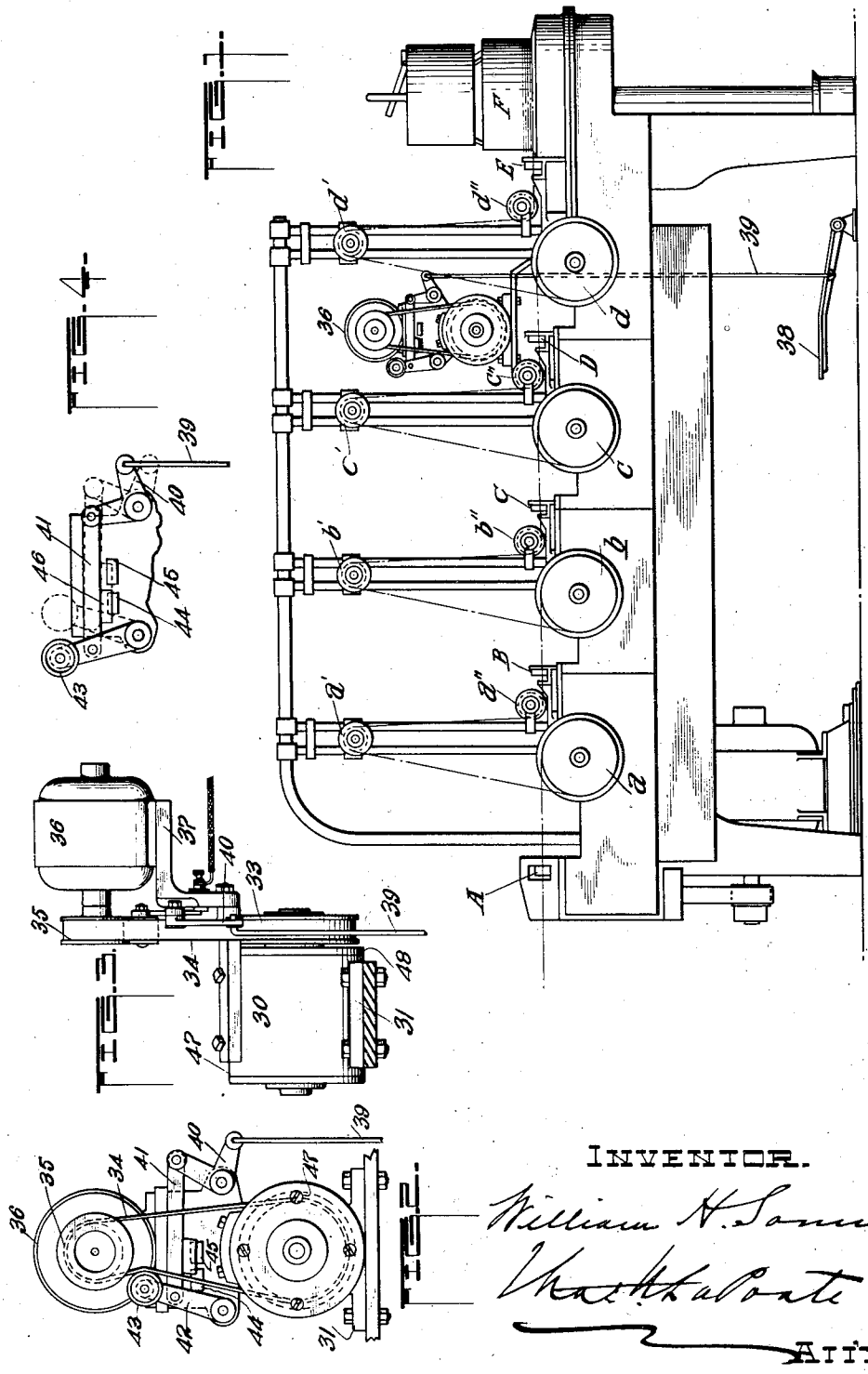
Dec. 25, 1928. 1,696,698

W. H. SOMMER

PROCESS FOR POINTING AND DRAWING WIRES

Original Filed Feb. 20, 1926 3 Sheets-Sheet 1



INVENTOR.

