Feb. 16, 1943. H. C. JAMES 2,310,959

PRUNING SHEARS

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Fig. 1.

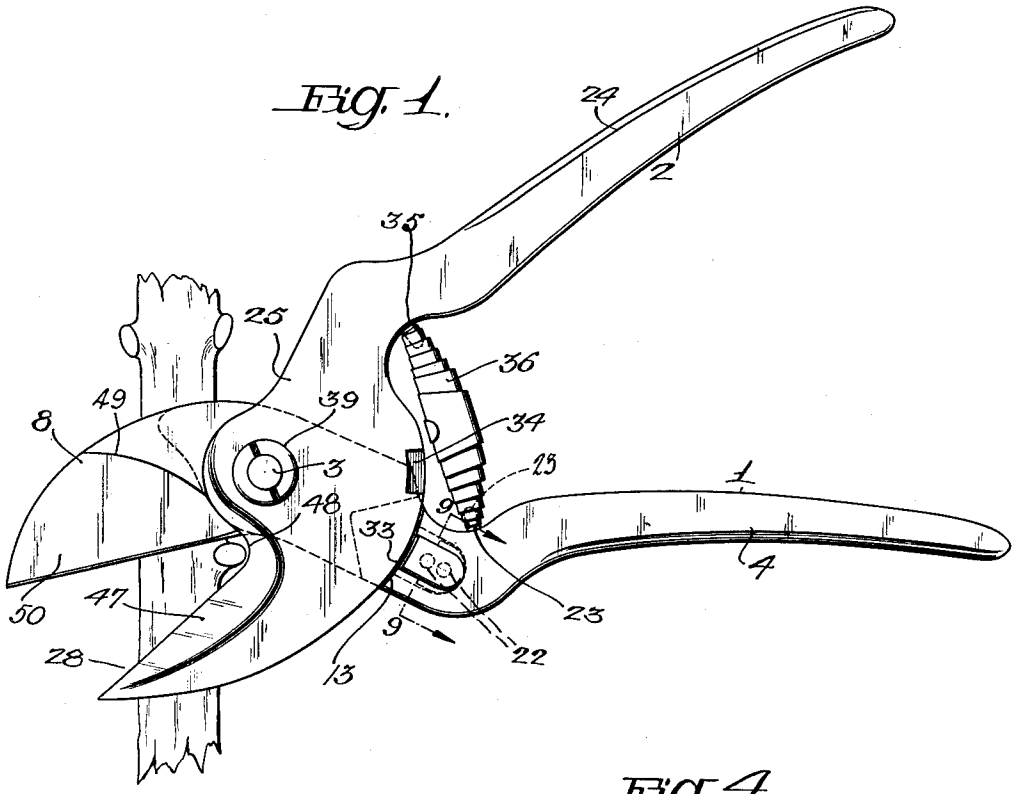
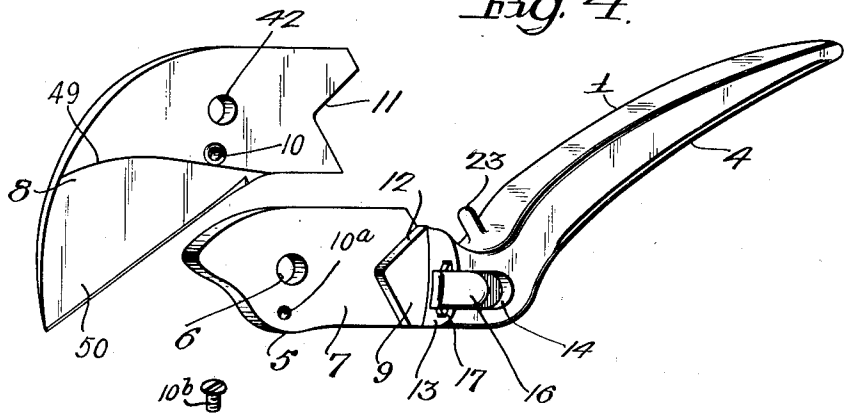


Fig. 4.



Inventor:-
Howard C. James
by his Attorneys
Howson & Howson

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PRUNING SHEARS

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Fig. 2.

