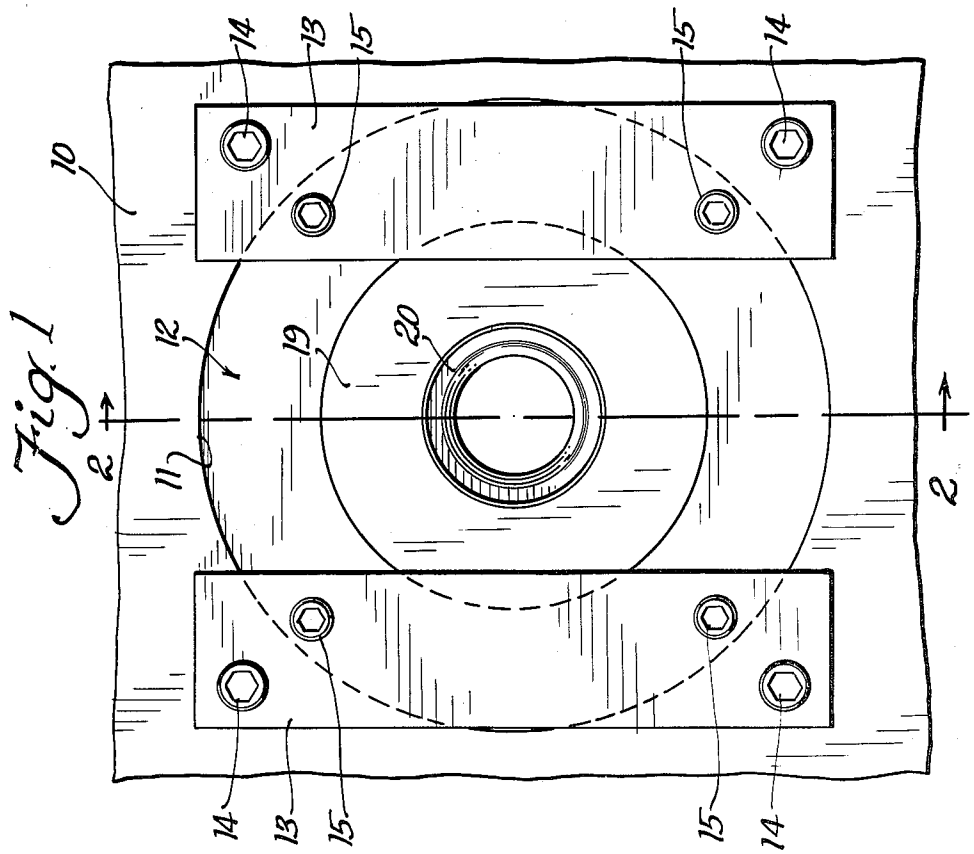
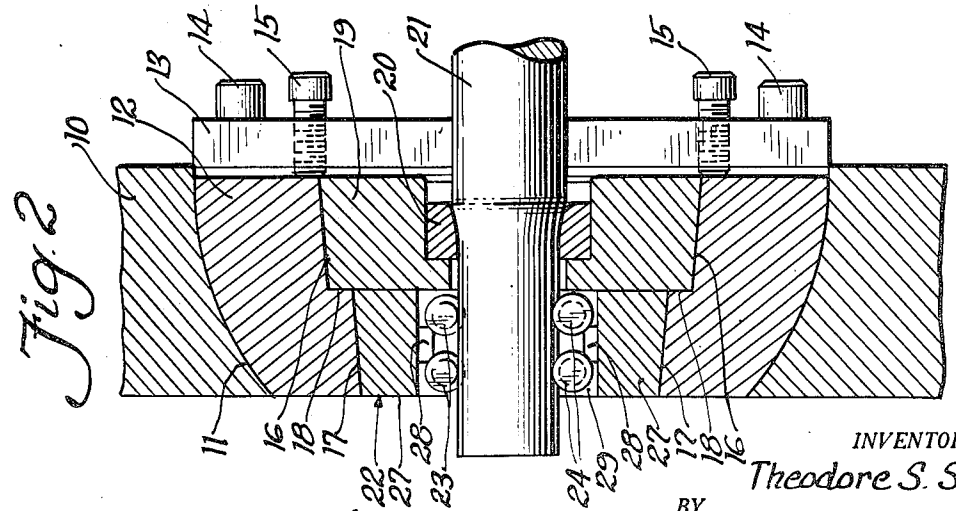
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DIE ASSEMBLY