William H. Sommer

Chas. H. LaPorte

ATTY

Dec. 25, 1928. 1,696,698

W. H. SOMMER

PROCESS FOR POINTING AND DRAWING WIRES

Original Filed Feb. 20, 1926 3 Sheets-Sheet 2

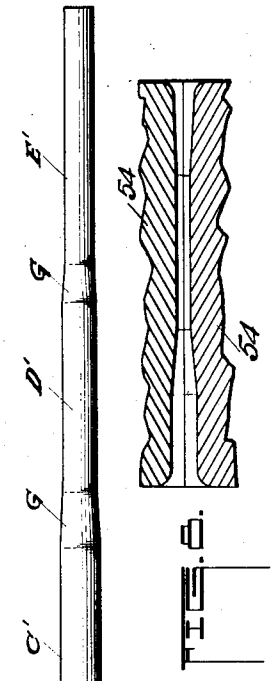


FIG. 4.

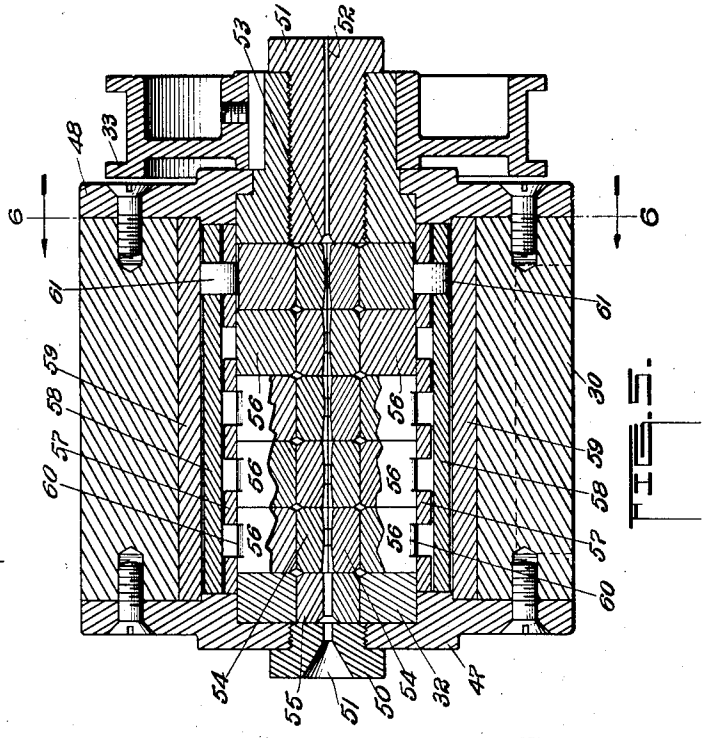


FIG. 5.

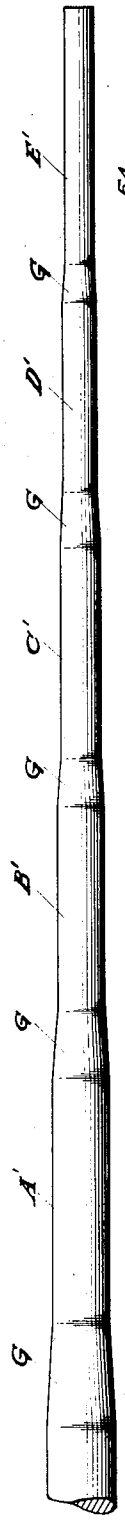


FIG. 3.