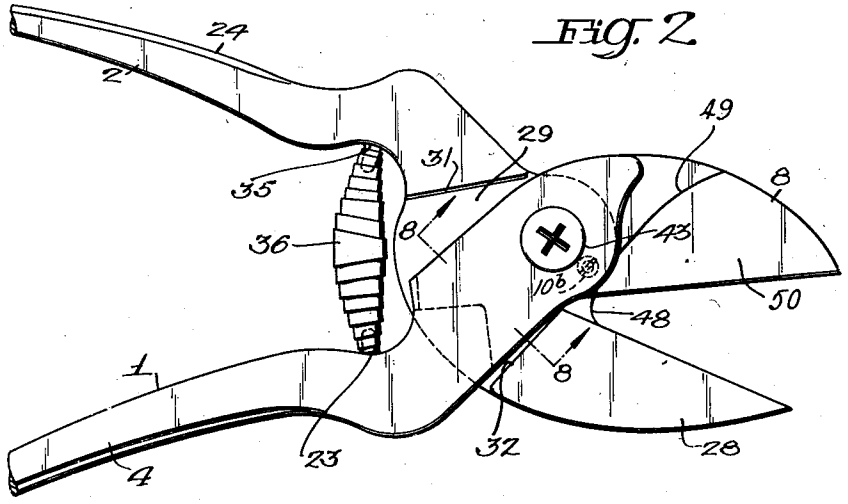


Fig. 3.

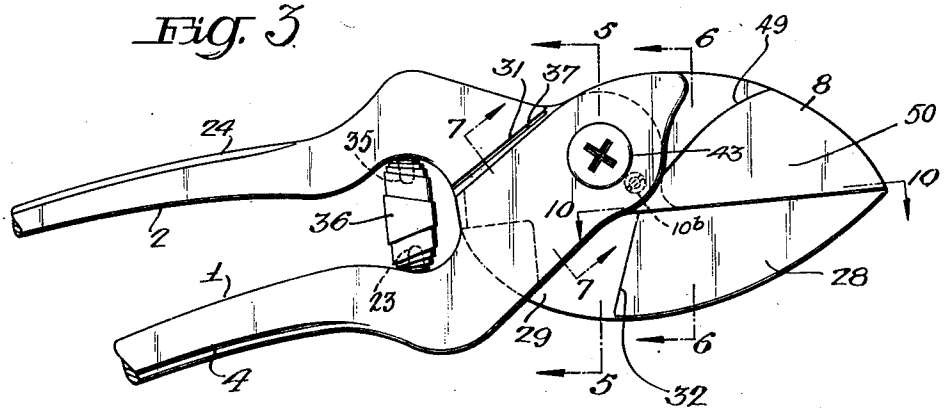
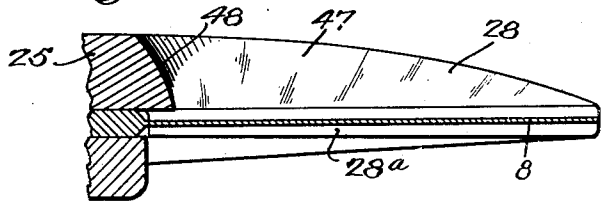


Fig. 10.



Inventor:-
Howard C. James
by his Attorneys
Howson & Howson

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PRUNING SHEARS

Filed Feb. 7, 1942 3 Sheets-Sheet 3

Fig. 5.

