This invention relates to the field of metal forming and can be used to produce metals and metallic materials with ultrafine grains through intensive plastic deformation; it is also applicable in mechanical engineering for workpieces processing for various purposes. Method for multiple-cycle reversible intensive plastic deformation of blanks consists of deforming a blank of a given length according to a scheme of a plane-deformed state in the blank cross-section, for which the deformation of the blank is restricted along two axes perpendicular to the deformation axis, at the ends of the blank and on both sides along its length, forming the blank cross-section using die sections, removing the blank from the die before each subsequent deformation stage, and rotating the blank around the longitudinal axis, positioning the blank in the die so that its acute angles contact the obtuse angles of the die sections, and reshaping the resulting cross-section of the blank by asymmetric upsetting so that the acute and obtuse angles of the cross-section are interchanged, and repeating the deformation the required number of times to achieve the specified degree of shear deformation. In this process, the blank cross-section is formed into a hexagon with two sides perpendicular to the deformation axis, and the rotation angles are varied so that the blank acute angles contact the various obtuse angles of the die sections opposite the vertical axis, rotating, respectively, clockwise and counterclockwise by an angle β, which is determined according to the formula: $\beta=\arcsin((2B+C)*tg(\alpha)/(A*tg(\alpha)+2B))$,where α is the angle of the inclined deforming surfaces relative to the horizontal axis; B is the depth of the cavities of the upper and lower die sections in the cross-section; A is the width of the horizontal platform in the cavities in the die cross-section; C is the gap between the die halves when the upper section is in the lower position. The invention consists in reducing the non-uniformity of deformation distribution across the blank cross-section and minimizing the number of operations by achieving a symmetrical blank shape at each stage of deformation.