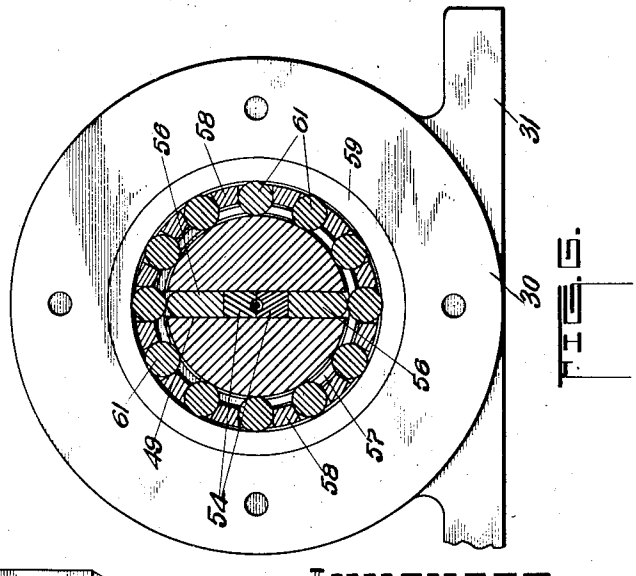


FIG. 6.

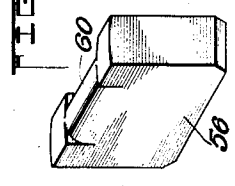


FIG. 7.

INVENTOR.

William H. Sommer

Chas. H. La Porte

ATTY

Dec. 25, 1928. 1,696,698

W. H. SOMMER

PROCESS FOR POINTING AND DRAWING WIRES

Original Filed Feb. 20, 1926 3 Sheets-Sheet 3

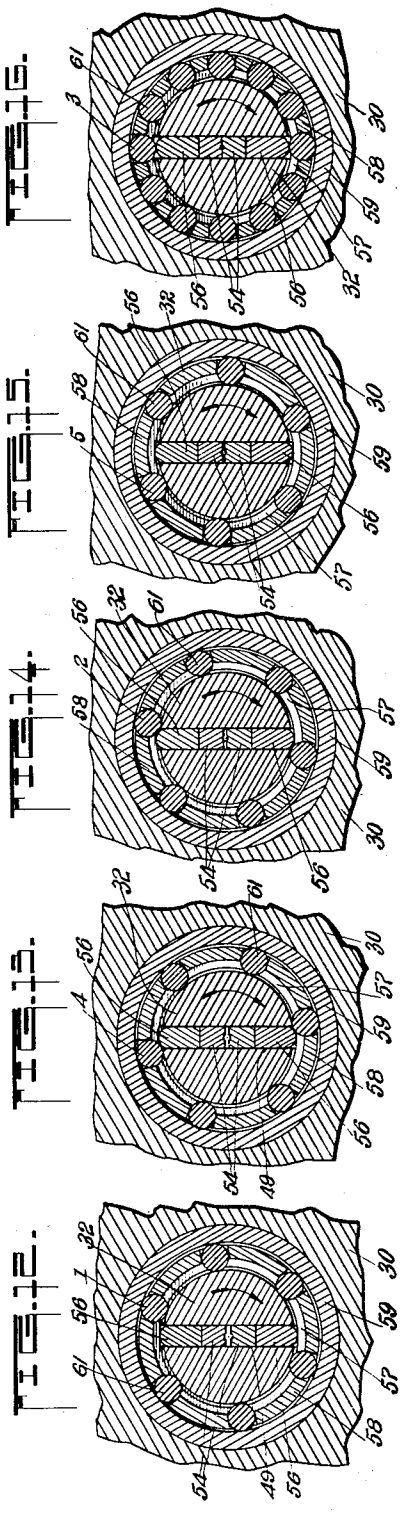


FIG. 15.

FIG. 14.

FIG. 13.

FIG. 12.

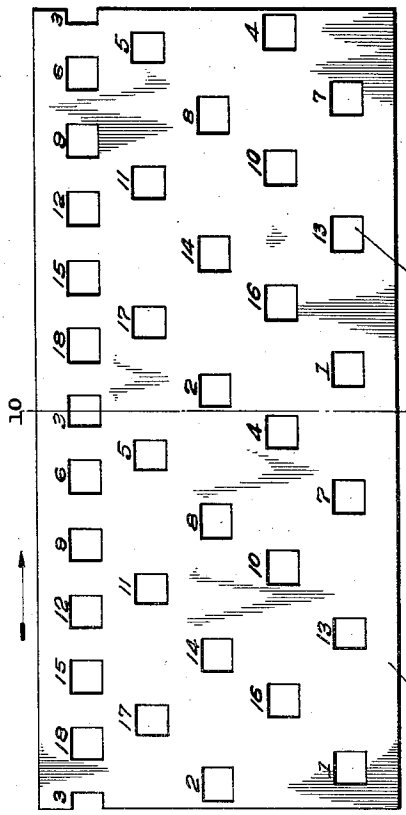


FIG. 11.

