Nov. 4, 1958 A. J. DUFFIELD 2,858,884

BLANKING SHEET MATERIAL

Filed May 17, 1955 3 Sheets-Sheet 1

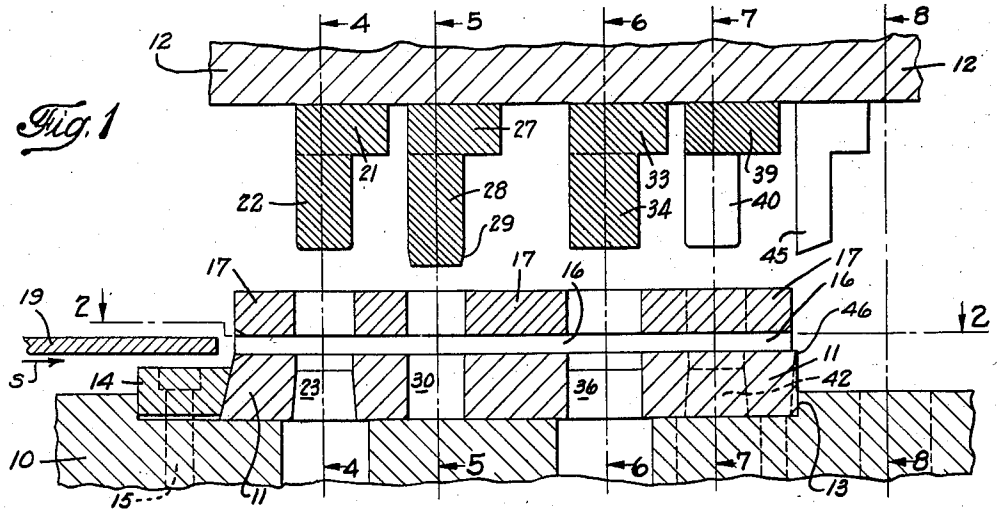


Fig. 1

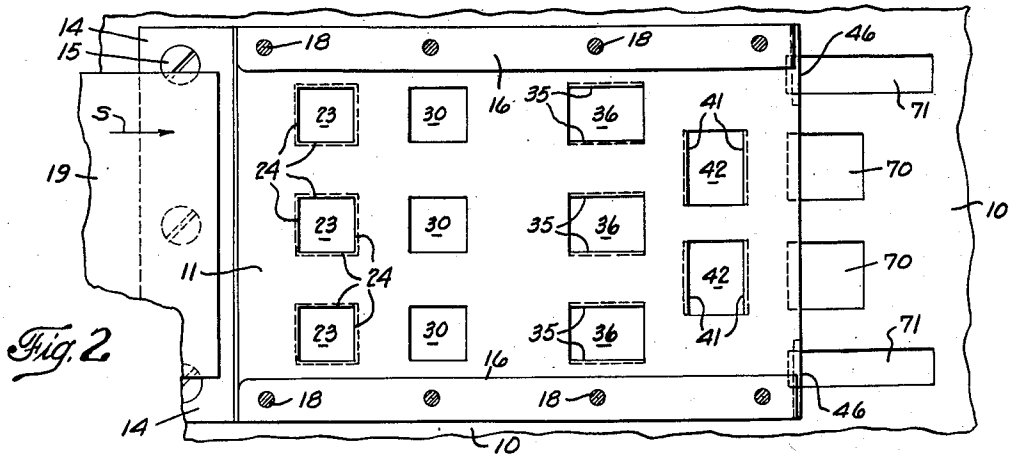


Fig. 2

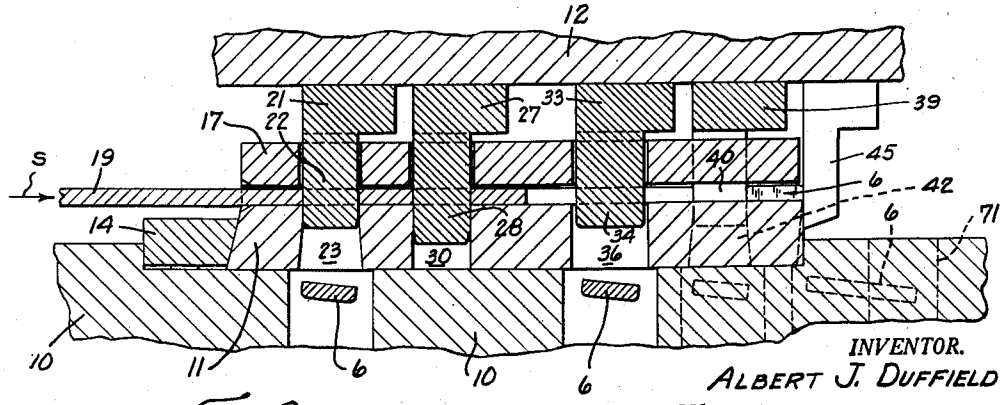


Fig. 3

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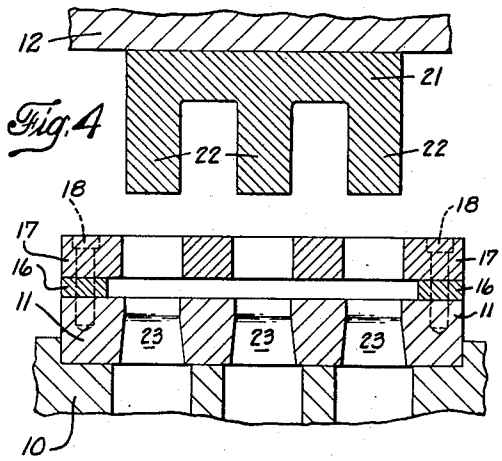