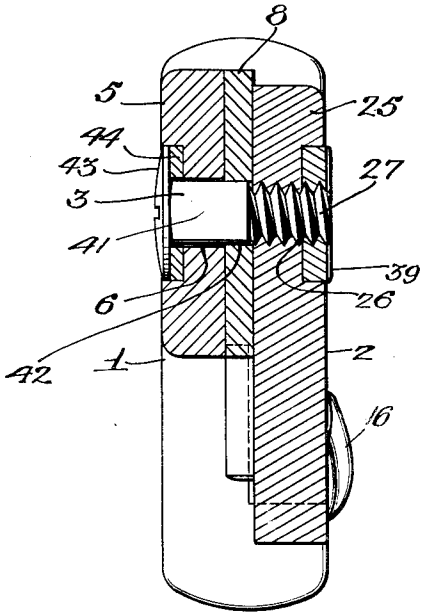


Fig. 6

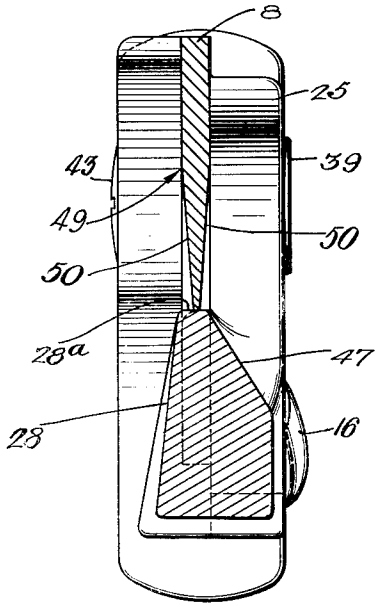


Fig. 7

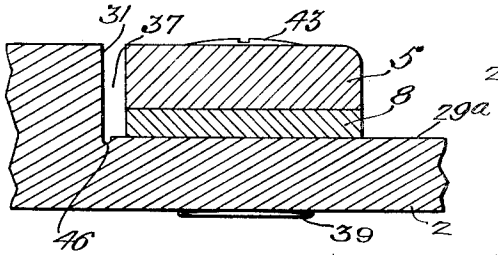


Fig. 8.

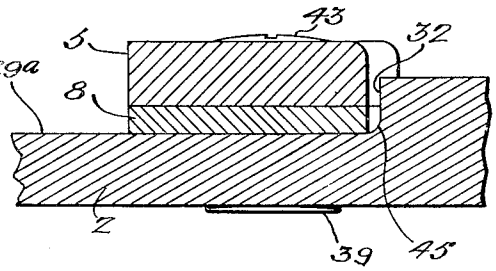
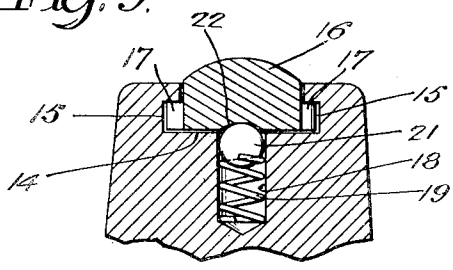


Fig. 9.



Inventor:-
Howard C. James
by his Attorneys
Howson & Howson

Patented Feb. 16, 1943 2,310,959

UNITED STATES PATENT OFFICE

2,310,959

PRUNING SHEARS

Howard C. James, Philadelphia, Pa., assignor to Henry Disston & Sons, Incorporated, Tacony, Pa., a corporation of Pennsylvania

Application February 7, 1942, Serial No. 429,919

16 Claims. (Cl. 30—262)

This invention relates to improvements in shears, and a principal object of the invention is to provide shears combining the several desirable characteristics of extreme lightness of weight, high operating efficiency, strength, and durability.

To this end, the invention contemplates the manufacture of the frame of the shears from magnesium, aluminum, or other alloys, preferably of a type susceptible of die casting, which alloys combine in marked degree the properties of strength and lightness of weight, and in part the invention resides in the adaptation of these metals to the particular requirements of instruments of the type involved.

More particularly, the invention resides in certain features of structural and mechanical design which make possible the efficient use of the aforesaid alloys in shears of the type set forth, and which in combination provide an instrument of exceptionally good physical characteristics and high operating efficiency.