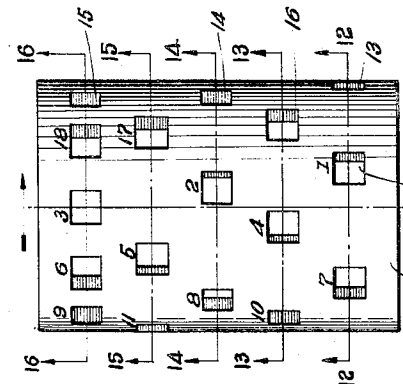


FIG. 10.

INVENTOR.

William H. Sommer

Chas. H. LaPorte

ATTY

Patented Dec. 25, 1928. 1,696,698

UNITED STATES PATENT OFFICE.

WILLIAM H. SOMMER, OF PEORIA, ILLINOIS.

PROCESS FOR POINTING AND DRAWING WIRES.

Original application filed February 20, 1926, Serial No. 89,739. Divided and this application filed May 4, 1927. Serial No. 188,745.

This invention has reference to a process for pointing the end of a wire or a wire rod, as the case may be.

Wires or wire rods may be pointed for various reasons, dependent upon the purposes for which they are to be used, and while there is no limitation in the use of wire or wire rods by my process, I shall describe the use of such pointing in connection with wire drawing operations. In this connection wire to be drawn to different sizes, or gauge, is inserted through a reducing die and coiled or wrapped about a wire drawing block and, in practice, to perform such operations the end of the wire is pointed, whereby it may be inserted through the drawing die and attached to the block, which operates to draw the wire to a reduced size through the die and wrap such wire around the drawing block. Such pointing of the wire becomes all the more necessary where the drawing operation is continuous, the drawing block being positioned beyond a series of drawing dies and the wire being drawn successively from a given wire through a series of reductions to the size of wire desired; as, for instance, for the purpose of illustration, draw a wire from No. 12½ gauge to No. 19 gauge through a series of reductions, say 13½, 15, 16 and 17½. In such a continuous drawing operation there would necessarily be, at least, five drawing dies differing in size to produce a wire of No. 19 gauge from a wire of No. 12½ gauge.

The principal object, therefore, of the present invention is to provide a process for producing on a section of one end of a wire or a wire rod a series or a plurality of successive elongations which differ in diameter, each of the successive diameters beginning with the end of the wire or wire rod, corresponding substantially to the respective drawing dies, through which the same is to be drawn to enable the operator to insert the wire or rod, first, through one die and then through the successive dies, and by means of suitable power applied to the wire or rod to thread the same through the successive dies and attach the end of the wire or rod to a drawing block, whereby the operation of drawing may be carried on.

A further object of the invention is to provide a process for progressively producing on an end of a wire a series of stepped elongations of successively reduced diameters, the end of the wire to be pointed being of a predetermined length and wherein the excess material produced by the reductions is absorbed therein, which increasingly varies the density of such reductions and thereby increases the tensile strength of these reduced sections, which is greatest toward the end of the wire. The resulting operation of the pointing of the wire provides therein sufficient tensile strength to withstand the pull required during the threading operation through the successive dies and, also, to withstand the final drawing operation through the last die, which determines the size or gauge of the wire to be drawn, by means of the drawing block which draws the wire and coils it into the bundle.