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Fig. 3

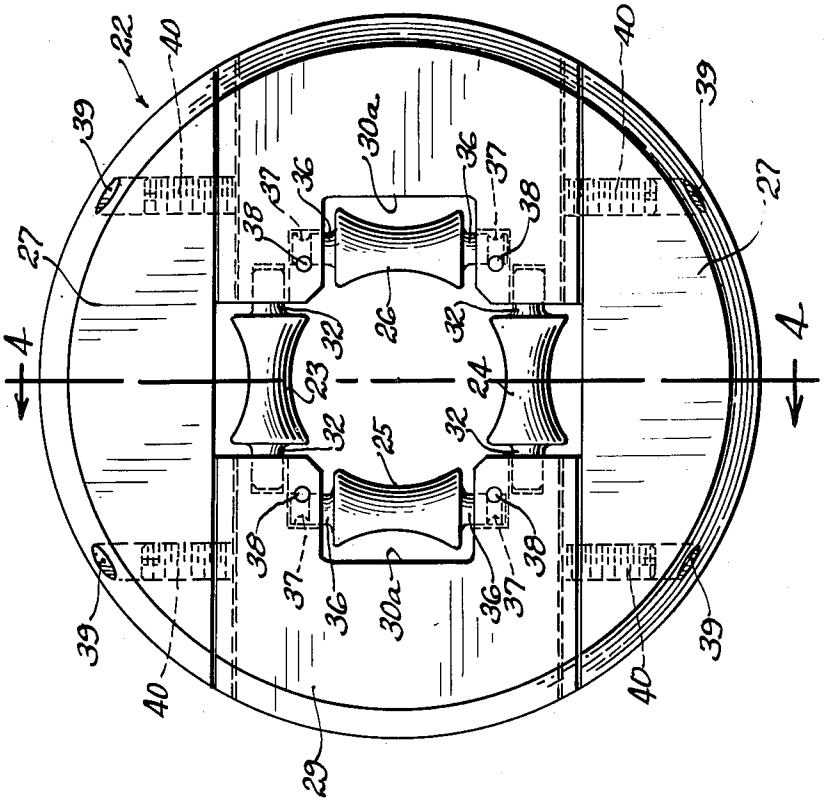
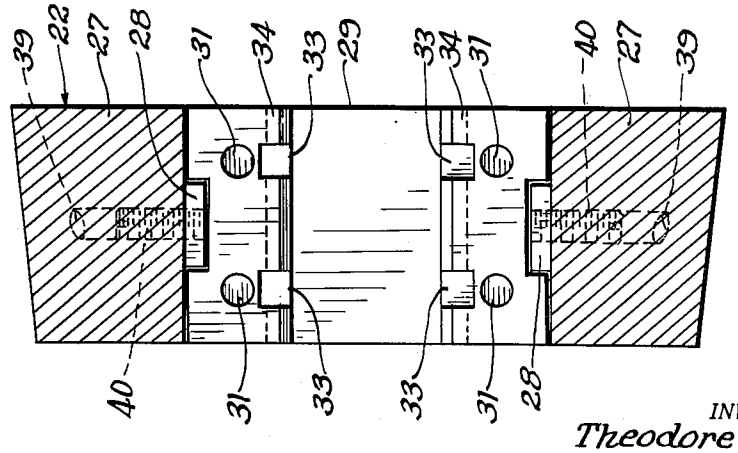


