June 24, 1924. 1,499,309

J. H. RAMSEY

PUNCHING TOOL AND METHOD OF MAKING SAME

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Fig. 1.

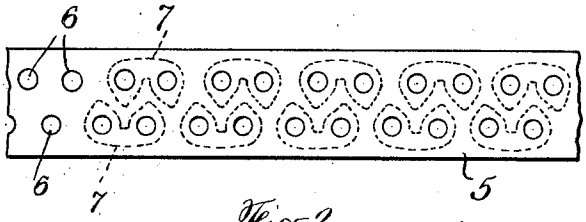
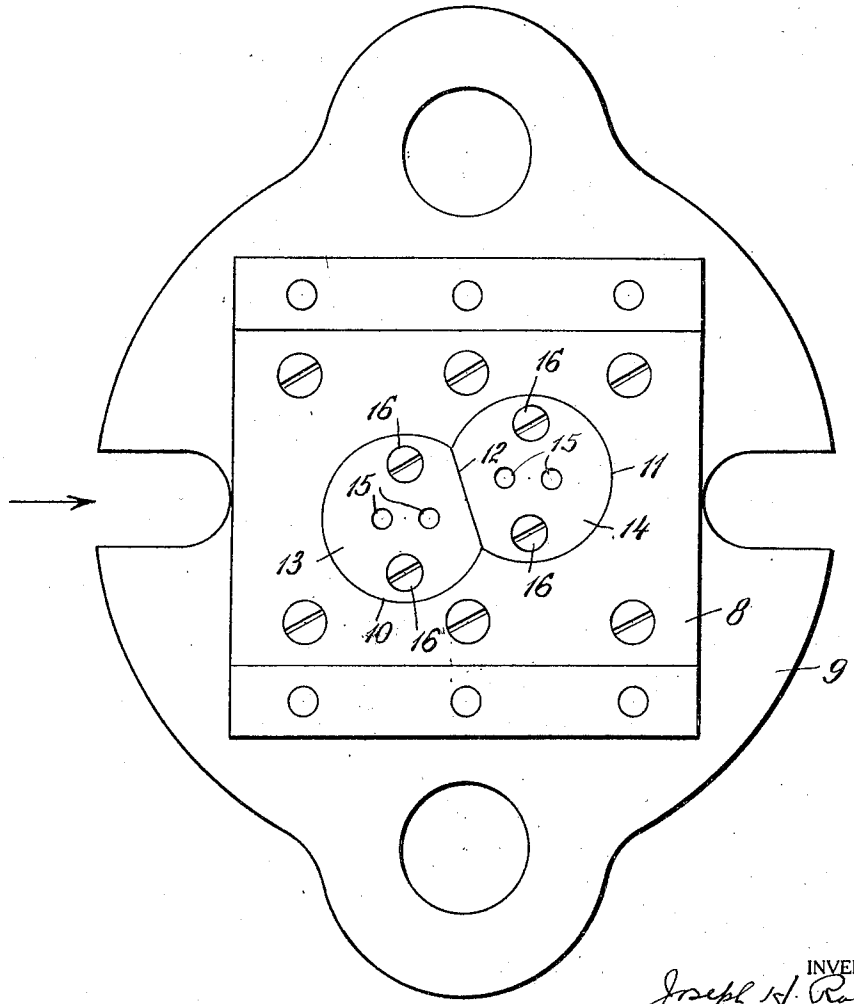


Fig. 2.