In carrying out the foregoing objects, I provide in one form of an apparatus a plurality of sets of swaging and hammer members, which are successively placed in juxtaposition axially of each other; the said swaging and hammer members being progressively arranged whereby to produce on the end of the wire a series of stepped elongations of successively reduced diameters, means being provided to rotate the said swaging and hammer members in unison, and their disposition and operation in relation to each other being such that they act upon the wire in rapid progression and alternately, whereby no two sets of the swaging and hammer members operate at the same time and thereby obviate any cobbling of the wire during such pointing formation.

That the invention may be more fully understood I have herein illustrated an apparatus embodying in its preferred form a structure through and by means of which the steps of the process may be carried out, and in which:—

Fig. 1 shows in side elevation the general arrangement of a continuous wire drawing bench and my apparatus associated therewith for pointing the end of a wire;

Fig. 2 is an enlarged side elevation of the apparatus associated with a motor drive therefor;

Fig. 3 is an elevation looking towards the left of Fig. 2;

Fig. 4 is a detail showing the means for manually controlling the operation of the motor and also the pointing apparatus;

Fig. 5 is a longitudinal sectional view

through the apparatus, parts being shown in full lines;

Fig. 6 is an end elevation in cross section, as the same would appear if taken on the line 6—6, Fig. 5, looking in the direction of the arrows and the arrangement of a set of swaging and hammer members and the means for acting thereupon;

Fig. 7 is a detail perspective view of one of the hammer members;

Fig. 8 is a detail sectional view of the acting ends of a set of the swaging members showing the arrangement and formation of the die faces;

Fig. 9 shows in detail, and considerably enlarged over actual size, the pointing formation produced on an end of a wire by my process.

Fig. 10 is a plan view of a cage employed within the apparatus, showing the arrangement for the seating of rollers which act upon the hammer and swaging members;

Fig. 11 shows in a diagrammatic way the cage illustrated in Fig. 10, which is of circular or ring like formation and which has been flattened out for the purpose of illustrating the disposition, spacing and arrangement of the seats for the rollers, designed to act progressively and alternately upon the swaging and hammer members as they are rotated;

Fig. 12 is a detail in cross section of the first set of swaging and hammer members, and the means for acting thereupon, as the same would appear, within the cage, if taken on the line 12—12 of Fig. 10 looking in the direction of the arrows on said figure;

Fig. 13 is a detail in cross section of the second set of swaging and hammer members, and the means for acting thereupon, as the same would appear, within the cage, if taken on the line 13—13 of Fig. 10 looking in the direction of the arrows on said figure;

Fig. 14 is a detail in cross section of the third set of swaging and hammer members, and the means for acting thereupon, as the same would appear, within the cage, if taken on the line 14—14 of Fig. 10 looking in the direction of the arrows on said figure;

Fig. 15 is a detail in cross section of the fourth set of swaging and hammer members, and the means for acting thereupon, as the same would appear, within the cage, if taken on the line 15—15 of Fig. 10 looking in the direction of the arrows on said figure;

Fig. 16 is a detail in cross section of the fifth set of swaging and hammer members, and the means for acting thereupon, as the same would appear, within the cage, if taken on the line 16—16 of Fig. 10 looking in the direction of the arrows on said figure.

Like characters of reference denote corresponding parts throughout the figures.

I am aware that pointing a wire per se to facilitate in the drawing operation of wire is not new, whether by continuous process or otherwise, but I am not aware that by any known process, or by the use of any known apparatus, a predetermined length of a section of one end of a wire is pointed by a series of stepped elongations progressively arranged and where the successive elongations are of different diameters, as herein pointed out.

I am, also, aware that attempts have been made to reduce the gauge of wire in a continuous process, by swaging, in lieu of the ordinary drawing process, and that the swaging mechanisms were located at distant points in relation to each other and associated with feeding and take-up means; also, that swaging mechanisms have been employed in continuous operations for forging down ingots, blooms and the like. However, none of such mechanisms are intended to, or could be used for pointing a wire, such as herein contemplated, and which produces a point on a predetermined section of a length of wire, which point embodies a series of stepped elongations of successively different diameters.