Fig. 4



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Fig. 5

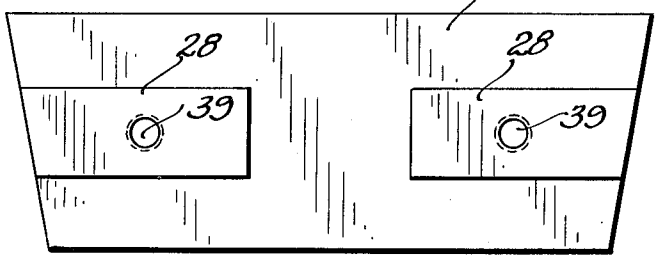


Fig. 7

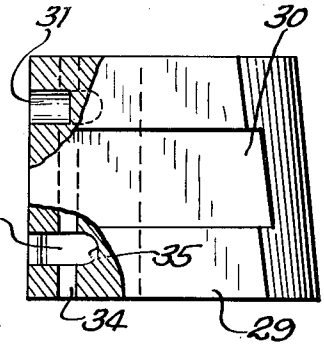


Fig. 6

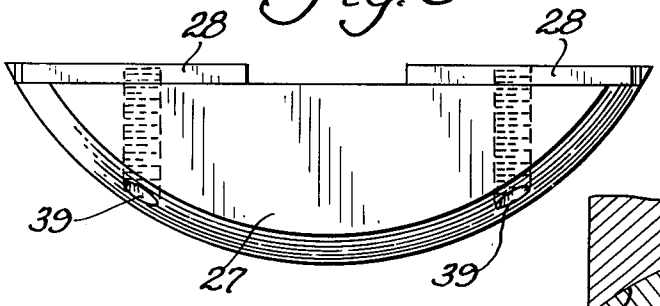


Fig. 8

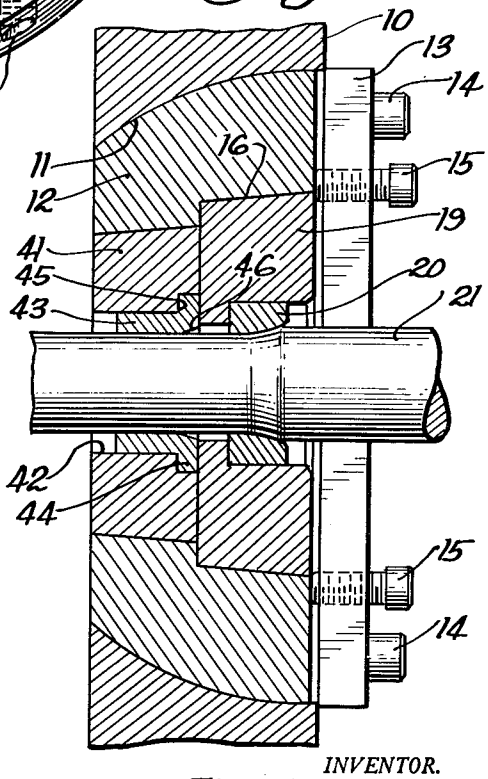
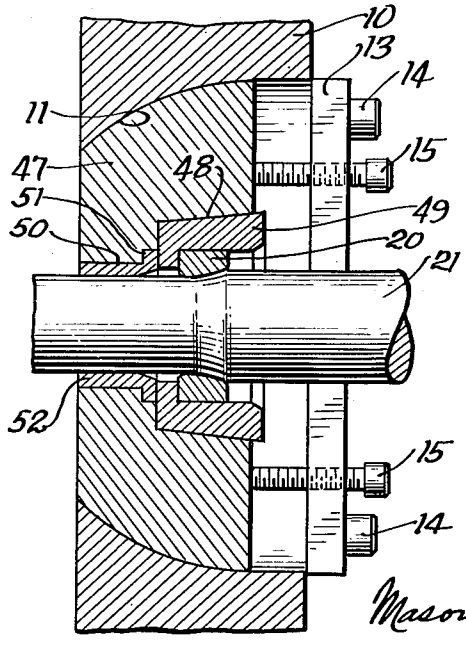


Fig. 9



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2,602,539

DIE ASSEMBLY

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Application April 6, 1950, Serial No. 154,289

4 Claims. (Cl. 205—25)

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This invention relates to drawing die assemblies, more particularly to die assemblies for use in the cold drawing of metal stock such as bars, rods and other metal articles, and the invention has for an object the provision of improved and highly efficient die assemblies of this character.

In the past it has been substantially the universal practice in the cold drawing of steel bars, for example, to machine the ends of the hot rolled bars which constitute the starting material, so as to provide points or pointed ends of reduced diameter which may be inserted through the drawing die so as to be gripped by the draw carriage of the usual draw bench, the drawing operation being completed by pulling the bar through the die. The pointed ends or points must later be cut off of the finished cold worked bar, and thus constitute scrap which, from a cost standpoint, amounts to a substantial loss. While it has previously been suggested that the pointing of the bars may be eliminated by pushing the bars through the dies for a distance sufficient to permit gripping of the pushed-through ends by the gripping jaws of the draw carriage, such procedure has not been effective to eliminate the scrap loss, since the gripping jaws of the heretofore known draw carriages have been provided with teeth or serrations which, during the drawing operation, so mar the ends of the bars as to produce from three to five inches of scrap on each bar.