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Fig. 3,

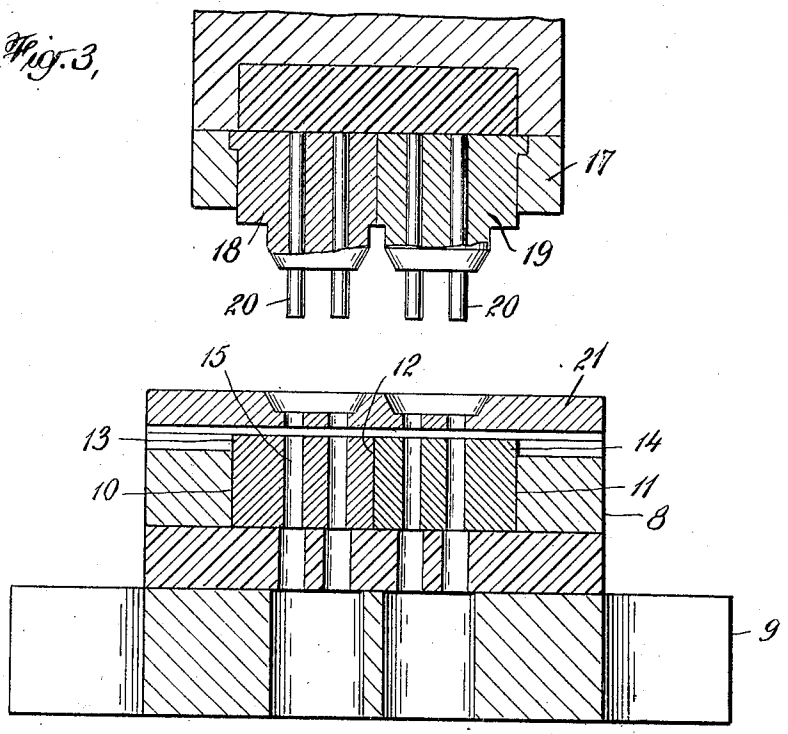
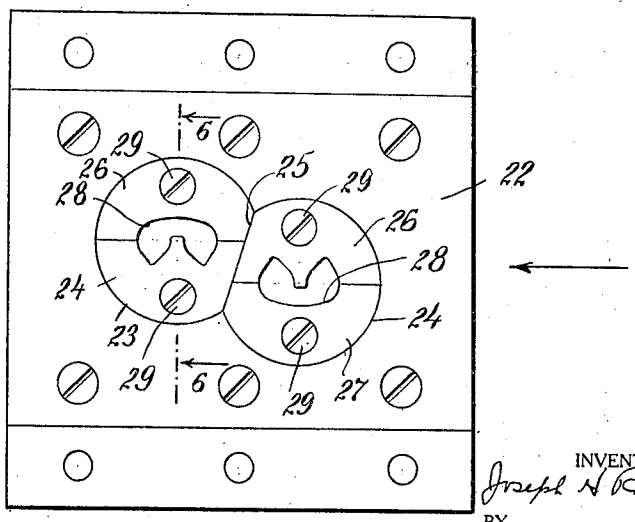


Fig. 4,



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Fig. 5.

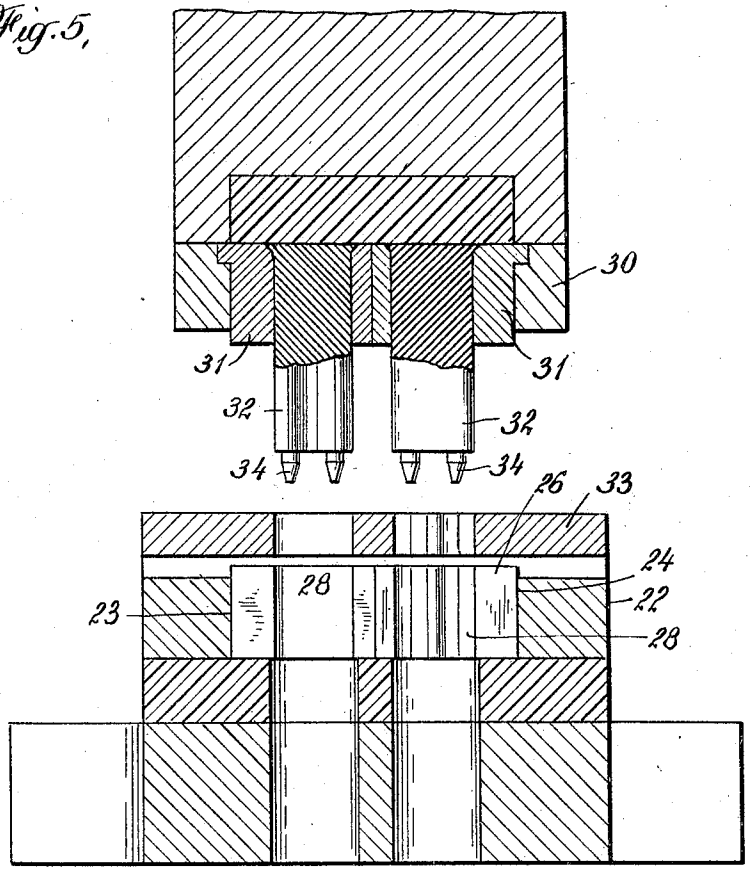
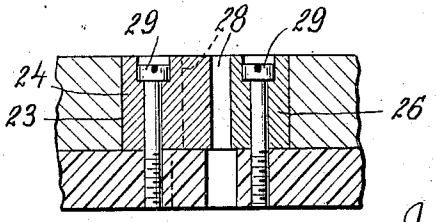


Fig. 6.