In Fig. 1 there is illustrated a greatly reduced side elevation of a continuous wire drawing bench, involving certain novel features of construction, but which forms no part of the present invention and is only introduced for the purpose of illustrating the application and adaptability of an apparatus by means of which the within described process for pointing the ends of the wires may be carried out, and I have shown the pointing mechanism in a convenient location on the wire drawing bench, and the controlling and operating means therefor. So far as the drawing bench, therefore, is concerned mention need only be made of the series of drawing dies, A, B, C, D and E, and the sets of wire guiding drums a and rollers a' and a''; b, b' and b''; c, c' and c'' and d, d' and d'' respectively, and the wire drawing block F. Assuming that it was desired to draw a No. 19 gauge wire from a No. 12½ gauge wire, the first reduction would be made by the drawing die A, producing a No. 13½ gauge; the second reduction would be made by the drawing die B, producing a No. 15 gauge; the third reduction would be made by the drawing die C, producing a No. 16 gauge; the fourth reduction would be made by the drawing die D, producing a No. 17½ gauge; and the fifth reduction would be made by the drawing die E, producing a No. 19 gauge, which is the final gauge at which it is desired to draw the wire from a No. 12½ gauge. These succeeding reductions may be changed as occasion requires. In other words, there is no limitation as to the original gauge of the wire, or the gauge to which it is to be reduced, as the respective

dies would be constructed to meet these needs.

It should now be apparent that to facilitate the drawing of the wire, and particularly as on a wire drawing bench such as exhibited in Fig. 1, the threading of the bench by passing the wire through the several drawing dies should be made convenient and simple and to accomplish this I provide for the pointing of the end of a wire in the manner exhibited in Fig. 9, wherein a predetermined length of section at one end of the wire is formed or provided with a series of stepped elongations A′, B′, C′, D′ and E′ and wherein the successive elongations are of different diameters but reduced from the main body portion of the wire through the series of reductions A′ and E′, both inclusive, and such reductions corresponding to the openings through the respective dies A to E both inclusive. In other words, the elongated reduction A′ on the wire corresponds to the drawing die A; the elongated reduction B′ on the wire corresponds to the drawing die B; the elongated reduction C′ on the wire corresponds to the drawing die C; the elongated reduction D′ on the wire corresponds to the drawing die D, and the elongated reduction E′ on the wire corresponds to the final drawing die E and represents the size the wire is finally to be drawn. If, for instance, as above stated, it is desirable to draw a wire from a No. 12½ gauge to a No. 19 gauge, the pointing on the end of the wire to adapt it to be threaded through the respective dies A to E, both inclusive, would include, preferably, the series of stepped reductions above pointed out and which are best seen in Fig. 9.

The threading operation would be somewhat as follows: The end of the pointed wire is inserted through the drawing die A and when the elongated reduction A′ is coincident with the drawing die A, a power operated gripper is attached to the pointed end of the wire, protruding through the drawing die A and a sufficient amount of the wire drawn to the size represented by A′ to enable the operator to coil the wire around the drum *a* and over the guiding rolls *a′* and *a″*; the pointed end of the wire is then inserted through the drawing die B until the reduced elongation B′ is coincident with the drawing die B and the power operated gripper is attached to the pointed end of the wire to draw the wire through the respective dies A and B—producing the different reductions A′ and B′ therein until a sufficient amount of wire had been drawn to enable the operator to coil the same around the drum *b* and over the rollers *b′* and *b″*. This operation is then carried on in substantially the same manner until the wire has been threaded through the respective drawing dies, C, D and E and coiled around the respective drums *b*, *c* and *d*, and the rollers associated therewith, until the pointed end of the wire shall be attached to the drawing block F, and when the dies have been so threaded and the wire to be drawn so attached to the drawing block F the bench may be operated, whereby to continuously draw wire from a No. 12½ guage to a No. 19 gauge, as herein indicated, or to other and various sizes of gauges as may be desired.

The mechanism which I employ to point the end of the wire, as herein described, and as best indicated in Fig. 9, is of such a character that it will act upon a predetermined section of an end of a wire to produce the progressively disposed and successively differing diameters, which results in an elongation of the said predetermined section and which also increases the density of the several reductions and thereby increases the tensile strength of the said section, which is greatest toward the end of the wire. There is, therefore, provided sufficient strength in the end of the wire to withstand the pulling strain by the means applied thereto for threading the wire through the several drawing dies, as will be understood.