Still more specifically, an object of the invention is to provide shears having a frame composed of an alloy metal of extreme lightness of weight as set forth, wherein rubbing action between the relatively movable parts of the frame shall be effectively avoided; wherein the relatively moving parts of the frame shall find a primary bearing upon the steel blade and blade-attaching means; wherein the anvil which cooperates with the cutting blade in the cutting operation constitutes an integral part of one of the frame elements; wherein the cutting blade shall be readily detachable from the frame for replacement; wherein the said blade is formed in novel manner to afford the highest degree of cutting efficiency consistent with an adequate degree of resistance to lateral deflection; wherein provision is made for compensating for wear in the anvil and the blade so as to extend the useful life of the tool; and wherein further the frame is formed in its several parts so as to afford maximum strength with minimum bulk, a maximum flexibility and efficiency in making grafting and similar cuts of a diagonal nature, efficient cutting action over the entire length of the shear jaws and freedom from jamming of the shears by uncut fragments or shreds, a minimum of lateral strain upon the frame during the cutting operations, and efficient locking means, all as hereinafter fully described.

The novel construction, by means of which the foregoing objects, and others hereinafter appearing, are attained, is illustrated in the attached drawings, in which:

Figure 1 is a view from one side of shears made in accordance with my invention;

Fig. 2 is a view of the opposite side of the shears;

Fig. 3 is a view corresponding to Fig. 2, but showing the shears in closed condition;

Fig. 4 is a view in perspective of one of the frame elements and of the cutting blade, which in assembly is seated on and immobilized with respect to said frame element;

Fig. 5 is a section on the line 5—5, Fig. 3;
Fig. 6 is a section on the line 6—6, Fig. 3;
Fig. 7 is a section on the line 7—7, Fig. 3;
Fig. 8 is a section on the line 8—8, Fig. 2;
Fig. 9 is a section on the line 9—9, Fig. 1, and
Fig. 10 is a section on the line 10—10, Fig. 3.

With reference to the drawings, the shears, therein disclosed as a preferred embodiment of my invention comprises two frame members 1 and 2, which in assembly are secured together by means, in the present instance, of a pivot bolt 3. The frame member 1 comprises a handle portion 4 which terminates at one end in an angularly offset blade-supporting portion 5, this section 5 having an opening 6 for reception of the bolt 3. The portion 5 has a flat inner face 7, which forms an extended seat for the cutting blade 8, and at the inner end of the seat 7 is an elevated angular portion 9 which in assembly fits into a corresponding angular recess 11 in the inner end of the blade, the blade fitting securely against the shoulder 12 formed by said elevated portion, and the latter retaining the blade securely against angular movement about the pivot bolt 3.

At the inner end of the raised portion 9 is a shoulder 13, which is formed on the arc of a circle concentric with the bolt aperture 6 for a purpose hereinafter set forth, and the handle portion 4 has a recess 14, the outer end of which intersects the curved surface of the shoulder 13. The side walls of the recess 14 are undercut or mortised, as best shown at 15 in Fig. 9. The recess 14 is adapted for reception of a catch element 16, this element having tongues or flanges 17 at opposite sides thereof which fit into the undercut recesses or mortises 15 so as to retain the catch in the recess 14 while permitting the catch element to slide longitudinally in the recess. As shown in Fig. 9, the bottom wall of the recess 14 is intersected by a cylindrical recess 18, and a spring 19 seating in the bottom of this latter recess exerts

resilient pressure upon a small sphere 21 to press the sphere against the under surface of the catch element 16. The catch element has in its under surface two shallow recesses 22, shown in dotted lines in Fig. 1, which are adapted to receive the sphere 21, as illustrated in Fig. 9, to thereby releasably retain the catch element 16 in either one of two adjusted positions. In one of these positions, the catch element is entirely retracted in the recess 14, as shown in Fig. 1, and in the other position, the end of the catch element is advanced or projected from the recess, as shown in Fig. 4.

The frame member 1 is also provided with an integral teat 23 which projects from the inside of the handle portion 4 at the juncture of said portion with the blade-supporting portion 5. The function of this teat 23 will be hereinafter described.

The frame member 2 comprises a handle portion 24 and an angularly offset portion 25 which has therein a threaded aperture 26 for reception of the threaded extremity 27 of the bolt 3, see Fig. 5. Integral with the portion 25 is an anvil 28 which is arranged for cooperative engagement with the cutting edge of the blade 8 as illustrated. The side of the frame member 2, i. e., that side which in assembly adjoins the frame member 1, is recessed between the handle portion 24 and the anvil 28, as indicated at 29 in Figs. 2 and 3. In assembly, this segmental recess is occupied by the portion 5 of the frame section 1 and by the blade 8, there being sufficient space between the shoulders 31 and 32 at the opposite ends of the recess 29 to afford the required relative movement of the frame sections about the pivot bolt 3.