Recently there has become available on the market a new design of draw carriage employing smooth faced wedge type gripping members which are effective to draw the bar without spoilage, and it is contemplated that, by eliminating the pointing operation and resorting to the practice of pushing the bars through the die at the initiation of the drawing operation, scrap loss due to spoilage of the ends of the bars can now be eliminated. Difficulties have been encountered, however, due to the fact that both the die block and the draw carriage must be rigidly mounted on the draw bench in so far as transverse movement is concerned and to the fact that the ends of the bars when pushed through a conventional drawing die have a tendency to emerge in a crooked or non-axial relation. In using the above referred to draw carriage having smooth faced gripping members, it is necessary that approximately ten to twelve inches of the bar be pushed through the die in order properly to be gripped in the draw carriage, and consequently it has been found that the pushed-through ends of the bar will not enter the gripping jaws of the draw carriage which allow a leeway of only ⅛ inch or less of deviation. Accordingly, it is a further object of this invention to provide a drawing die assembly which will insure that the pushed-through ends of the bar emerge from the die block in straight or axial relation so as properly to enter the gripping jaws of the draw carriage.

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Another object of the invention is the provision of a die assembly incorporating straightening means rigidly supported with relation to the reduction die for receiving and guiding the pushed-through ends of the bar being drawn.

Still another object is the provision of a die assembly of the above character provided with straightening rolls for receiving the pushed-through ends of a bar and guiding the bar into the draw carriage.

Still another object of the invention is to provide a die assembly of the above character which includes a straightening die mounted forwardly of the reduction die for receiving and guiding the pushed-through end of the bar being drawn.

In carrying out the invention in one form, a drawing die assembly is provided comprising die supporting means in which a reduction die is mounted for effecting a reduction in the cross-sectional area of the work when the work is pushed through the die, together with work engaging straightening means mounted in the die supporting means forwardly of the reduction die and in aligned relation thereto for receiving and guiding the pushed-through ends of the work.

For a more complete understanding of the invention, reference should now be had to the drawings, in which:

Fig. 1 is an elevational view of the rear or entrance side of a die block incorporating a die assembly embodying the present invention;

Fig. 2 is an elevational sectional view taken substantially along the line 2—2 of Fig. 1;

Fig. 3 is an elevational view on a somewhat larger scale showing the arrangement of the straightening rollers and the supporting means therefor embodied in the die assembly of Figs. 1 and 2;

Fig. 4 is a sectional view taken substantially along the line 4—4 of Fig. 3 with the rollers omitted;

Fig. 5 is a bottom plan view of one of the filler members incorporated in the supporting means of Figs. 3 and 4;

Fig. 6 is a side elevational view of the filler member shown in Fig. 5;

Fig. 7 is a top plan view, partially in section, of

one of the roller housings incorporated in the roller supporting means of Fig. 3; and

Figs. 8 and 9 are elevational sectional views similar to Fig. 2, showing further embodiments of the invention in which straightening dies are provided in place of the straightening rollers of the embodiment of Fig. 2.

Referring now to the drawing, the invention has been shown as embodied in a die assembly mounted in a suitable die block or housing 10 which forms a part of a draw bench equipped with a draw carriage of the above described character. Neither the draw bench nor the draw carriage are shown in the drawing, inasmuch as they form no part of the present invention. As shown in Figs. 1 and 2, the die block 10 is provided with the usual socket 11 having a spherically formed peripheral wall for receiving a similarly formed die ring 12 which may be adjustably positioned within the socket 11 and clamped in fixed relation by means of a pair of clamping members 13 secured to the die block 10 by suitable bolts 14 and provided with threaded adjusting members 15 which extend through the clamping members 13 so as to engage the rear surface of the die ring 12. In accordance with the present invention, the die ring 12 is provided with an axially extending opening having peripheral wall portions 16 and 17 which taper inwardly from the entrance side of the die block toward the exit side thereof and which are connected by an abrupt shoulder portion 18.