The pointing mechanism includes in its structure a housing 30, supported by a base plate 31, and in said housing there is journaled a slotted shaft 32 to which is secured a pulley 33 by means of which the pointing mechanism may be operated through and by means of a belt 34, actuated by a pulley 35 on the shaft of a motor 36, the motor being mounted on a suitable support 37.

Means is provided for manually controlling the source of power to the pulley 33; such a means being desirable, due to the fact, that the pointing mechanism is only operated periodically and then only when it is desired to point a wire for threading it through the respective drawing dies of the drawing bench, it being obvious that when the bench is in operation drawing wire, and there is no mishap, there is no need of using the pointing mechanism. The means employed for controlling the source of power to the motor comprises a foot lever or treadle 38 to which is connected a rod 39 and it in turn has connection with a bell-crank lever 40 having connected thereto a bar 41 which in turn has connection with a crank arm 42 carrying an idler 43 adapted to be moved into contact with the belt 34 so as to produce sufficient frictional engagement between said belt, the pulley 35 and the pulley 33 for imparting motion from the former to the latter. Two contact members are provided—44 and 45—with which a contact member 46 on the bar 41 is adapted to have engagement, in the manner illustrated in Figs. 1, 2 and 4. The contact members

44 and 45 provide terminals for an electric circuit, which may be made and broken through the reciprocation of the bar 41 to provide contact of the member 46 therewith. When the operator desires to actuate the shaft 32 of the pointing mechanism he presses down the foot lever or treadle 38, oscillating the bell crank lever 40 and shifting the bar 41 into the full line position shown in Fig. 2 and the dotted line position shown in Fig. 4, which causes a contact between the contact members 46, 44 and 45, resulting, as will be obvious, in the motor starting and imparting rotation to the slotted shaft 32. These parts are so arranged that the contact members 46, 44 and 45 will first engage to impart rotative movement to the motor, and then the further movement of the bar 41 will cause the idler 43 to bear sufficiently against the belt 34 so as to produce the necessary frictional engagement between the belt and the pulleys 35 and 33 to impart rotation to the shaft 32 of the pointing mechanism.

The housing 30 is preferably cylindrical in formation, being closed at its opposite ends by the removable end plates 47 and 48 and they are so constructed as to form bearing surfaces for the opposite ends of the slotted shaft 32, said shaft being slotted transversely, as at 49, so as to open out at diagrammatically opposite sides thereof, see Fig. 6, and to extend for a greater portion of the length thereof and for that portion, particularly, within the housing and between its end plates. At the feeding-in side of the shaft 32 there is threaded into the end plate 47, in axial alignment with said shaft, a guide 50 having a tapered opening 51 converging inwardly of said guide. At the opposite end of said shaft 32 and in that portion protruding through the end plate 48, and to which the pulley 33 is secured, there is provided a threaded bushing 51 disposed axially of the shaft and with an axially aligned opening 52 therethrough which is enlarged or tapered, as at 53, at the inner end thereof. This bushing is intended, not only as a wire guide, but is also adjustable to take up any end thrust or play which may develop between the swaging members and the hammer members, to be described, operatively carried within the slotted shaft.