Fig. 4

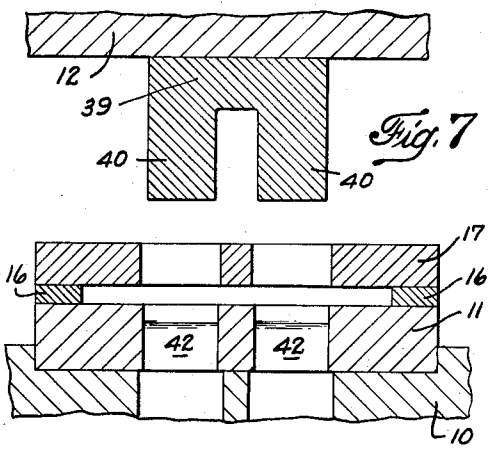


Fig. 7

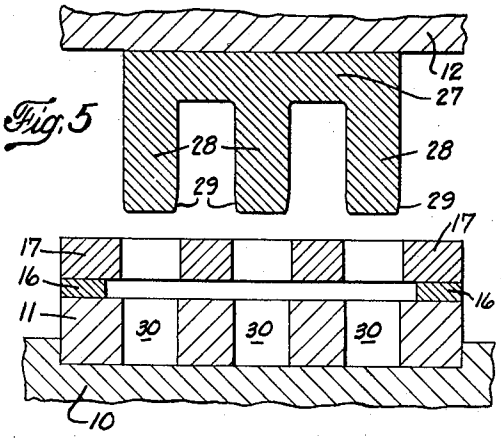


Fig. 5

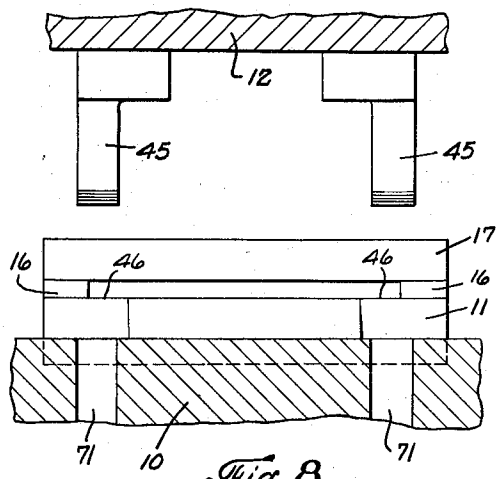


Fig. 8

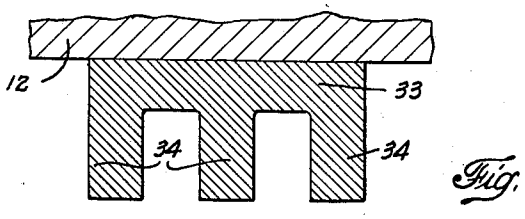
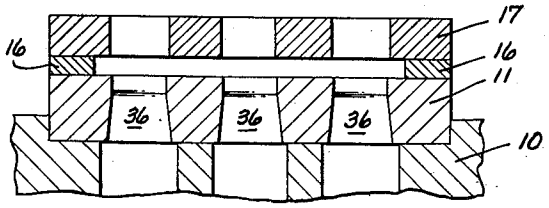


Fig. 6



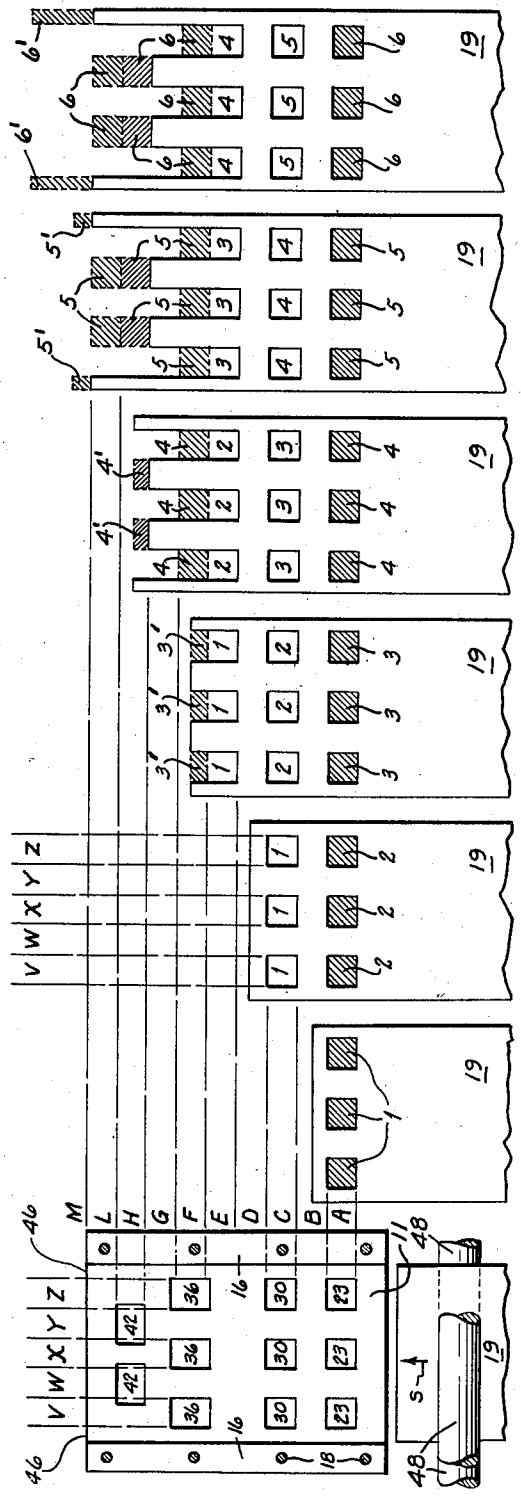
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Fig. 9



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2,858,884

BLANKING SHEET MATERIAL

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Application May 17, 1955, Serial No. 508,967

5 Claims. (Cl. 164—19)

The invention relates to cutting sheet or plate material into blanks, and more particularly to making metal blanks of square shape.