Within the area of the recess 29, the curved inner edge 33 of the portion 25 of the frame section 2 lies in closely spaced relation to the shoulder 13 of the frame section 1. The edge 33, like the shoulder 13, is in this area formed upon the arc of a circle concentric with the aperture 26 which receives the pivot bolt 3. In all relative positions of the frame members, therefore, the edge 33 lies in contiguity with the shoulder 13. Intersecting the edge 33 and on the outer face of the portion 25 of the frame section 2 is a recess 34, and this recess is so positioned that when the shears are closed, or substantially closed, the recess 34 will register with the end of the catch recess 14. When the recesses are thus registered, the outer end of the catch element 16 may be projected into the recess 34 to thereby lock the frame elements in the closed relation. It is apparent that except when the recess 34 is in registration with the recess 14, the edge 33 prevents the projection of the catch element 16 from its recess and precludes accidental displacement of said element.

At the juncture between the sections 24 and 25 is a projecting teat 35 corresponding to the teat 23 of the frame member 1, and the said teat elements 23 and 35 constitute together a support for a coiled spring 36, of well known form, which is confined under compression between the frame members and exerts upon the latter resilient pressure tending to open the shears. The extent to which the blade 8 may move away from the face 28a of the anvil under the pressure of the spring 36 is limited by the shoulder 32 at the inner end of the anvil 28, this shoulder as previously described lying in the path of the portion 5 of the frame member 1 and constituting a stop for the latter, as illustrated in Fig. 2. The shoulder 31 at the opposite side of the recess 29 is so placed that when the cutting edge of the blade 8 bears against the surface 28a of the anvil 28, as shown in Fig. 3, there is clearance between the said shoulder 31 and the adjoining side edge of the portion 5 of the frame section 1, this clearance being indicated at 37 in Fig. 3. The shoulder 31 does not, therefore, interfere with the cooperative engagement between the cutting blade and the anvil.

As shown in Fig. 5 and as previously described, the bolt 3 has a threaded portion 27 which enters the correspondingly threaded aperture 26 of the frame member 2. At the outer side of this frame member, the threaded aperture 26 is countersunk for reception of a nut 39 threaded onto the end of the bolt 3. The bolt is thereby bound solidly to the frame member 2 and moves with the latter. The unthreaded portion 41 of the bolt 3 passes freely through the aperture 6 of the frame section 1 and through an aperture 42 in the blade 8, and terminates in a head 43. The aperture 6 in the frame member 1 is countersunk at the outer end for reception of the head 43 and an underlying flat washer 44. It will be noted that the washer 44 and the head 43 fit neatly within the countersink, but that a slight clearance is left between the bolt 3 and the walls of the aperture 6. Similarly the unthreaded portion 41 of the bolt fits neatly within the aperture 42 of the blade. With this arrangement, the major portion of the frictional wear resulting from the movement of the frame member 1 and the blade around the pivot bolt falls upon the blade 8, the bolt, the washer 44, and the head 43. The arrangement is of particular importance where, as in the preferred embodiment, the frame members are made of a relatively light and soft alloy, since the wear on the frame is negligible, and the wear on the other parts may be readily compensated, if required, by replacing the washer 44 or the bolt 3. The wear between the steel bolt and the steel blade occurs relatively slowly and may also be corrected, if necessary, by replacement of the bolt 3.