Disposed within the portion of the axial opening in the die ring 12 defined by the wall portion 16 is a suitable die supporting stock or matrix 19 which carries a suitable reduction die 20 made of hardened metal and suitably designed for effecting a reduction in the cross-sectional area of the bar or stock 21 in accordance with conventional practice when the bar 21 is pushed or pulled through the die. Mounted forwardly of the die supporting matrix 19 and disposed within the portion of the axial opening defined by the wall portion 17 is a supporting assembly 22 for supporting a plurality of pairs of straightening rollers 23, 24, 25 and 26 (Fig. 3). As shown, both the roller supporting assembly 22 and the die supporting matrix 19 are provided with tapered peripheral walls corresponding to the tapered walls 17 and 16 respectively, and it will be apparent that, upon assembly of these elements into the die block 12 from the rear or entrance side thereof, a wedging action between the matrix 19 and the wall 16 will be effected so as firmly to position the drawing die 20 when a bar is pushed or pulled therethrough, and the matrix 19, which bears on the rear surface of the roller supporting assembly 22, will force this assembly firmly into engagement with the tapered wall 17 so as properly to position the assembly 22 and the straightening rollers in the die block.

By employing the straightening rollers 23 to 26, inclusive, mounted forwardly of the reduction die 20 and in alignment therewith so as to receive the pushed-through end of the bar 21, it is possible to insure that the ends of the bar will emerge from the die block in a straight condition and will properly enter the gripping jaws of the draw carriage.

As shown best in Figs. 3 to 5, inclusive, the supporting assembly 22 for the straightening rollers comprises a pair of identical filler members 27, each of which includes an outer tapered wall conforming to the wall portion 17 of the die block 12, and each of which is provided with an opposed flat wall having suitable keys or guides 28 extending therefrom. Disposed between the filler members 27 are suitably shaped roller housings 29 having outer surfaces shaped to conform to the peripheral wall 17 of the die block 12 and having the top and bottom surfaces thereof provided with suitable notches or keyways 30 for receiving the keys 28 on the top and bottom filler members 27.

As shown best in Figs. 3, 4 and 7, the inner face of each of the roller housings 29 is provided with a notch 30*a* for accommodating the vertically disposed rollers 25 and 26, the horizontally disposed rollers 23 and 24 being disposed between the inner faces of the roller housings. In order properly to support the horizontal rollers 23 and 24, the inner faces of the roller housings 29 are provided with inwardly extending drilled apertures 31 which constitute bearings for receiving the stub shafts 32 which extend from the opposite ends of each of the rollers and are preferably formed integrally therewith. Assembly of the rollers 23 and 24 between the opposed bearing housings 28 may be accomplished merely by holding the rollers 23 and 24 in proper position and moving the roller housings inwardly to the assembled position shown in Fig. 3. In order properly to support and position the vertical rollers 25 and 26, the roller housings are provided with inwardly extending slots 33 which are intercepted at an intermediate point thereof by suitable locking pin receiving openings 34. The stub shafts 36 on the vertically disposed rollers 25 and 26 are provided with annularly extending grooves 37 so that, after the rollers have been placed in position with their stub shafts 36 in the slots 33, a locking pin 38 may be inserted through the openings 34 to retain the rollers 25 and 26 in position against the rounded end walls 35 (Fig. 7) of the slots 33.

After the vertical rollers 25 and 26 have been assembled and locked in position in the roller housings 29, and the roller housings have been moved inwardly toward each other so as to engage the stub shafts 32 on the rollers 23 and 24, the fillers 27 may be assembled on the roller housings, as shown in Fig. 3, and the entire assembly may then be inserted into the axial opening in the die block 12. In order to permit minor adjustment of the roller housings and the filler members, the filler members 27 are provided, as shown, with threaded openings 39 which extend therethrough and in which are mounted corresponding threaded adjusting members 40, the inner ends of which bear on the upper and lower surfaces of the housings 29. After insertion of the assembly into the axial opening in the die block 12, the entire roller supporting assembly will be held firmly in fixed relation by means of the pressure exerted thereon by the die supporting matrix 19.

While pairs of rollers 23, 24, 25 and 26 have been shown, it will, of course, be understood that only a single roller of each pair or a greater number of rollers may be employed, if desired, and that the sets of rollers may be disposed angularly about the bar being drawn as desired or necessary properly to engage the surface of the work and insure straight drawing of the ends.

In the embodiment of the invention shown in Fig. 8, similar parts are given similar reference numerals and will not be again described, but it will be observed that, in place of the roller supporting assembly 22 of the heretofore described embodiment, the die assembly shown in

Fig. 8 includes a die supporting matrix or stock 41 having a cylindrical aperture 42 therein in which is disposed a cylindrical hardened guide die 43 which is provided at its rear end with an annular flange 44 adapted to rest against an annular shoulder 45 at the corresponding end of the die receiving opening 42. The cylindrical guide die 43 is provided with an opening therein which is equal in diameter to the diameter of the bar 21 after the bar has been pushed through the reduction die 20, and this opening is slightly relieved at the entrance end of the die 43 as indicated by the reference numeral 46 to insure that the end of the bar will properly enter the guide die 43. The die assembly shown in Fig. 8 functions in the same manner as in the previously described embodiment in that the guide die 43 insures that the pushed-through ends of the bar 21 will emerge in a straight and axially aligned condition.

