Feb. 14, 1933. O. L. HUMPHREY 1,897,518

SLUB CATCHER

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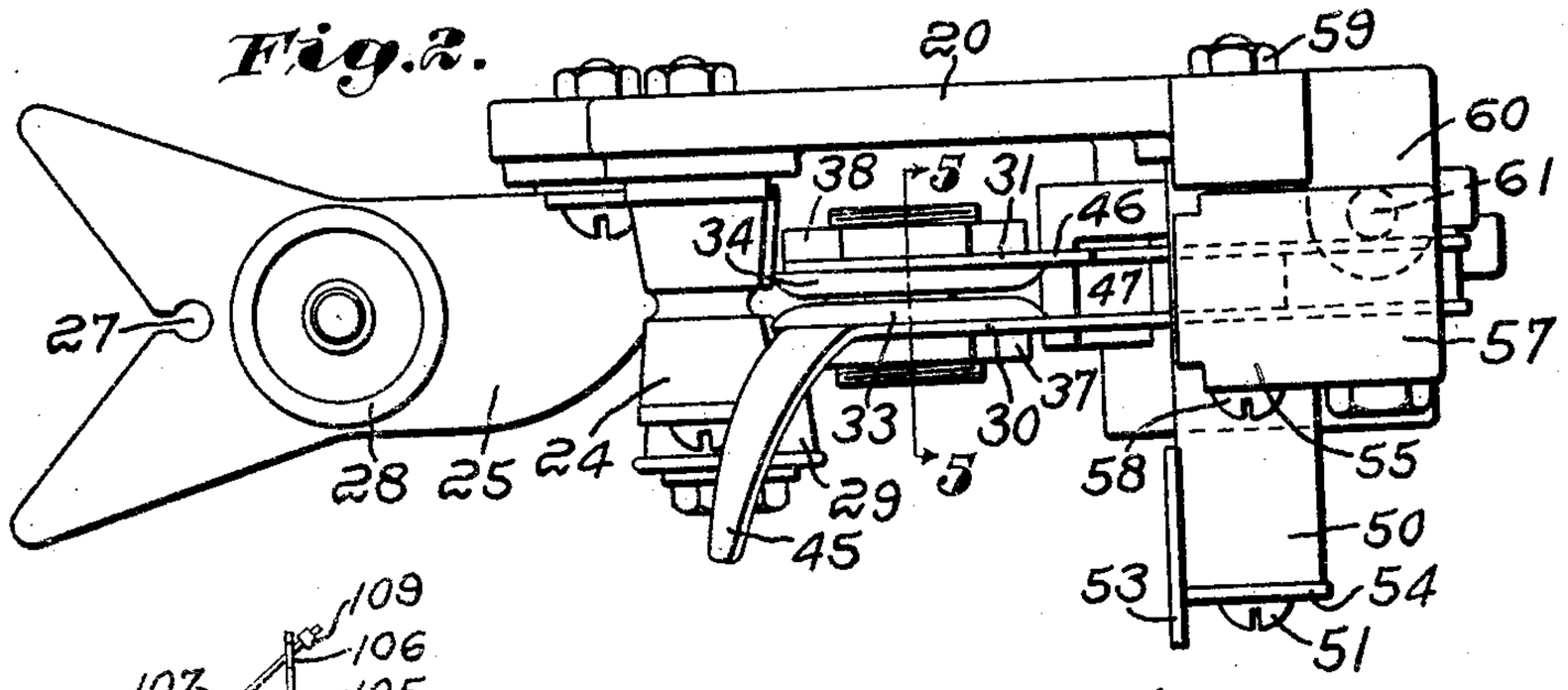
Fig. 2.



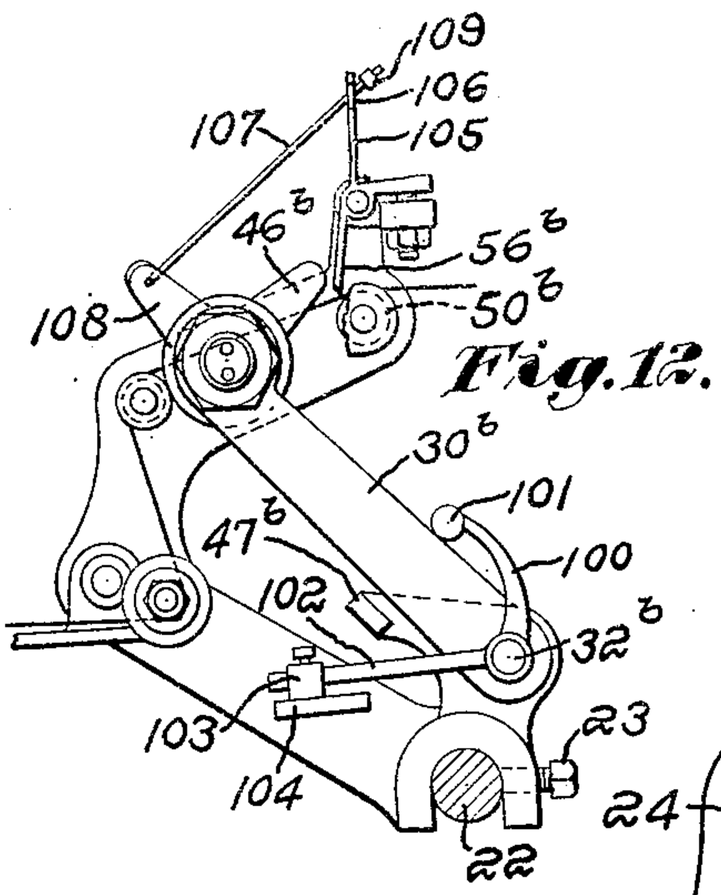


Fig. 12.