It is well known that making metal blanks of square shape, in theory at least, reduces cutting waste. However, from a practical standpoint, especially when the blanks must have close tolerances, it is usually necessary to punch square blanks with webbing between the blanks—thus creating waste.

Square blanks of close tolerance are advantageous as a starting product in certain processes, as for example, for impact extrusion of hollow articles for the manufacture of cartridge shells, such as illustrated in Patent No. 2,630,916, granted March 10, 1953, on application of Emile Blair.

Among the objects of the present invention are to cut square blanks from sheet stock accurately and efficiently, with no webs between blanks, with fewest separate operations, and with minimum stress on the press.

Other objects and features of the invention will be more apparent from the following description when considered with the following drawings in which:

Fig. 1 is a vertical longitudinal section through the press with the head in raised position;

Fig. 2 is a plan view of the die, taken on the line 2—2 of Fig. 1;

Fig. 3 is a longitudinal vertical section through the press, with the head in its lowermost position and illustrating the cutting of the several blanks;

Fig. 4 is a transverse section on the line 4—4 of Fig. 1 illustrating the four-edged square blanking dies;

Fig. 5 is a transverse vertical section on the line 5—5 of Fig. 1 illustrating the aligning dies;

Fig. 6 is a vertical transverse section on the line 6—6 of Fig. 1 illustrating the two-edged blanking dies, whose cutting edges extend lengthwise of the press;

Fig. 7 is a transverse vertical section on the line 7—7 of Fig. 1 illustrating the two-edged blanking dies, whose cutting edges extend transverse of the press;

Fig. 8 is a transverse vertical section on the line 8—8 of Fig. 1 illustrating the scrap shears;

Fig. 9 is a diagram illustrating the operation of the press.

In the following description and in the claims, various details will be identified by specific names for convenience, but they are intended to be as generic in their application as the art will permit.

Like reference characters denote like parts in the several figures of the drawings.

In the drawings accompanying and forming part of this specification, certain specific disclosure of the invention is made for purposes of explanation, but it will be understood that the details may be modified in various respects without departure from the broad aspect of the invention.

Referring now to the drawings and more particularly to Figs. 1 and 2, the die set or press comprises in general, a lower bolster or support 10 carrying die section 11, and an upper, vertically movable head 12 carrying a series of punches and shears; these are discussed below. The lower support 10 also carries a stripper plate 17 under which passes the coil or strip of sheet material 19, such strip being movable in the direction of the arrow S.

The support 10 has a recess 13 for seating die 11. A hold-down wedge 14 having bolts 15 positions the die section, in a well-known manner. Guide bars 16 rest on die section 11 and stripper plate 17 overlies the guide bars. Bolts 18 hold these members assembled. The distance between guide bars 16 is approximately the width of strip 19.

In general, the die 11 comprises a row of square blanking die openings 23, a row of square aligning openings 30, a row of longitudinal oblong blanking die openings 36, a row of transverse oblong blanking openings 42, and shear edges 46 for scrap shears 45. These will be described more in detail hereinafter.

Referring now also to Fig. 4, the die openings 23 are square and have cutting edges 24 on all four sides, as indicated by the reliefs shown in dotted lines in Fig. 2. The head 12 carries a unit 21 having three blanking punches 22, each having four cutting edges.

Referring now to Fig. 5, the die openings 30 have no relief. The head 12 has a unit 27 comprising three aligning punches 28, each having a chamfered end 29. The aligning punches 28 are somewhat longer than the blanking punches, as indicated especially in Figs. 1 and 3. This die set does no cutting, but merely passes through holes already punched in the strip 19, for the purpose of aligning or registering the strip, as explained hereinafter.