The structural design described above is calculated to reduce wear in the frame members to a minimum by avoiding direct frictional contact between the frame members themselves. It will be noted, for example, that the blade forms, in effect, an insulating liner between the frame members, and that the sliding contact is confined entirely to that between the blade and the surface 29 of the frame member 2. To this end, the blade is made slightly thicker than the height of the angular elevated portion 9 of the frame member 1, so that clearance is provided between the two frame members. It will be noted also that the blade is provided with a countersunk aperture 10 which registers with a hole 10a in the seating face 7 of the portion 5 for joint reception of a screw 10b. This screw positively secures the blade to the seat, but its primary function is to immobilize the blade against movement in the plane of the face 7, and it might, therefore, be replaced by a simple pin. I have found a drive screw suitable for the purpose, and the use of a screw of that type avoids necessity for tapping the hole 10a. The screw, in conjunction with the shoulder 12, prevents the thrust, which occurs when the cutting edge of the blade meets the work or the anvil, from falling directly on the bolt 3. This not only reduces wear, but also prevents a tendency of the blade, if allowed to work on the bolt in this manner, to cause the bolt to turn upon its axis and to

tighten with resultant gradual stiffening of the shear action.

As previously described, the shoulder 32 at the inner end of the anvil 28 constitutes a stop limiting the opening movement of the shears. Where the frame members are made of magnesium or other light alloys, it is desirable to avoid sharp angular corners. To this end, the corner at the base of the shoulder 32 is rounded, as indicated at 45 in Fig. 8. Also as previously set forth, a clearance space 37 is provided between the opposite shoulder 31 and the side edge of the portion 5 of the frame member 1 so that the cutting edge of the blade may solidly engage the face of the anvil even after the effective width of the blade has been reduced by filing or grinding for sharpening purposes, or after the working face of the anvil has become worn. It is apparent that a rounded corner at the bottom of the shoulder 31 corresponding to that at the bottom of the shoulder 32 previously described would tend to reduce the effective width of the clearance space 37, and would entail the necessity for setting back the shoulder 31 and thereby reducing the amount of metal in the offset portion 25. In order to afford the required amount of clearance and at the same time to carry the shoulder 31 as close as possible to the opposed edge of the frame member 1 when the shears are closed, I employ the device illustrated in Fig. 7, wherein it will be noted that the junction between the shoulder 31 and the bottom surface 29a of the recess 29 is formed by a rounded recess 46 extending below the said surface 29a. With this arrangement, the full width of the clearance space 37 is available for compensating wear in the cutting blade or in the anvil face 28a.

The anvil portion of the frame member 2 is designed particularly to afford a high degree of efficiency and flexibility in the use of the shears. It will be noted, as shown in Fig. 10, that this portion of the frame member tapers longitudinally as a matter of thickness towards the tip of the anvil. Similarly the anvil tapers in the other dimension from the outer edge toward the working surface 28a. One side face of the anvil is sharply beveled as indicated at 47, and this bevel extends into the rounded gullet portion 48 of the frame member 2, as best illustrated in Figs. 1 and 10. The cutting blade 8 is formed and arranged so that the cutting edge thereof engages the anvil on a line, see Figs. 6 and 10, which approximately bisects the working face of the anvil. The bevel surface 47 affords considerable latitude in the angular relation of a stem or branch to be cut with respect to the plane of the blade, so that the said stems or branches may be cut at a relatively sharp angle, for purposes of grafting for example, and so also that a branch shoot may be severed in relatively close proximity to the parent stem so as to afford a substantially flush cut. This latitude of angular cut extends also to the gullet between the anvil and the base of the blade. It will be noted that the working face of the anvil increases somewhat in width towards the outer end. This gives assurance that the cutting edge of the blade will meet the face of the anvil irrespective of possible lateral flexure of the blade.

It will be noted also by reference to Figs. 3 and 10 that the working face of the anvil, and also the cutting blade 8, extend rearwardly of the rounded gullet 48, so that the cut is effective to the extreme bottom of the gullet. This gives assurance that the cut will be complete and effective, and precludes the accumulation of only partially severed shreds or particles in the gullet and resulting interference with the proper meeting of the blade with the anvil.

It is to be noted, by reference particularly to Figs. 4 and 6, that the blade 8 is ground so as to leave a major portion of the blade body of maximum thickness for increased strength. Thus the entire back portion of the blade above the curved line 49 in Fig. 4 is of the greater thickness, and the ground faces 50, 50, starting at the lines 49 converge toward the cutting edge of the blade. This arrangement affords both maximum strength and cutting efficiency.