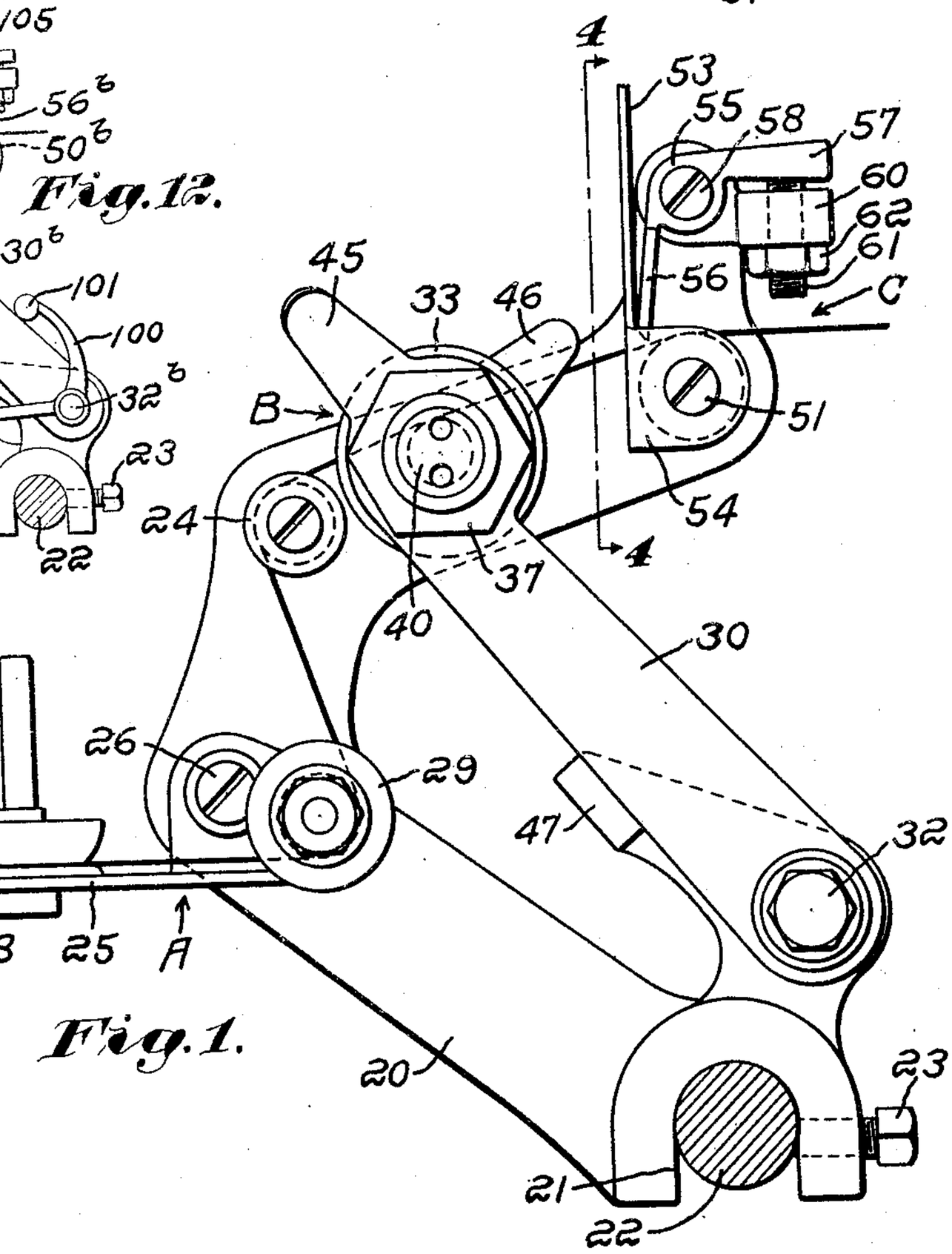


Fig. 1.

Inventor:
Otis L. Humphrey,
by Roberts, Cushman & Woodberry
Att'ys.

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SLUB CATCHER

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Fig. 3.

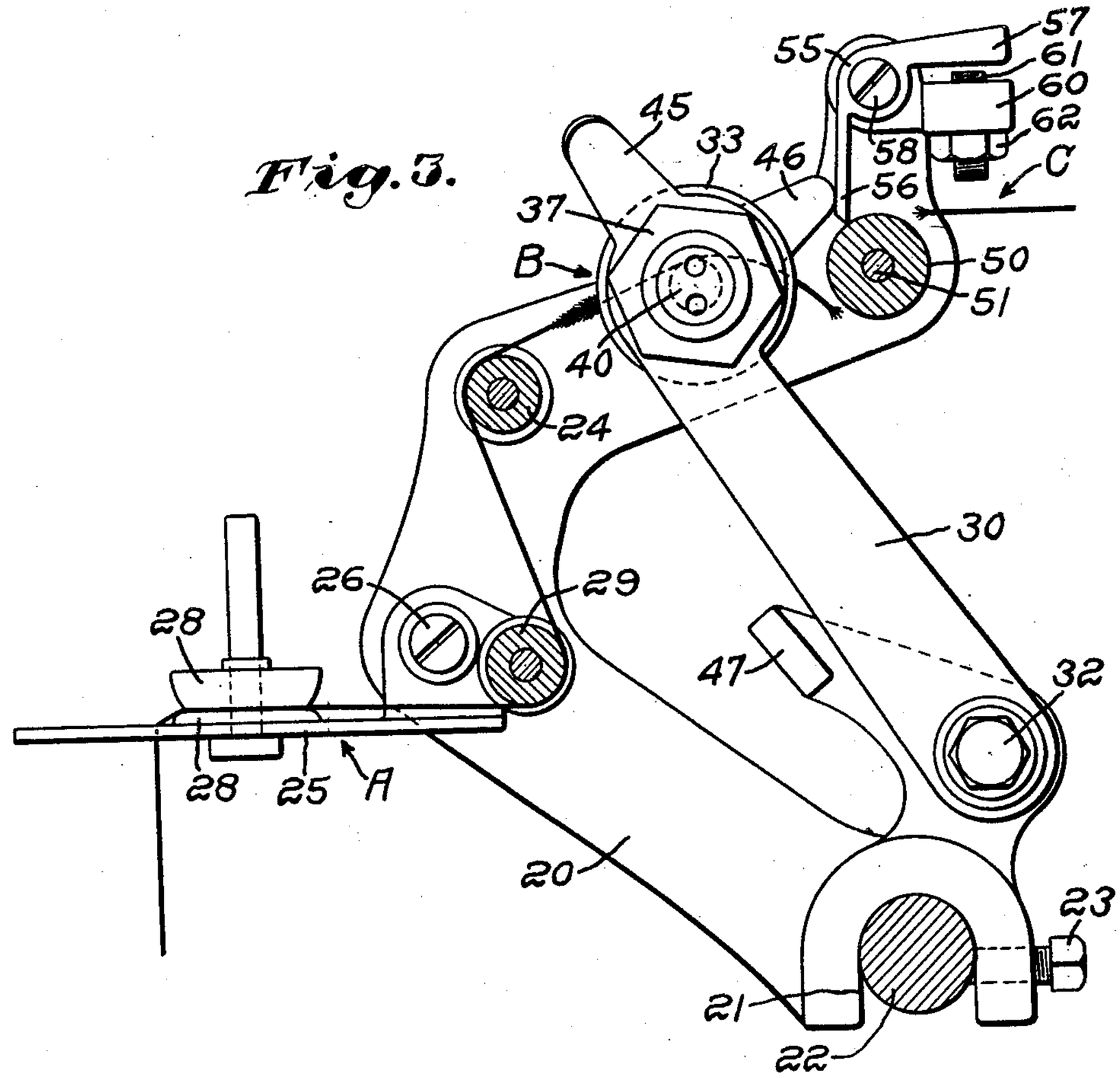


Fig. 4.