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Patented June 24, 1924. 1,499,309

UNITED STATES PATENT OFFICE.

JOSEPH H. RAMSEY, OF ALBANY, NEW YORK, ASSIGNOR TO RAMSEY CHAIN CO. INC., OF ALBANY, NEW YORK, A CORPORATION OF NEW YORK.

PUNCHING TOOL AND METHOD OF MAKING SAME.

Application filed October 12, 1923. Serial No. 668,130.

To all whom it may concern:

Be it known that I, JOSEPH H. RAMSEY, a citizen of the United States, residing at Albany, in the county of Albany, State of New York, have invented certain new and useful Improvements in Punching Tools and Methods of Making Same; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to punches and dies and to a method of making tools for punching metals and particularly the tools which are employed in the manufacturing of links for silent chains, although the invention is not limited to tools for any specific purpose.

Silent chains are composed of a plurality of overlapping sets of links which are connected by pintles extending through openings therein. The links are blanked from metal strips which are first punched or perforated to provide the pintle openings in properly spaced relation.

To facilitate the production of the links without waste from the metal strip it is desirable to punch and likewise to blank two or more links at each operation. As the blanking operation follows that of punching it is essential that the punches and dies be arranged with extreme accuracy to ensure proper register and to avoid inaccuracies in the links which would make the chain worthless. Furthermore, it is desirable that the dies be removable individually from the supporting blocks in which they are assembled to permit repair or replacement when the punches or dies are worn or injured. For replacement the new punch or die must be an exact counterpart of the original and it must be disposed in a certain definite relationship to the other punches and dies.

Heretofore in making a die the opening was cut in a rectangular steel block of considerable size. The entire block was then hardened and because of its size considerable distortion of the die resulted. The cooperating punch was supported in a similar block and positioned to cooperate as closely as possible with the die. Extreme accuracy was impossible and rapid wearing of the cutting edges of the die usually resulted. The punches and dies were not interchangeable with others of the same kind and the wearing of a particular die necessitated the making of an entirely new block and of cooperating punches therefor. Die-making is a very costly operation and much unnecessary expense resulted from the method followed in making the dies and punches.

It is the object of the present invention to provide punches and dies and a method of making such tools whereby accuracy and exact alignment is ensured, distortion in hardening is avoided and interchangeability is secured, so that the cost of preparing and replacing punches and dies is reduced to a minimum and variations in the dimensions of product cut by the dies is substantially eliminated.

Other objects and advantages of the invention will be apparent as it is better understood by reference to the following specification and accompanying drawing, in which—

Fig. 1 is a diagram indicating the arrangement of the perforations or pintle openings in the metal strip with the outline of the links, as finished by the blanking dies, superposed thereon;

Fig. 2 is a plan view of a block with the perforating dies disposed therein;

Fig. 3 is a vertical section through the perforating dies and punches;

Fig. 4 is a plan view of a block with the blanking dies disposed therein;

Fig. 5 is a vertical section through the blanking dies and punches; and

Fig. 6 is a section on the line 6—6 of Fig. 4.

The invention depends upon the utilization to the maximum possible extent in toolmaking of boring and turning operations which are capable of application with extreme accuracy. A supporting block of steel is first finished to exact dimensions to receive the dies or punches. A circular opening is then bored in the block upon a center which is established by the desired relationship of the cutting edges of the dies. A second opening overlapping the first is then bored on another center which is likewise established by the desired relationship of the cutting edges of the dies. The exact positioning of the openings can be assured by the use of Johansen gauges or equivalent devices in connection with the boring bar. The common chord of the two circular

openings establishes a definite angular relation with the axes of the block and furnishes a datum to which all dies and punches are finished so that when mounted in the openings they will always assume the same position relatively to each other in the block. The block may be hardened and ground or not as desired; as it is not subject to wear hardening is unnecessary.