Any tendency of the parts to separate under working strain is in the present instance largely offset or compensated by the relatively large bearing surface between the frame members in the area extending inwardly from the pivot pin, and this extended bearing surface also distributes the frictional wear to an extent materially increasing the durability of the shear. The relatively great depth, for example, of the portion 25 of the frame member 2 between the pivot pin 3 and the arcuate edge 33, and the extended bearing between this portion of the frame member 2 and the blade 8, and between the blade and the blade-carrying portion of the frame member 1, tend to hold the parts rigidly in their normal relative positions, and in large degree remove the strain from the pivot bolt and the area of the frame members immediately surrounding the bolt.

I claim:

1. Shears comprising pivotally connected frame members, a separate cutting blade having an end portion extending between the overlapping faces of said members, means for anchoring the blade to one of the members for movement with the latter, said end portion of the blade extending over a major portion of the said overlapping facial areas of said members and forming a running bearing for the relatively movable member precluding material frictional contact between said members, and an anvil on said movable member for cooperative engagement with the cutting edge of said blade.

2. Shears comprising a pair of frame members, a bolt uniting said members, said bolt being secured in one of said members and forming a pivot for the second member, a cutting blade having an end portion extending between the overlapping faces of said members, and means for anchoring the blade to said second member for movement with the latter about said pivot, said blade forming a running bearing for said second member on the first member and precluding material frictional contact between said members.

3. Shears comprising a pair of frame members, a cutting blade having an end portion extending between the overlapping faces of said members, a bolt passing through said members and the blade and pivotally uniting said members, said bolt being secured in one of said members and having a head fitted closely within a countersunk recess in the second of said members, the body of said bolt passing loosely through said second member and fitting closely in said blade, and means for securing said blade to said second member.

4. Shears comprising a pair of frame members, one of said members comprising a handle portion, an adjoining blade-supporting portion and a shoulder at the juncture of said portions, the

other of said members comprising at one end a handle portion, an anvil portion at the other end, and an intermediate portion of lesser thickness providing a recess between said handle and anvil portions for reception of the blade-supporting portion of the other member, means for pivotally securing said blade-supporting portion of the first member in the said recess of the second member, the said shoulder of the first member adjoining an edge of the said intermediate portion of the second member, and said edge being formed on the arc of a circle centering in the axis of said pivot, said shoulder and adjoining edge portion having registering recesses, and a catch element slidably mounted in one of said recesses and adapted to be projected into the other of said recesses to relatively immobilize the frame members.

5. Shears comprising pivotally connected frame members, a shoulder on one of said members adjoining an edge of the second member, an undercut recess in said first member intersecting the said shoulder, a recess in said second member adapted in predetermined position of relative adjustment of said members to coincide with the end of the recess in said first member, and a catch element slidably supported in the last-named recess and adapted when projected to extend into the recess in the said second member to thereby lock the members in said position of relative adjustment.

6. Shears comprising pivotally connected frame members, a shoulder on one of said members adjoining an edge of the second member, a recess in said first member intersecting said shoulder, keyways in the side walls of said recess, a catch element slidably mounted in said recess and having at the sides thereof transversely extending keys fitting the keyways of said recess and preventing lateral displacement of said element from the recess, the said adjoining edge of the second of said members having a recess adapted in a predetermined relative position of said members to register with the end of the recess first named for reception of said catch element whereby when said catch element is slidably projected into the said receiving recess the said members are immobilized with respect to each other.

7. Shears comprising pivotally connected frame members, a shoulder on one of said members adjoining an edge of the second member, a recess in said first member intersecting said shoulder, keyways in the side walls of said recess, a catch element slidably mounted in said recess and having at the sides thereof transversely extending keys fitting the keyways of said recess and preventing lateral displacement of said element from the recess, the said adjoining edge of the second of said members having a recess adapted in a predetermined relative position of said members to register with the end of the recess first named for reception of said catch element whereby when said catch element is slidably projected into the said receiving recess the said members are immobilized with respect to each other, and resilient means for releasably retaining the catch element in each of the retracted and projected positions.