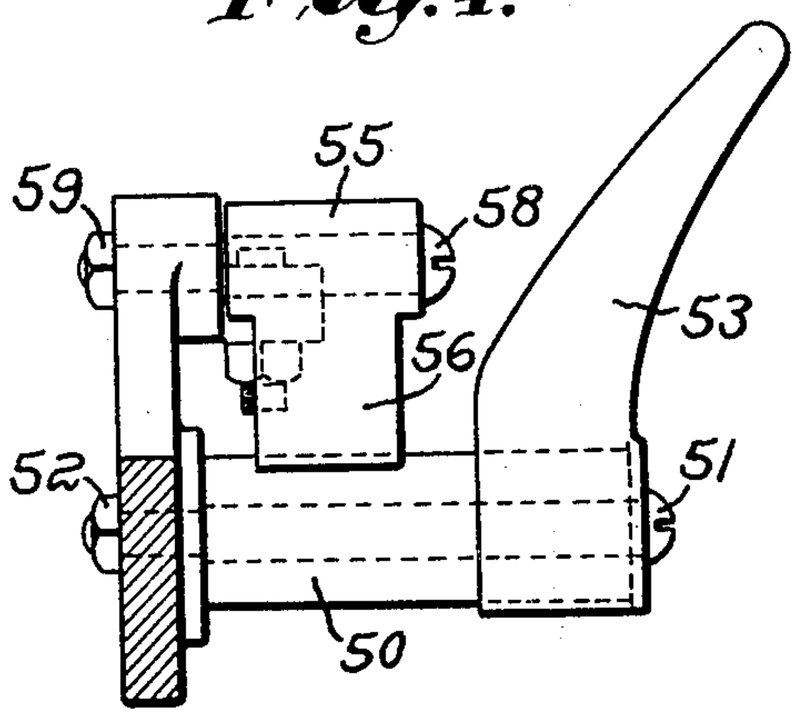
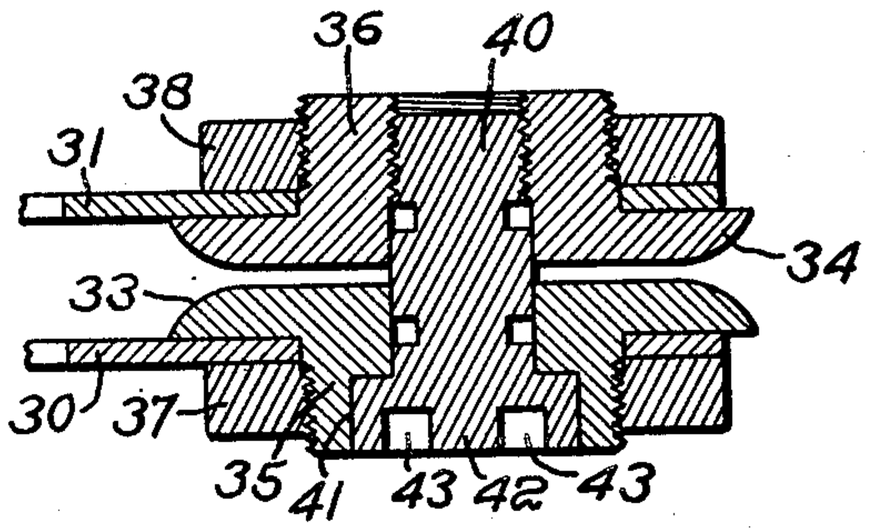


Fig. 5.



Inventor:
Otis L. Humphrey,
by Pluets Cushman & Woodberry
Att'ys.

Feb. 14, 1933. O. L. HUMPHREY 1,897,518

SLUB CATCHER

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Fig. 6.