The dies are next formed in cylindrical steel blocks of approximately the diameter of the openings in the supporting blocks, but slightly over-size. If the die openings are circular they are bored in the die block in exact relative position. If the openings are irregular in shape as in the case of the blanking dies the block is split into two parts and the openings are cut, for example, by a special milling cutter. The die blocks are then hardened, and owing to their relatively small size there is no material distortion. After hardening the die blocks are mounted in a special fixture and ground, first to the exact diameter of the openings in the supporting block and then at one side so as to provide a flat surface corresponding to the chord of the overlapping openings. The angular relation of the flattened surface to the cutting edges of the die is fixed so that when the die blocks are mounted in the supporting block the cutting edges of the contiguous dies will be in the exact relation desired. As all similar die blocks are finished in the same manner and to the same dimensions, they may be duplicated exactly and are interchangeable.

The punches are ground to exact dimensions and are supported in punch blocks having openings to receive them, the openings being bored on predetermined centers exactly as the die blocks are bored. The punch blocks are ground to fit the openings in the supporting blocks and have flattened sides in proper angular relation to the cutting edge of the punches to ensure mounting thereof in predetermined relationship. The punch blocks are therefore exact complements of the dies and cooperate with all dies of the same kind and dimensions.

Referring to the drawing for a more detailed disclosure of the invention, 5 indicates a metal strip from which the links are stamped. The strip is fed through the stamping machine by mechanism (not shown) and is first perforated as indicated at 6. It is to be understood that the perforations may be of any desired form depending upon the design of the links. For convenience the perforations are indicated as circular. After perforation the links are blanked from the strip and usually have the form indicated in dotted lines 7 on Fig. 1. The relative positions of the punches and dies for perforating and blanking the links are indicated in Fig. 1, it being desirable to punch and to blank two links at each operation. To accomplish this result successfully it is necessary that the punches and dies of each pair bear a definite and predetermined relation to each other, and as hereinbefore indicated it is the purpose of the present invention to ensure that this relation is maintained.

In carrying out the invention a supporting block 8 of steel or other suitable material is first finished to exact dimensions. This block is adapted to be secured to the platform 9 on the punching machine. The block 8 is mounted in a boring machine and a circular opening 10 is bored therein upon a center which is definitely established by the desired relation of the finished dies in the block. The center may be accurately determined by the use of Johansen gauges or other suitable precision instruments. A second circular opening 11 is then bored in the block in overlapping relation with the opening 10 and upon a center which is determined and fixed in the same way. These two circular openings have a common chord 12 which is disposed in a definite angular position with reference to the axes of the block 8. The chord establishes, therefore, a datum to which all dies are finished, and when so finished the dies may be inserted in the openings and will assume and maintain a fixed and definite position in the supporting block.

The dies 13 and 14 are cylindrical in form and are made from steel blocks. If the openings 15 in the dies are circular they are bored in the die blocks in the exact relative position in which the perforations are to be made in the metal strip 5. The exact position of the openings may be determined as in the case of the openings 10 and 11 in the supporting block. The die blocks are slightly oversize and are hardened in the usual manner before they are finished. As the die blocks are of relatively small size the hardening operation does not cause any material distortion. After hardening the cylindrical surfaces of the die blocks are ground until the blocks are of the exact diameter to fit the openings 10 and 11 in the block 8. They are then ground to provide flattened surfaces corresponding to the chord 12, these surfaces being disposed in exact angular relation to the axes of the die blocks and the cutting edges of the openings 15. Suitable fixtures are employed to determine the position of the flattened sides of the die blocks so that every die is a complement of every other, and when the dies are mounted in the block 8 the cutting edges will assume a definite position with reference to the cutting edges of the complementary block. The die blocks may be fastened to the block 8 by screws 16 or other suitable means.

The cooperating punches are similarly

formed, a supporting block 17 being first prepared and bored to provide overlapping openings having a common chord. The punch blocks 18 and 19 are then bored to receive the punches 20 which have been previously ground to the proper shape and size. The punch blocks 18 and 19 are hardened and ground to the proper dimensions to exactly fit the openings in the supporting block 17 and are provided with flattened sides corresponding to the common chord of the circular openings. The angular relation of these flattened sides to the punches 20 is predetermined and fixed and when the punch blocks are mounted in the supporting blocks 17 the punches necessarily assume the proper positions to cooperate exactly with the openings 15 in the die blocks 13 and 14. When the dies and punches are mounted in the punching machine they are in exact alignment and perform their intended function with the minimum of wear. In Fig. 3 the punches and dies are shown in assembled relation with a stripping plate 21 which ensures withdrawal of the punches from the strip 5 as it passes between the die blocks and the stripping plate.