8. Shears comprising a pair of frame members, one of said members having a handle portion and an adjoining blade-supporting portion, the second of said members having a handle portion at one end, an anvil portion at the other end, and an intermediate portion of lesser thickness providing between said handle and anvil portions a recess for reception of the blade-supporting portion of the first member, means for pivotally securing the blade-supporting portion of the first member in the said recess of the second member, a cutting blade having an end portion extending between the overlapping faces of said members, means for anchoring the blade of the first-named member for movement with the latter, the cutting edge of said blade being coactive with said anvil, a shoulder at the inner end of said anvil defining one side of said recess and coactive with the blade-supporting portion of the first member to limit the relative pivotal movement of said members in one direction, a shoulder defining the opposite side of said recess, the face of said shoulder meeting substantially at right angles the plane of the bottom of said recess, and said shoulder being positioned so as to provide between said shoulder and the adjoining side of the blade-supporting portion of the first member a substantial clearance space when the cutting edge of the blade is in engagement with the anvil.

9. Shears comprising pivotally connected frame members, a blade movable with one of said members, an anvil on the other of said members arranged for cooperative engagement with the cutting edge of said blade, a shoulder extending transversely from the inner end portion and one edge of the working face of said anvil and forming the inner end of a gullet between said blade and anvil, the cutting edge of said blade and the said working face of the anvil extending inwardly beyond the line of said shoulder and providing an effective cutting area below the said inner end of the gullet.

10. Shears comprising pivotally connected frame members, a blade movable with one of said members, an anvil on the other of said members arranged for cooperative engagement with the cutting edge of said blade, and a shoulder extending transversely from the inner end portion and one edge of the working face of the anvil and along one face of the blade and forming the inner end of a gullet between the blade and anvil, said shoulder and the proximate edge of the anvil being beveled away from the bottom and side of said gullet.

11. Shears comprising pivotally connected frame members, a blade movable with one of said members, and an anvil on the other of said members having a narrow working face coactive with the cutting edge of said blade, said working face increasing in width toward the outer free end of said blade.

12. Shears comprising pivotally connected frame members composed of a light metal of the character of magnesium alloy, an anvil forming an integral part of one of said members, and a cutting blade having an end portion extending between the overlapping faces of said members, and means for anchoring the blade to the second of said members for coaction with said anvil, said blade separating said members and forming a running bearing for the first member.

13. Shears comprising a pair of frame members, a cutting blade having an extended end portion, a bolt passing through said members and the blade and pivotally securing said members together at opposite sides of said end portion of the blade, said bolt passing loosely through one of said members and being secured in the other of said members, and the body of

the bolt passing through and closely fitting an aperture in the blade, a countersunk recess in the first-named member embracing the head end of the bolt, a washer neatly fitted to the said recess and closely embracing the bolt and forming a bearing seat for the bolt head, and means for anchoring the blade to the member first named for movement therewith about the pivot.

14. In shears of the type comprising relatively movable frame members, a pivot bolt connecting said members, a blade movable with one of said members, and an anvil on the other of said members arranged for cooperative engagement with the cutting edge of said blade; a boss on the first-named member fitting into a recess in the base of the blade and anchoring the latter, and means independent of the pivot bolt and coactive with said boss to anchor the blade on said member against movement with respect to the latter in the plane of the blade.

15. In shears of the type comprising relatively movable frame members, a pivot bolt connecting said members, a blade movable with one of said members, and an anvil on the other of said members arranged for cooperative engagement with the cutting edge of said blade; means independent of the pivot bolt for anchoring the blade on the first-named member against movements relative to the latter in the plane of the blade.

16. In shears of the type comprising relatively movable frame members, a pivot bolt connecting said members, a blade movable with one of said members, and an anvil on the other of said members arranged for cooperative engagement with the cutting edge of said blade; the blade having a cutting edge extending from the tip end of the blade to a point short of the base end, the opposite faces of the blade converging toward the cutting edge from a line extending approximately on the arc of a circle from a point adjoining the inner terminal end of the cutting edge to a point on the back edge and relatively close to the said tip end of the blade, the remainder of the blade body being substantially of uniform thickness.

HOWARD C. JAMES.