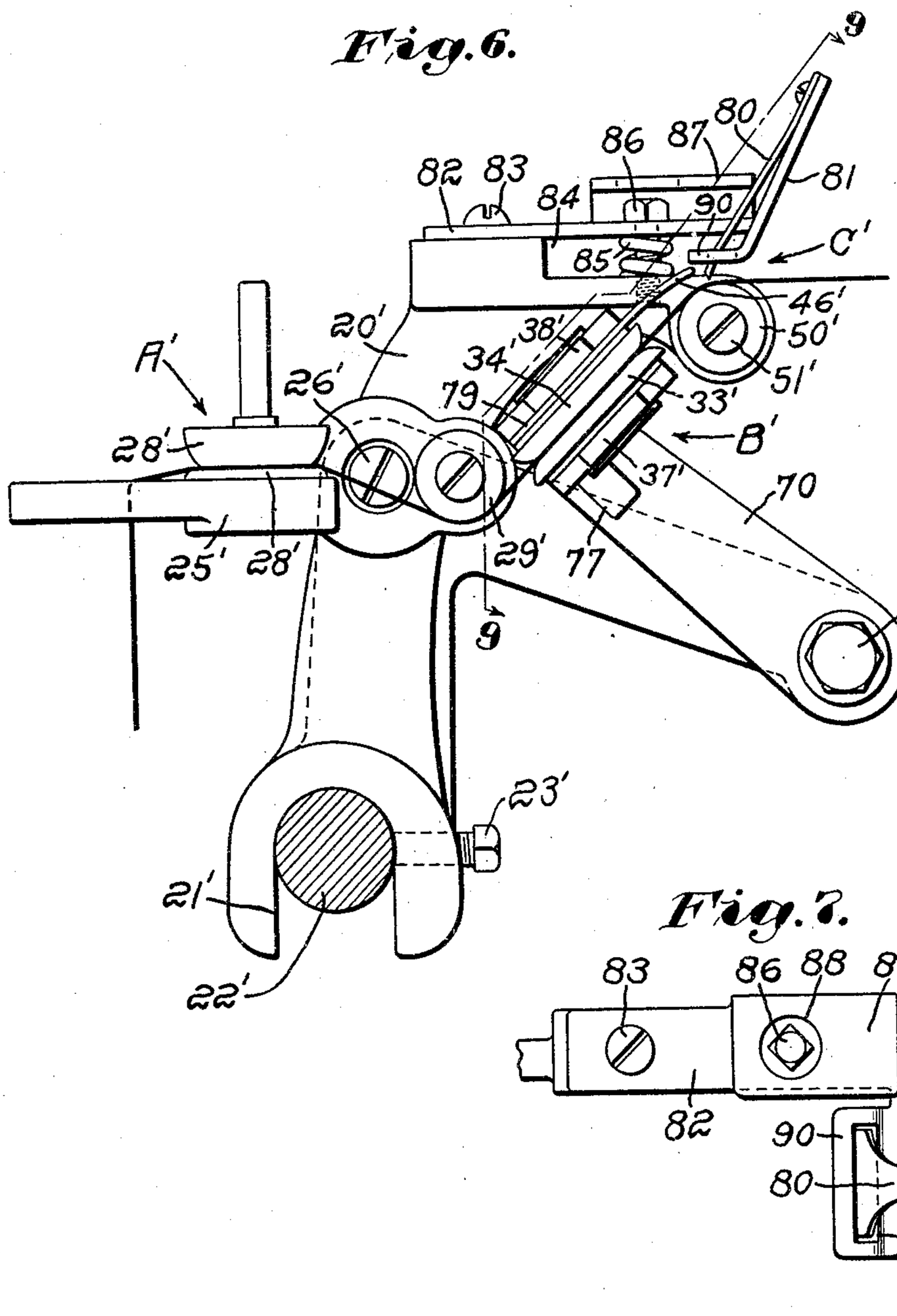
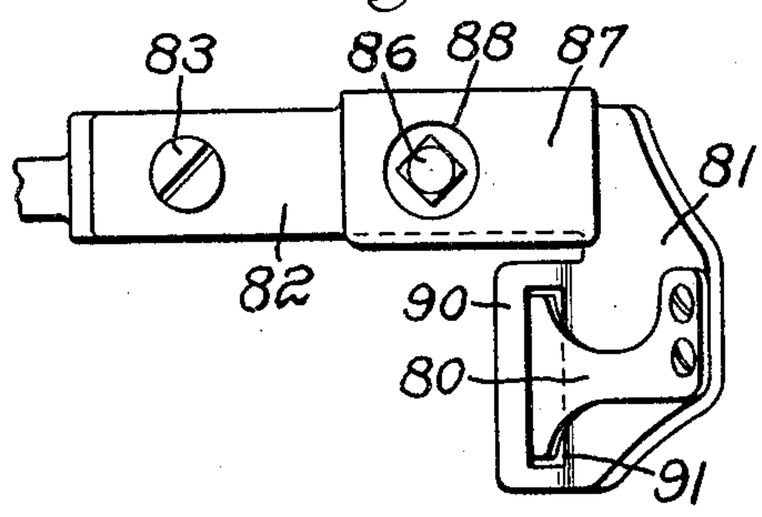


Fig. 7.



Inventor:
Otis L. Humphrey,
by Bluett, Cushman & Woodley
Att'ys.

Feb. 14, 1933. O. L. HUMPHREY 1,897,518

SLUB CATCHER

Filed Aug. 27, 1931 4 Sheets-Sheet 4

Fig. 8.