In the embodiment shown in Fig. 9, a modified die ring 47 is provided in place of the die ring 12 of the previously described embodiments, the difference being that the axial opening through the die ring 47 includes a tapered portion 48 corresponding to the portion formed by the walls 16 in the die ring 12 for receiving a suitable die supporting matrix 49 having correspondingly tapered peripheral walls in which is mounted the reduction die 20, but, in place of the tapered walls 17 of the die ring 12, the die ring 47 is provided with cylindrical walls 50 and an annular shoulder 51 for directly supporting a guide die 52 which is in general of the same structure as the guide die 43 of Fig. 8. The guide die 52 is held firmly in position by engagement of the matrix 49 therewith during the drawing operation, and consequently the guide die 52 functions as previously explained to insure that the pushed-through ends of the bar 21 emerge in a straight and axially aligned condition.

While particular embodiments of the invention have been shown, it will be understood, of course, that the invention is not limited thereto since many modifications may be made, and it is therefore contemplated by the appended claims to cover any such modifications as fall within the true spirit and scope of the invention.

What is claimed and desired to be secured by Letters Patent is:

1. A drawing die assembly comprising a die ring having coaxial annular internal surfaces of different diameters, each of said annular internal surfaces tapering inwardly from the entrance side of said die ring, a reduction die supporting matrix disposed in said die ring in seating engagement with said annular surface of largest diameter, a reduction die seated in said supporting matrix to effect a reduction in the cross-sectional area of the work when the work is passed through said die, a roller supporting assembly seated in said annular surface of smallest diameter opposite the exit side of said die and comprising a pair of filler members having opposed roller housings supported therebetween, and straightening rollers rotatably supported at the inner opposed ends of said roller housings to receive therebetween and engage the work after reduction by said die.

2. A drawing die assembly comprising a die ring having coaxial annular internal surfaces of different diameters, each of said annular internal surfaces tapering inwardly from the entrance side of said die ring, a reduction die supporting matrix disposed in said die ring in seating engagement with said annular surface of largest diameter, a reduction die seated in said supporting matrix to effect a reduction in the cross-sectional area of the work when the work is passed through said die, a roller supporting assembly seated in said annular surface of smallest diameter opposite the exit side of said die and comprising a pair of filler members having opposed roller housings supported therebetween, straightening rollers rotatably supported at the inner opposed ends of said roller housings to receive therebetween and engage the work after reduction by said die, and means for adjustably positioning said roller housings relative to said filler members.

3. A drawing die assembly comprising a die ring having coaxial annular internal surfaces of different diameters, each of said annular internal surfaces tapering inwardly from the entrance side of said die ring, a reduction die supporting matrix disposed in said die ring in seating engagement with said annular surface of largest diameter, a reduction die seated in said supporting matrix to effect a reduction in the cross-sectional area of the work when passed through said die, a roller supporting assembly seated in said annular surface of smallest diameter opposite the exit side of said die and comprising a pair of filler members having opposed roller housings supported therebetween, straightening rollers rotatably supported at the inner opposed ends of said roller housings, and additional straightening rollers rotatably supported between the ends of said roller housings, said rollers being adapted to receive therebetween and engage the work after reduction by said die.

4. A drawing die assembly comprising a die ring having coaxial annular internal surfaces of different diameters, each of said annular internal surfaces tapering inwardly from the entrance side of said die ring, a reduction die supporting matrix disposed in said die ring in seating engagement with said annular surface of largest diameter, a reduction die seated in said supporting matrix to effect a reduction in the cross-sectional area of the work when passed through said die, a roller supporting assembly seated in said annular surface of smallest diameter opposite the exit side of said die and comprising a pair of filler members having opposed roller housings supported therebetween, straightening rollers rotatably supported at the inner opposed ends of said roller housings, additional straightening rollers rotatably supported between the ends of said roller housings, said rollers being adapted to receive therebetween and engage the work after reduction by said die, and means for adjustably positioning said roller housings relative to said filler members.

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