The openings in the blanking dies are necessarily irregular in form but the dies are prepared and mounted in substantially the manner hereinbefore described. Thus a supporting block 22 is first finished to the desired dimensions and is bored on predetermined centers to provide circular openings 23 and 24 in overlapping relation and having a common chord 25. The die blocks are each made in two parts 26 and 27. These blocks are first made over-size and the openings 28 are formed in the parts 26 and 27 by means of suitably shaped milling cutters. The blocks are then hardened and are ground to the exact diameter of the openings 23 and 24. Thereafter flattened sides are formed on the die blocks while they are held in assembled relation, the flattened sides being in exact angular relation to the axes of the blocks and to the cutting edges. The die blocks may then be assembled with the supporting block 22 and secured thereto by screws 29 or other suitable fastening means.

The cooperating punches are, as indicated in Fig. 5, mounted in a supporting block 30 which is provided with overlapping circular openings having a common chord and predetermined centers, the openings being formed by boring as herinbefore described. The punch blocks 31 are formed oversize and are bored to receive the punches 32 which are separately formed and hardened. After the punch blocks have been hardened they are ground to the diameter of the openings in the supporting block 30 and similarly provided with flattened faces corresponding to the common chord of the overlapping circles and in exact angular relation with the axes of the blocks and with the cutting edges of the punches 32. When the punches are assembled with the punch blocks 31 the cutting edges will be in proper relation to cooperate exactly with the cutting edges of the dies. The punches and dies are assembled in the machine with a stripping plate 33 disposed therebetween which ensures separation of the punches from the strip 5 as the latter passes through. The punches are provided with leaders 34 which enter the perforations in the strip and ensure the centering thereof so that the edges of the links will bear a predetermined relation to the perforations.

From the foregoing it will be observed that I have provided tools for punching metals and a method of preparing such tools which ensures the duplication thereof with mathematical exactness. Furthermore, the method, because of the utilization of inexpensive operations of boring, turning and grinding, ensures the production of the tools with a minimum of expense. The accuracy and interchangeability of the separate tools permit replacement of parts broken or damaged in use and avoids losses which otherwise occur through the necessity of duplicating parts which are not worn because other parts have been injured in use.

Various changes may be made in the form and arrangement of the tools and in the details of the method as herein described without departing from the invention or sacrificing any of the advantages thereof.

I claim:—

1. In a punching tool the combination of a supporting block having overlapping circular openings with their centers in definite and predetermined relation, and cylindrical blocks having the desired cutting edges with flattened sides corresponding to the common chord of the intersecting circular openings and disposed in definite relation to the cutting edges whereby when the cylindrical blocks are mounted in the circular openings the cutting edges of the cylindrical blocks will bear a definite relation to each other.

2. A method of making punching tools, which comprises boring overlapping circular openings in a supporting block with their centers in definite and predetermined relation, forming cylindrical blocks having the desired cutting edges with flattened sides corresponding to the common chord of the intersecting circular openings and disposed in definite relation to the cutting edges whereby when the cylindrical blocks are mounted in the circular openings the cutting edges of the cylindrical blocks will bear a definite relation to each other.

3. A method of making punching tools, which comprises boring overlapping circular openings in a supporting block with their centers in definite and predetermined rela-

tion, forming cylindrical blocks having the desired cutting edges, grinding the cylindrical blocks to provide flattened sides corresponding to the common chord of the intersecting circular openings and disposed in definite relation to the cutting edges whereby when the cylindrical blocks are mounted in the circular openings the cutting edges will bear a definite relation to each other.

4. A method of making punching tools, which comprises boring overlapping circular openings in a supporting block with their centers in definite and predetermined relation, forming cylindrical blocks having the desired cutting edges, hardening and grinding the cylindrical blocks to provide flattened sides corresponding to the common chord of the intersecting circular openings and disposed in definite relation to the cutting edges whereby when the cylindrical blocks are mounted in the circular openings the cutting edges will bear a definite relation to each other.

In testimony whereof I affix my signature.

JOSEPH H. RAMSEY.