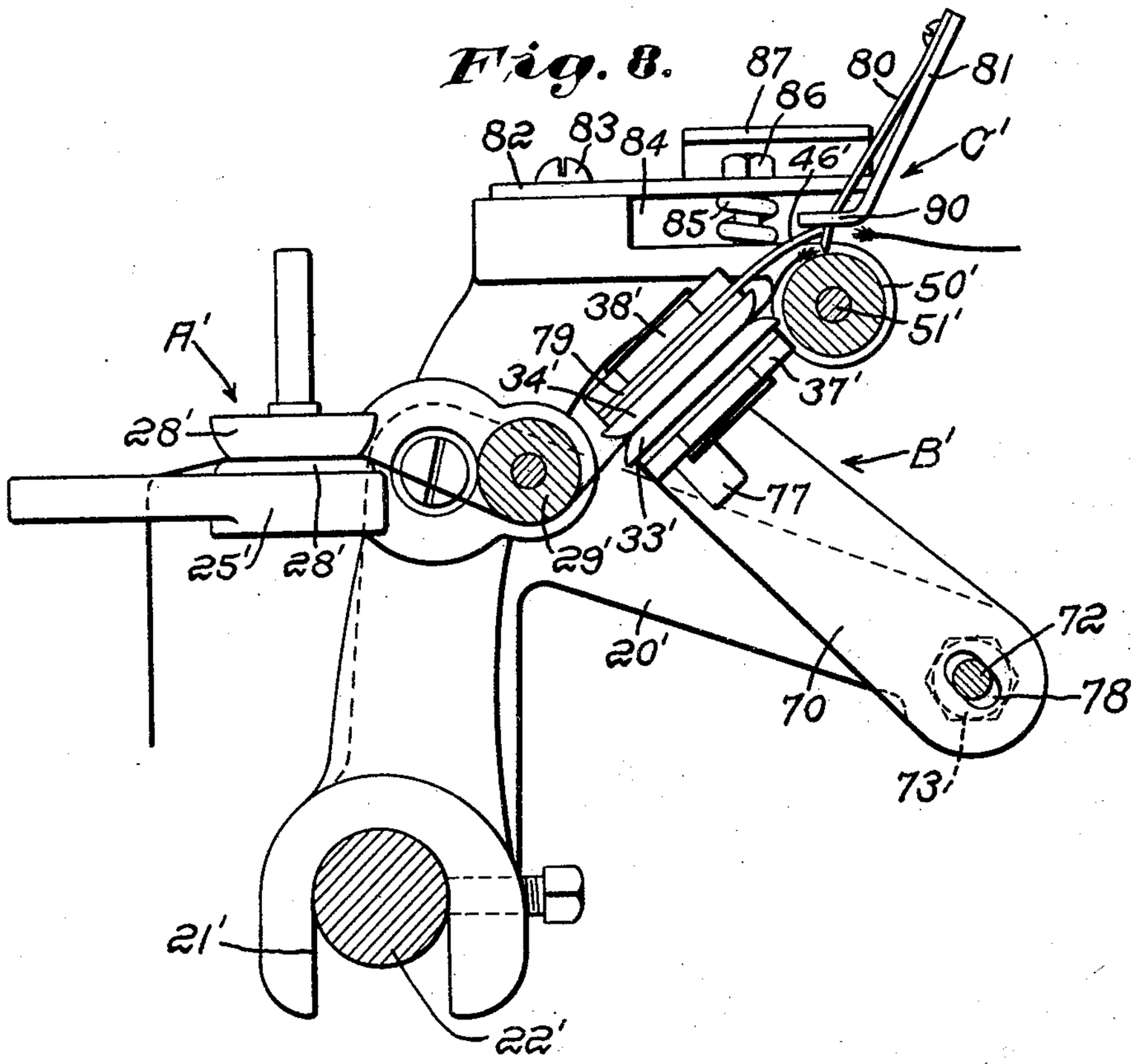


Fig. 9.

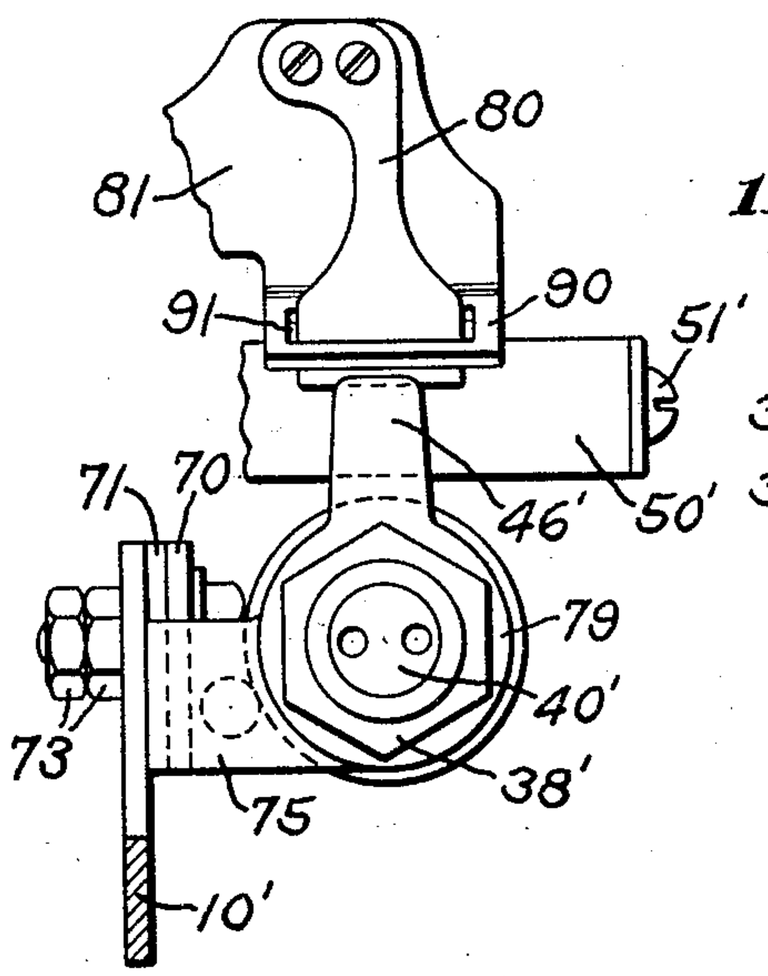


Fig. 10.

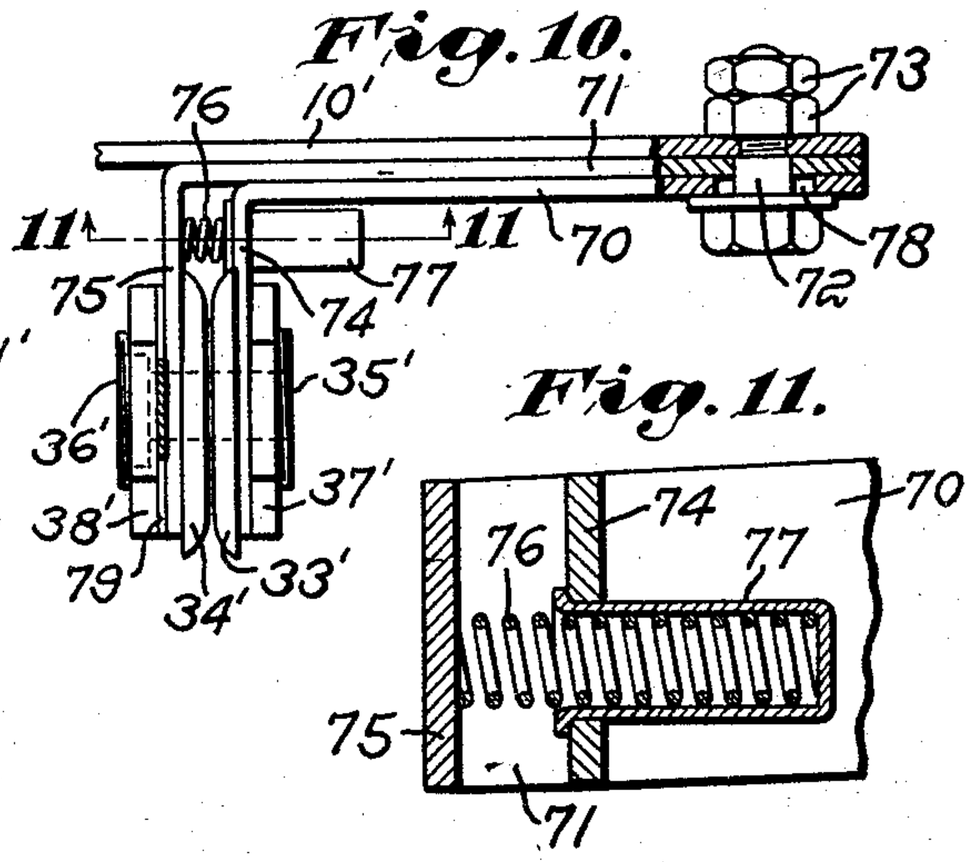


Fig. 11.

Inventor:
Otis L. Humphrey,
by Pruett, Cushman & Humphrey.
Att'ys.