Referring now to Fig. 6, the die openings 36 are of oblong shape, as shown in Fig. 2, and have only two cutting edges 35; these extend lengthwise of the blank. The shorter edges do no work. The head 12 carries a unit 33 which carries three blanking punches 34 of oblong cross-section corresponding to the die openings 36. The length of the cutting edges 35 are somewhat longer than the edge of a square blank, whereas the distance between the cutting edges corresponds to the length of an edge of the square blank.

Referring now to Fig. 7, the die openings 42 are oblong and have only two cutting edges 41; these extend crosswise of the strip. The length of the cutting edges 41 is somewhat greater than the edge of a square blank while the distance between cutting edges corresponds to the length of an edge of the square blank. The head 12 carries a unit 39 having two blanking punches 40 having cutting edges which correspond to the die openings 42.

Referring now to Fig. 8, the head 12 carries two scrap shears 45 adapted to cooperate with the edges 46 of the die section to shear the edge strips into pieces of scrap of convenient length, as described hereinafter.

In all of the die sets described above, it will be noted from Fig. 3 that the several punches and shears have enlarged bases to facilitate securing to the head 12. It will be understood that the blanking punches and scrap shears are secured to the head 12 by conventional means, not shown. It will be noted too that the several die openings have corresponding openings through the stripper plate 17 to receive the punches, as well as corresponding openings through the support 10 for passage of the severed blanks and scrap pieces. The head 12 reciprocates vertically and is maintained in proper register with the bolster 10 by conventional means, not shown. All parts not shown are omitted for simplicity of explanation.

Referring to Fig. 9, to help explain the operation of the press, it is helpful to lay out the strip 19 into straight

longitudinal columns and straight transverse rows to indicate the blanks formed by successive strokes or passes of the press. The columns are denoted by letters V to Z. These columns extend lengthwise of the strip in the direction of strip movement. The rows are indicated by A to M and extend perpendicular to the columns.

In Fig. 9, the die **11** is laid out diagrammatically alongside the successive positions of the strip from starting position to position of constant repetition. The columns and rows are also indicated on the die **11**, to illustrate the position of the several die sets with respect to the blanks produced. By following horizontal rows, it is easy to see the particular blanks produced by particular operations.

For convenience, the several die openings and shear edges are sometimes referred to as positions, with the same reference characters, to indicate the operations performed by the particular die openings or shear edges and associated parts.

It will be noted that positions **23**, **30**, and **36** lie in columns V, X, and Z, with columns W and Y intervening; and that the positions **42** lie in and extend beyond columns W and Y. The distance between the adjoining column axes of the several columns is equal to one blank width.

It will be noted that positions **23** lie in row A while positions **30** lie in row C, with row B intervening. The row axis of position **23** is spaced from the row axis of position **30** by the width of two blanks. Positions **36** lie in and extend beyond row F, with rows D and E between positions **30** and **36**. The distance between the row axes of positions **30** and **36** is equal to the width of three blanks. Position **42** lies in row H with row G intervening between positions **36** and **42**. The distance between the row axes of positions **36** and **42** is equal to the width of two blanks. The location of position **46** is not critical since it operates only to cut the edge scrap into small pieces.

In all of the several starting positions of the strip **19** in Fig. 9, the continuous lines indicate the shape of the strip after the stroke, and the shaded areas indicate the blanks or scrap removed during the stroke. The number of the stroke is denoted by Roman numerals I to VI. For convenience, pieces removed by the several starting strokes are numbered with the number of the stroke; thus pieces removed by the first stroke are numbered **1**, those removed by the second stroke are numbered **2**, and so on.

Before describing the operation in detail, it may be helpful to consider the blanks produced by the first and second strokes. These are indicated by **1** and **2**. The blanks between **1** and **2** are removed by stroke IV which removes blanks **4**, and which leaves, on the leading end of the strip, a series of spaced tongues. Stroke V punches blanks **5** from said tongues (spaced from the free ends of the tongue by one blank), thereby also freeing the end blanks, also denoted by **5**.

The starting operation is as follows:

A new piece of stock **19** may be fed by hand into the press until its leading edge is about half-way the width of row B. The first stroke of the press then produces (by position **23**) three blanks **1**, as indicated in stroke I.

