of such side bars of a mesh or opening in the expanded metal, and such slits or cuts are spaced apart by a distance representing twice the width of a side bar of a mesh in the completed metal. The cutters p^1 are arranged to cut a series of slits or cuts in the metal of the same length as those formed by the cutters p but spaced in the center between the cuts formed by such cutters p and with the spaces between the slits or cuts formed by successive operations of such cutters p^1 spaced apart by a distance representing the connecting key between adjacent bars and with the uncut portions between successive cuts equally spaced between the uncut portions left between successive cuts formed by the series of cutters p. The result of this is that the cuts are arranged as diagrammatically indicated in a portion of the sheet of metal M in Fig. 9. Fig. 5 represents a side view of one of the cutters p with the cutting edge turned from the observer. Fig. 4 shows in edge view three of the upper and coöperating lower cutters p as overlapping and in substantially the positions they assume at the completion of a cut in the metal. It is desirable that there be provided for one edge of the metal a guard or fence located practically opposite the cutters. For this reason

I provide a bar c^1 which, as seen in Figs. 1 and 2, is screwed on top of the end block d.

Refer now to Figs. 10 and 11. U is the base piece of the press having the side members u connected at the top by the cross piece u^1 and having near their upper ends bearings provided for the main shaft S upon which is provided the usual cam or crank and connecting member v articulating at its lower end in the usual way with the upper end of a reciprocating die block V, to which the upper cutter base or holder A is secured, as indicated, such member V reciprocating vertically between the guides v^1. The base member U has secured thereto the lower cutter holder or base piece B properly alined of course with the upper cutter base A in the manner already described. In Fig. 10 the sheet of metal M is shown in dotted outline while in Fig. 11 such sheet of metal is shown in full lines in edge view.

The press as thus described is of a common make and for feeding the sheets through the press I provide a rock shaft s supported in bearings z suitably secured to the right hand feet of the press and on the end of this shaft s toward the observer is secured a crank arm r^1 from which the connecting rod r extends to a crank pin secured in the crank disk s^1 on the end of the main shaft toward the observer, as indicated in Fig. 11. On this shaft s and just within the bearings therefor are secured two upwardly extending arms L having segmental slots in their upper and widened ends adapted to receive the operating pins t projecting outwardly from the side bars N which work or slide in the guide blocks n, secured to the base U, which guide blocks form supports and guides for the side bars N of the feed frame. Between these side bars N of the feed frame there extend transversely disposed bars N^1 and N^2 which form supports for four longitudinally arranged braces h having preferably formed integrally therewith the nearly vertically disposed members j, each of which latter is bifurcated at its upper and lower ends, as will be explained. In the bifurcated upper ends of these members j are pivotally supported grippers g having on their ends extending toward the center of the press suitably formed projections adapted to grip the sheet of metal M and clamp it down upon the cross bars N^2. The outer ends of these grippers g articulate with the upper ends of connecting links r^2, the lower ends of which links articulate with the outer ends of the levers r^3 pivotally supported in the bifurcated lower ends of the members j and having their inner ends all articulating upon a common shaft s^2, upon the center of which is pivotally supported the connecting link r^4, the lower end of which in turn articulates with the outer end of the arm r^5 secured upon the shaft s.

The parts as just above described are so relatively proportioned and positioned that while the cutting dies are in engagement with the metal, the grippers g are released by the upward movement of the arm r^5 while at the same time the upper ends of the slotted levers L are moved to the right to carry the feed frame, comprising the longitudinally disposed members N and the cross bars N^1 and N^2 connected therewith correspondingly to the right or the rear. Before the forward movement of the feed frame the grippers g are brought into engagement with the sheet of metal M by the downward movement of the arm r^5 and this occurs before the rear ends of the slots in the upper ends of the arms L engage the pins t to force the feed frame to the left or forward the required distance. The slots in the upper ends of the arms or levers L are to provide a sufficient period in each half cycle of the press during which the feed frame and the sheet supported thereon may remain at rest. This is necessary in order that, as the sheet cannot be fed while the dies are in engagement therewith, the feed frame may remain at rest at each end of its course during a brief interval. The length of the slots in the upper ends of these arms L is proportioned therefore to provide the proper amount of lost motion for this purpose.

I desire to call attention to the fact that the above described feed mechanism is only one of the many mechanisms which may be employed with a die press such as shown for properly feeding the metal to the cutting dies. The specific character of such feeding mechanism comprises no part of my present invention.

It is believed from the foregoing description of the construction and operation of my invention that no further explanation is necessary herein. I may add, however, that I prefer to grind a flat bevel on the cutters and form the cutting edge at a much blunter angle by a second bevel, as indicated in Figs. 4 and 5.

What I claim is:—

1. In a machine of the class described, two sets of cutters of two coöperating series in each set; means for supporting the two series of each set in coöperative relation to the two series of the other set and spaced apart a distance represented by substantially one half the length of a cut formed by any one of such cutters plus the length of a space between the cuts to be formed by either set of cutters and means for reciprocally moving the series of cutters in one of such sets coöperatively to and from the series of cutters in the other set.

2. In a machine of the class described, two sets of cutters of two coöperating series in each set; means for supporting the two series of each set in coöperative relation to

the two series of the other set and spaced apart a distance represented by substantially one half the length of a cut formed by any one of such cutters plus the length of a space between the cuts to be formed by either set of cutters; means for reciprocally moving the series of cutters in one of such sets cooperatively to and from the series of cutters in the other set and means for intermittently advancing the sheet between the cutters and between the operations of the cutters thereon a distance longitudinally of the sheet represented by the length of a cut formed therein by one of such cutters and added thereto the length of such a space between the cuts to be formed by either set of cutters.

3. As a means for holding a series of individual cutters properly spaced with their cutting edges in substantially parallel planes in a machine of the class described, a pair of rack bars having beveled grooves therein; beveled edges on the cutters adapted to engage the beveled grooves in the rack bars and means for clamping the rack bars together with the cutters between them.

4. As a means for holding a series of individual cutters properly spaced with their cutting edges in substantially parallel planes in a machine of the class described, a base piece for supporting such cutters; a pair of rack bars having beveled grooves therein; beveled edges on the cutters adapted to engage the beveled grooves in the rack bars and means for clamping the rack bars together with the cutters between them, such means connected to such base piece.

5. A cutter for the purpose described comprising a plate having a substantially flat bevel formed thereon near the cutting edge and having a segmental cutting edge formed by a second and a segmentally curved bevel less acute than the flat bevel.

HERMANN HILL.

Witnesses:
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ARTHUR A. BENHAM.