Patented Feb. 14, 1933

1,897,518

UNITED STATES PATENT OFFICE

OTIS L. HUMPHREY, OF LOWELL, MASSACHUSETTS

SLUB CATCHER

Application filed August 27, 1931. Serial No. 559,685.

This invention pertains to textile apparatus and relates more particularly to devices generally known as slub catchers which are commonly designed to remove from a strand, for example spun yarn, imperfections in the nature of local enlargements on the strand,—such local enlargements including those commonly known as slubs, knots, "doubles", etc. Usually slub catchers are intended to cut, break or otherwise sever the yarn whenever such a local enlargement is brought into the field of action of the slub catcher, but in preparing certain kinds of yarn it is also important to remove abnormally thin places, commonly known as "singles", but no slub catcher known to me is capable of performing both of these functions.

A common type of slub catcher which is in quite general use comprises relatively movable parts between which a strand of normal diameter passes freely but which are caused to approach by engagement with a local enlargement so as directly to sever the strand by cutting, pinching or clamping it. While a slub catcher of this usual type may be depended upon in most cases to sever the yarn in response to the impact of hard slubs, knots, or the like, it is not wholly dependable for removing soft yielding imperfections, even though of substantial length and considerably exceeding the normal diameter of the strand, such soft enlargements being frequently encountered in worsted yarns in particular and being especially objectionable in any yarn which is to be used in knitting, as well as for certain kinds of weaving.

After considerable experiment I have discovered that when a yarn carrying a soft yielding slub is moved between two substantially parallel and unyielding surfaces of considerable length in the direction of yarn travel, such surfaces being rigidly spaced a distance slightly exceeding the normal yarn diameter, a substantial friction force is developed by the soft slub in moving between such surfaces, particularly when, as suggested, the slub is of substantial length, although it may be soft and yielding. For the removal of such soft slubs I propose to apply the force thus developed as hereinafter more fully described. On the other hand such an arrangement of accurately parallel surfaces as that just described can not always be depended upon to detect small hard slubs or fly and thus in accordance with the present invention I propose to combine devices responsive respectively to both types of slub, to wit long soft yielding slubs and small, hard slubs, and fly, thereby insuring the effective and certain removal of all such local enlargements from the strand, and in certain embodiments of the invention find it readily possible to provide for the removal of abnormally thin places in the strand, as well.

In attaining this desirable result I employ a primary strand severing means, preferably a slub catcher of more or less usual type adapted to operate directly in response to impact by hard knots or slubs, thereby to sever the yarn, but I combine therewith secondary means, hereinafter referred to as detector means, adapted to move from a normal position in response to engagement by another kind of local enlargement, for example a soft, yielding slub, and in so moving causing the primary severing element of the slub catcher proper to sever the yarn.

Thus one object of the invention is to provide apparatus of the class described, which is dependably operative to effect severance of the strand in response to local enlargements of distinctively different character. A further object is to provide a slub catcher having primary severing means such as a knife, pinching element, clamp, or the like, past which the strand normally moves freely but which is operated to sever the yarn in response to the impact of a hard slub, and in combination therewith a movable detector element having strand contacting surfaces such as to develop a frictional drag, by the passage of a soft and yielding slub, sufficient to move the detector element and thereby to cause the primary severing means to act. A further object is to provide a slub catcher having primary strand severing means past which the strand normally moves freely, and a movable detector device arranged when

moved in response to the engagement thereby of a local enlargement on the strand to change the path of the strand so as to move the latter into operative engagement with the primary severing means. A further object is to provide means operative to remove both local enlargements and abnormally thin places or "singles" from the strand.

Other objects will appear from an examination of the following description and of the accompanying drawings, in which:

Fig. 1 is a side elevation of one embodiment of the invention, the parts being shown in their normal positions;

Fig. 2 is a plan view thereof;

Fig. 3 is a side elevation similar to Fig. 1, the parts, however, being shown in the positions assumed when a slub in the yarn has been presented and the yarn consequently severed;

Fig. 4 is a sectional view taken along the line 4—4 in Fig. 1;

Fig. 5 is a sectional view taken along the line 5—5 in Fig. 2;

Fig. 6 is a side elevation of another embodiment of the invention, the parts being shown in their normal positions;

Fig. 7 is a fragmentary plan view thereof;

Fig. 8 is a side elevation similar to Fig. 6, the parts being shown in the positions assumed when a slub in the yarn has been presented and the yarn consequently severed;

Fig. 9 is a fragmentary view of the device taken along the line 9—9 of Fig. 6;

Fig. 10 is an elevation of the detector unit of this device;

Fig. 11 is an enlarged sectional view taken along the line 11—11 of Fig. 10; and

Fig. 12 is a view similar to Fig. 3, but illustrating a modification.

The embodiment of the invention shown in Figs. 1 to 5, inclusive, includes a bracket 20 provided with a recess 21 adapted to receive a stationary support, for example, a shaft, plate or bar 22, the bracket having a set screw 23 by which it is rigidly secured to the support. Mounted upon the bracket 20 are a yarn tensioning unit A, a secondary or slub detector unit B, and a primary or yarn severing unit C. The yarn passes through the unit A, over a guide spool 24 to the unit B, and thence through the unit C, it being understood that in its broader aspects the invention is independent of the specific details of the units employed.

The tensioning unit A may, for example, comprise a plate 25 pivotally attached to and adjustable upon the bracket 20 by means of bolt 26, and has a guide eye 27 at one end thereof. Fixed upon the plate 25 are tensioning disks 28, and a guide spool 29. The disks and spool are of any desired wear-resistant material.