The strip is then advanced two blank widths so that the holes **1** now coincide with aligning die openings **30**. The pressure of the feed rollers **48** on the strip is released by means (not shown) just as the aligning punches enter the holes **1** in the strip. The strip is thus held in exact position for the second stroke while three more blanks **2** are made at positions **23**.

For the third stroke, the strip **19** is advanced two more blank widths and the same procedure is repeated, with three more blanks **3** being produced. Also, on this stroke, end scrap pieces **3'** approximately one-half a blank, left ahead of holes **1** after the first stroke of the press, are sheared off at positions **36**.

On the fourth stroke, the strip has advanced two additional blank widths and three blanks **4** are produced at positions **23**. In addition, three blanks **4** are made at positions **36** and end scrap pieces **4'** are sheared off at positions **42**.

On the fifth stroke, the strip is advanced two more blank widths and three blanks **5** are produced at positions **23**, and three blanks **5** are produced at positions **36**. In addition, two blanks **5** are produced at position **42**, leaving two blanks **5** in row L which are pushed ahead by the next advancement of the strip. Edge waste pieces **5'** are also produced at positions **46** in row M.

The sixth stroke produces complete blanks, the same as on the fifth stroke, and also produces full length scrap pieces **6'** at positions **46**. All strokes after the sixth produce pieces the same as the sixth stroke, including ten square blanks at each stroke.

It will be noted from Fig. 3 that the blanks at blanking positions **23**, **36**, and **42** drop through openings under the dies, and that blanks produced ahead of positions **42** drop through openings **70** in Fig. 2. Also, the edge scrap pieces drop through openings **71** in Fig. 2.

Thus, a blanking system is provided in which a large number of blanks is produced at each stroke of the press entirely by punches. The distribution of blanking pressure is over a wide area of the strip or sheet, thus balancing the pressure applied by the press. Furthermore, the use of the aligning punches with the first row of perforations holds the strip in exact register for further punching operations. In all blanking positions, square blanks are formed, all of which have close tolerances and are uniform in size.

Furthermore, the invention provides for double production, in that the feed of the strip between each stroke is twice the blank size. Since the guiding is accomplished by the aligning punches moving with the die set, there is no danger from scratching or galling the strip from the sliding of the feed rollers as, for example, may occur when feeding against a solid stop. Furthermore, a minimum of waste results, the only waste after starting being the narrow margins along the edges of the strip.

It will be understood that the press may vary in size without departing from the disclosed pattern. For example, as disclosed, with a strip five blanks wide, ten blanks are produced on each stroke of the press after the initial starting steps. With a strip three blanks wide, six blanks would be produced by each stroke of the press; and with a strip seven blanks wide, fourteen blanks would be produced by each stroke.

While certain novel features of the invention have been disclosed herein, and are pointed out in the annexed claims, it will be understood that various omissions, substitutions and changes may be made by those skilled in the art without departing from the spirit of the invention.

What is claimed is:

1. In a press for forming square blanks from a sheet strip, said strip being movable lengthwise of itself through the press, said press in effect cutting said strip into columns of adjoining blanks extending lengthwise of the strip and corresponding rows of adjoining blanks extending crosswise of the strip, a die having a first row of spaced blanking openings, the adjacent edges of said openings being spaced apart the width of one blank, a second row of spaced aligning openings which openings are in the same columns as said first row, a third row of spaced blanking openings which openings are in the same columns as said first row, a fourth row of spaced blanking openings which openings are located in columns intermediate the columns of said first row, said first row of openings having four-sided cutting edges, said second row of openings having four-sided aligning edges, said third row of openings being oblong, the long sides extending lengthwise of the sheet and constituting cutting edges, said fourth row of openings being oblong, the long sides extending crosswise of the sheet and constituting cutting edges, the axes of said first and second

rows being spaced apart the width of two blanks, the axes of said second and third rows being spaced apart the width of three blanks, the axes of said third and fourth rows being spaced apart the width of two blanks, and a movable head having rows of punches corresponding to and adapted to enter said die openings, the punches of said second row being longer than the other punches and having chamfered ends for the purpose of aligning the strip.