The detector unit B, as illustrated in the embodiment of Fig. 1, includes a pair of parallel arms 30 and 31, each supported at one end upon a stub shaft 32 and provided at the other end with axially adjustable friction disks 33 and 34, respectively. These disks are preferably of wear-resistant material, for example, case hardened iron, nitrided or chrome plated steel, porcelain, glass, or the like, having smooth and preferably polished yarn engaging surfaces which, when the parts are assembled, are held in parallel relation, the edges of the disks preferably being rounded or bevelled to facilitate threading the yarn into the space between them. As shown in Fig. 5, the disks 33 and 34 each has an externally threaded sleeve 35 and 36, respectively, which project through openings in the corresponding supporting arms and are secured in position by nuts 37 and 38 which mesh with the threaded portions of the sleeves so that the disks are clamped securely to the inner faces of the arms. The disk-carrying ends of the arms are connected by a bolt 40 which rigidly and accurately regulates the space between the disks. The outer end of the sleeve 35 is recessed to provide a chamber 41 which receives the cylindrical head 42 of the bolt 40, while the outer end of the sleeve 36 is internally threaded to receive the threads of the bolt. In the bolt head 42 are formed depressions 43 which may be engaged by a spanner wrench to rotate the bolt and adjust the distance between the disks. It may be noted that the size of the parts is such that although the yarn path is eccentric to the axis of the disks, the latter are held firmly in parallel relation and will not spring apart in response to the wedging action of an entering slub. Preferably the arms 30 and 31 are normally bowed away from each other to a slight extent, so that when the parts are assembled they exert outward resilient pressure against the collars 37 and 38, thus taking up any lost motion in the engaging screw threads of the parts 40 and 36. Projecting from the arm 30 is a finger 45 which serves as a yarn guide and which may be manually engaged to shift the detector unit if desired, while a finger 46 projects from the arm 31 for a reason to be set forth hereinafter. A crossbar 47 carried by the support 20, extends behind the arms and provides a rest against which the detector unit normally lies (see Fig. 1).

The severing unit C chosen for illustration in Fig. 1 includes a normally fixed bed roll 50 through which extends a bolt 51 engaged at its outer end by a nut 52 so that the roll is secured to the support. Projecting adjacent to one end of the roll 50 is a guiding finger 53 which may include a flange 54 having an opening therein through which the bolt 51 passes. The cooperating severing element is shown as a knife 55 pivotally supported at 58 and having a cutting blade 56 and a tail 57 extending substantially at right angles thereto. The knife 55 is pivoted to swing

freely upon the bolt 58 which is secured to the support 20 by a nut 59. Projecting from the support 20 below the tail 57 of the knife is a tab 60 through which extends set-screw 61. The tail 57 preferably is heavier than the blade 56 so that it normally rests upon the set-screws 61 and holds the blade 56 out of contact with the roll 50. The set-screw 61 may be raised or lowered to determine the width of the space between the blade and the roll, and is fixed in such position by a nut 62, the adjustment being such that when hard slubs or knots on the yarn encounter the edge of blade 56, they cause the latter to swing downwardly toward the bed roll, thereby severing the yarn by a cutting or pinching action.

The embodiment disclosed in Figs. 6 to 11 corresponds generally to the embodiment previously described and the common elements will be indicated by primes of the reference characters used in Figs. 1 to 5, inclusive, and will not be again described in detail.

In this embodiment the slub detector B′ comprises a pair of arms 70, 71 pivotally supported at one end upon a bolt 72 secured in position upon the support 20′ by nuts 73. The arms terminate at the other ends in flanges 74 and 75 bent substantially at right angles to the body portions. Mounted upon the inner faces of the flanges 74, 75 are the disks 33′ and 34′ which are preferably secured to the flanged ends of the arms in the manner in which the disks 33, 34 are secured to the arms 30 and 31. The flanges 74 and 75 are yieldably separated by an expansion coil spring 76 carried by a cup 77 mounted upon the flange 74 and bearing at one end against the flange 75 (see Fig. 11). In order to permit the separation of the flanges, the arm 70 is provided with a longitudinally extending slot 78 through which the bolt 72 passes. Mounted on the sleeve 36′ between the flange 75 and the nut 38′ is a washer 79 from which projects the finger 46′.

The yarn severing unit C (illustrated in Fig. 8) is of a well known type, and I make no claim thereto except in combination with the other elements of my improved device as herein described. This unit C′ comprises a bed roll 50′ secured to the support 20′ by a bolt 51′, and a spring blade 80. The blade 80 is mounted upon an upwardly inclined plate 81 which may, as here shown, form an integral part of a strip 82 secured by a screw 83 to the support 20′. A portion of the support below the strip 82 is cut away to form a recess 84 in which is mounted a spring 85 coiled around a set screw 86. The head of the screw 86 enters a recess formed by bending a tongue 87 projecting from one side of the strip 82, a hole 88 being provided in the tongue through which the screw may be manipulated, as indicated in Fig. 7. The blade supporting plate 81 terminates adjacent to the bed roll 50′ in a flange 90 having a slot 91 through which the blade 80 projects. Obviously the space between the cutting edge of the blade 80 and the bed roll 50′ may be regulated by the screw 86 and spring 85.

In each of the above-described embodiments the yarn on its way to a winding bobbin, cone, tube, spool, or other manipulating device (not shown) travels from the tensioning unit between the disks of the slub detector unit and over the bed roll of the slub catching or severing unit. As it passes over the bed roll the yarn is in contact with or just out of contact with the cutting blade. The disks of the detector unit are spaced a predetermined distance apart and the cutting blade is likewise spaced with respect to the bed roll so that yarn of normal diameter will pass freely therebetween, it being noted in particular that the distance between the parallel faces of the disks 33 and 34 may be adjusted with great accuracy and that when once adjusted, the disks remain relatively fixed and do not yield in response to the wedging action of slubs entering between them.

When, as shown in Figs. 3 and 8, there arrives a soft local enlargement in the strand too large to pass freely between the disks, the frictional force exerted by this slub upon the disks will cause the detector unit to swing on its pivot until the finger 46 (or 46′) strikes the cutting blade of the severing unit and causes it to sever the yarn. If the slub is soft, it may yield and pass into the space between the disks, but owing to the distance it must travel between the disks and the increased friction set up by its passage, it will cause the detector unit to swing and actuate the cutting blade. On the other hand, very small, hard slubs or fly which may be able to pass between the detector disks, will engage the cutting element of the slub catcher unit and directly operate the latter to sever the yarn in usual manner.

In the embodiment shown in Figs. 1 to 5, inclusive, the yarn passes normally through the detector unit in substantially a straight path from the guide spool 24 to the bed roll 50. However, when the detector unit is swung upwardly by a slub, the path of the yarn is thereby shifted,—the yarn being raised into direct contact with the knife blade, and in dealing with certain yarns, at least, this is sufficient to produce the desired cutting action, so that under some conditions the blade actuating member 46 may be dispensed with as unnecessary.

It is of importance to note that the disks 33 and 34 are of substantial diameter so that the path of the yarn across their opposed faces is of considerable length, thus insuring development of the requisite frictional force by the passage of a soft enlargement, and that the means provided for adjusting, supporting and spacing the disks is of a character

such as to insure accurate and rigid parallelism of the yarn engaging surfaces. The accuracy of adjustment of the disks is an important feature, since the frictional force generated by yarns of different materials, twist, moisture content, etc., may vary, even in yarns of the same apparent diameter.

Referring to Fig. 12 I have diagrammatically illustrated a modified arrangement adapted to detect and to remove "singles" or abnormally thin places in the strand as well as soft and hard enlargements. In this arrangement the arm 30^b corresponds to the arm 30 of Fig. 3 and carries detector elements and a finger 46^b of similar construction and function. On the pivot 32^b which carries the arm 30^b is mounted a bell crank lever having an upstanding arm 100 provided with a stop lug 101 disposed in the path of upward movement of the arm 30^b. The bell crank lever also has an arm 102 carrying an adjustable weight 103 which is normally supported by a fixed stop 104 so that the lug 101 normally engages the arm 30^b. A fixed stop 47^b limits the movement of arm 30^b in the opposite direction. The cutter member 56^b which corresponds in construction and function to the cutter 56 of Fig. 3 is provided with an upstanding ear 105 having an aperture 106 through which freely passes a light thin rod 107. Preferably the ear 105 is so shaped at its upper end as to guide a strand accidentally engaged therewith downwardly into proper relation to the bed roll 50^b.

The rod 107 is pivotally secured at one end to a lug 108 projecting from the upper end of the arm 30^b, and is provided at its other end with a knob 109 normally spaced from the ear 105 but adapted at times to engage said ear and thereby to swing the cutter to operative position.

In the normal operation of the mechanism the parts are positioned as shown in Fig. 12, the friction of the yarn in passing between the detector disks of the arm 30^b being such as to raise the arm away from the stop 47^b and into contact with the lug 101. In this position the knob 109 is spaced from the ear 105. So long as the yarn continues to be of normal diameter, the parts maintain substantially this position even though local enlargements of immaterial size may encounter the detector elements, since the weight 103 keeps the arm 30^b from swinging and it is only when such an enlargement is of a size such as to develop abnormal friction force against the detector disks that the arm 30^b rises sufficiently to cause the finger 46^b to engage the cutter 56 and thereby to cut the yarn. On the other hand, if an abnormally thin place such as a "single" passes the detector surfaces, the arm 30^b is allowed to swing downwardly, due to the decrease in the friction force exerted by the passing yarn, and thus the knob 109 engages the ear 105, swinging the cutter 56^b into operative position so as to cut the yarn. It is of course to be understood that the cutter 56^b acts in the usual way by direct impact with hard slubs to cut the yarn, and thus the apparatus is adapted to detect both soft slubs, thin places, and hard slubs and to cut the yarn whenever such imperfections occur.

While two embodiments of this invention have been shown and its use in connection with worsted or other yarns described it will be understood that I am not limited thereto and that other embodiments and/or uses may be made without departing from the spirit and scope of the invention as set forth in the following claims.

I claim:

1. In a slub catcher, a combination of a movably mounted detector element and a severing unit, the severing unit comprising normally spaced relatively movable parts between which the strand normally passes freely but which are operative by direct impact of a hard slub thereby to sever the strand, the detector element including members which present substantially parallel and unyielding surfaces of considerable length in the direction of yarn travel and rigidly spaced apart a distance slightly exceeding the normal strand diameter so that when engaged by a soft local enlargement in the strand it is moved thereby from its normal position, and means moving with the detector element for moving one of the parts of the severing unit relatively to the other to sever the strand.

2. In a slub catcher, the combination of a detector unit having an engaging element, a severing unit comprising a movable severing element normally disposed adjacent to a passing strand but so to permit free passage of the strand thereby but which is operative by direct impact of a hard slub to sever the strand, said movable detector element including members which present substantially parallel and unyielding surfaces of considerable length in the direction of yarn travel and rigidly spaced apart a distance slightly exceeding the normal strand diameter so that when engaged by a soft local enlargement on the strand it is moved from normal position and by such movement directly actuates the movable severing element to sever the strand.

3. In a slub catcher, a detector unit comprising a pair of parallel arms, disks mounted upon the inner surfaces of the arms in opposed relation, each disk including a sleeve, means engaging said sleeves to secure the disks to the arms, and a bolt passed through the sleeves for moving the disks a predetermined distance apart.

4. In a slub catcher, a detector unit comprising a pair of parallel arms, each pivotally supported at one end, disks mounted upon the inner surfaces of the arms, the faces of

the disks being in substantially parallel spaced relation, each disk including a sleeve, means engaging said sleeves to secure the disks to the arms, one sleeve having an enlarged recess at the outer end and the other sleeve being internally threaded at its inner end, and a bolt in the sleeves for moving the disks a predetermined distance apart, the head of said bolt entering the recess of one sleeve, and said bolt being in threaded engagement with the other sleeve.

5. In a slub catcher, a detector unit comprising a pair of pivotally supported parallel arms, disks mounted upon the inner surfaces of the arms in opposed relation, each disk including a sleeve, means engaging said sleeves to secure the disks to the arms, a bolt passed through the sleeves for moving the disks a predetermined distance apart, and means for yieldably resisting such movement of the disks in one direction.

6. In a slub catcher, a detector unit comprising a pair of pivotally supported parallel arms, disks mounted upon the inner surfaces of the arms in opposed relation, each disk including a sleeve, means engaging said sleeves to secure the disks to the arms, a bolt passed through the sleeves for moving the disks a predetermined distance apart, and means carried by one arm and engaging the other arm for yieldably resisting such movement of the disks in one direction.

7. A device of the class described having means defining a normal yarn path, a movable detector having substantially parallel surfaces disposed at opposite sides of the yarn path and spaced to permit free passage of yarn of normal diameter, said surfaces being of such extent in the direction of yarn travel that a soft slub in passing between them will develop friction force sufficient to move the detector with the yarn and change the yarn path, a movable cutter for severing the yarn when the cutter is engaged by a hard slub on the yarn, and means for transmitting movement of the detector to the cutter to cause the latter to sever the yarn.

8. A device of the class described comprising detector unit having yarn engaging means, said detector moving in one direction from normal position in response to passage of a local enlargement on the yarn and in the other direction in response to the passage of an abnormally thin place in the yarn, and yarn severing means operative in response to either of said movements of the detector unit to sever the yarn.

Signed by me at Boston, Massachusetts, this 25th day of August, 1931.

OTIS L. HUMPHREY.