2. In a press for forming square blanks from a sheet strip, means for moving the strip lengthwise of itself through the press in steps corresponding to two blanks, said press, in effect, cutting said strip into columns of adjoining blanks extending lengthwise of the strip, a die comprising a set of square blanking openings in primary alternate columns, one square opening in each column, a set of longitudinally extending oblong blanking openings in said primary columns, one oblong opening in each column, a set of spaced transversely extending oblong blanking openings in secondary columns intermediate said primary columns, one last-mentioned opening in each secondary column, the axes of said square openings being spaced from the axes of the oblong openings in said primary columns a distance corresponding to an odd number of blanks greater than one, and a movable head having punches corresponding to and adapted to enter said die openings.

3. In a press for forming rectangular blanks from a sheet strip, means for moving the strip lengthwise of itself through the press in steps corresponding to two blanks, said press, in effect, cutting said strip into columns of adjoining blanks extending lengthwise of the strip, a die comprising a set of rectangular blanking openings in primary alternate columns one in each column, a set of rectangular aligning openings in said primary columns, a second set of parallel-edged blanking openings in said primary columns one in each column, a third set of parallel-edged blanking openings in secondary columns intermediate said primary columns one in each column, the axes of said first set of blanking openings being spaced from the axes of said aligning openings a distance corresponding to an even number of blanks, the axes of said set of aligning openings being spaced from the axes of said second set of blanking openings a distance corresponding to an odd number of blanks greater than one, a movable head having blanking and aligning punches corresponding to and adapted to enter said die openings, said aligning punches being longer than said blanking punches and having chamfered ends, and means for causing said aligning punches to engage openings in said strip resulting from the operation of said blanking punches whereby to align the strip.

4. In a press for forming rectangular blanks from a sheet strip, means for moving the strip lengthwise of itself through the press in steps corresponding to two blanks, said press, in effect, cutting said strip into columns of adjoining blanks extending lengthwise of the strip, a die comprising a set of rectangular blanking openings in primary alternate columns one in each column, a second set of parallel-edged blanking openings in said primary columns one in each column, a third set of parallel-edged blanking openings in secondary columns intermediate said primary columns, the axes of said first and second sets of

blanking openings being spaced apart a distance corresponding to an odd number of blanks greater than one, said primary columns constituting the outer columns of the die, said die having guide edges for said strip, said guide edges being spaced apart a distance greater than the remote edges of the die openings in said outer columns, and a movable head having punches corresponding to and adapted to enter said die openings.

5. In a press for forming square blanks from a sheet strip, means for moving the strip lengthwise of itself through the press in steps corresponding to two blanks, said press, in effect, cutting said strip into columns of adjoining blanks extending lengthwise of the strip, a die comprising a set of square blanking openings in primary alternate columns one in each column, a set of square aligning openings in said primary columns, a second set of parallel-edged blanking openings in said primary columns one in each column, a third set of parallel-edged blanking openings in secondary columns intermediate said primary columns one in each secondary column, the axes of said first set of blanking openings being spaced from the axes of said aligning openings a distance corresponding to an even number of blanks, the axes of said set of aligning openings being spaced from the axes of said second set of blanking openings a distance corresponding to an odd number of blanks greater than one, said primary columns constituting the outer columns of the die, said die having guide edges for said strip, said guide edges being spaced a distance greater than the remote edges of the die openings in said outer columns, a movable head having blanking and aligning punches corresponding to and adapted to enter said die openings, said aligning punches being longer than said blanking punches and having chamfered ends, and means for causing said aligning punches to engage openings in said strip resulting from the operation of said blanking punches whereby to align the strip.

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