Within the slotted portion 49 of the shaft 32, as best seen in Fig. 5, are a plurality of sets of swaging members 54, each set comprising two members capable of sliding movement toward and in opposite directions from each other radially of the shaft. As illustrated in the drawings there are preferably provided five sets of such swaging members disposed in juxtaposition and longitudinally of the shaft, filling the space provided by the slot 49 therein, and the matching and coacting faces of each pair of said swaging members are formed or provided with dies of a construction suitable to perform the reductions on the wire, as may be desired, and the meeting faces of each set of dies are normally axially of the shaft 32. Each set of swaging members may be said to be substantially alike, in that, they are adapted and intended to produce substantially the same elongated formations on the end of a wire, such as is exhibited on the wire section shown in Fig. 9, and the arrangement of the die faces of the coacting members, forming each set are preferably so shaped as to produce the successive elongations A′, B′, C′, D′ and E′ on the end of a wire with the stepped portions G therebetween, see Fig. 9. Thus, it will be obvious that the die faces of the successive sets of swaging members 54 differ in formation only to the extent that the openings therebetween, or provided by such die faces, are more and more restricted—beginning with the largest opening in the first set of swaging members at the left of Fig. 5, which is at the receiving end of the device, and being more and more reduced and concluding with the smallest opening in the swaging set at the farthest end of the shaft 32 within the housing and at the other end of the slot 49 therein, as it is believed will be understood. In the receiving end of the shaft 32 a suitable bushing 55 is provided with a wire opening therethrough in axial alignment with the opening in the guide 50 and which acts as a feeder for the wire into the shaft as it is fed forwardly to and between the swaging members 54.

Arranged within the slotted portion 49 of the shaft 32 and associated with each pair of swaging members 54 is a pair of hammer members 56, one each engaging a swaging member, and the said hammer members lying in juxtaposition to each other throughout the series in substantially the same manner as are the swaging members, see Fig. 5. These hammer members like the swaging members are capable of movement radially of the shaft.

Between the peripheral surface of the shaft 32, having reference to that portion of the shaft lying between the end plates 47 and 48, and the housing 30 are provided a plurality of annular spaced rings 57, these rings being spaced so that certain of said rings are preferably located at the meeting edges of adjacent hammer members 56, while others of said rings are located at the meeting edges of the opposite and end hammer members and the adjacent end walls of the slot 49 in the shaft 32, see Fig. 5; and encircling the said rings, and between the same and the housing, is located a cylindrical cage 58 capable of creeping movement, and between the periphery of the

cage and the housing there is preferably provided a hardened steel bushing 59.

The outer faces of the hammer members 56 are provided with the rounded portions 60 mediate their ends, at best illustrated in Fig. 7, and adapted to have a rolling contact with these rounded portions of the hammers are rollers 61, which are disposed within openings 62 in the cage 58. Such openings and their arrangement are best shown in Figs. 10 and 11, although they are shown in several cross sectional views and, particularly, Figs. 5 and 6.

It will be observed from an examination of Figs. 12 to 16, both inclusive, which are cross sectional views taken progressively of the successively arranged swaging and hammer members—beginning with the first set at the left hand end of Fig. 5, six rollers in each instance are provided for engagement with the several sets of hammer members, with the exception of the last set of said hammer members at the right hand end of Fig. 5, and for this set there are provided twelve rollers. In other words, as will be fully explained, the set of swaging and hammer members at the right hand end of Figs. 1 are operated upon by the rollers twice as often as any of the remaining swaging and hammer sets. In addition to the rollers 61, serving to bear against the hammer members to bring about the swaging action, they provide a roller bearing action for the shaft 32 which facilitates its smooth operation. The disposition and arrangement of the rings 57 prevent any over-travel of the hammer members 56 during the rotation of the shaft 32 and between the rollers 61.

The roller arrangement as illustrated in Figs. 12 to 16, both inclusive, and the relative activities of the individual rollers on the hammer members as they are timed in their relation to each other, is probably best seen in Figs. 10 and 11 showing the detailed disposition of the slots 62, in which the rollers are carried; sectional indicating lines on Fig. 10 corresponding to the sectional views, Figs. 12 to 16, both inclusive, as will be observed by comparison.

On Fig. 11, which represents in a diagrammatic way the flattened or extended cage 58, 10—10 is an indicating line which represents the axis of the cage, as exhibited in Fig. 10. For each set of swaging and hammer members within the shaft 32 there is provided an annular row of openings 62 in the cage 58 and in each opening is a roller 61. As will be observed, the openings of the respective annular rows are in well defined staggered arrangement in relation to each other, the purpose of which is to have the first set of hammers at the left of Fig. 5 acted upon by one pair of coacting rollers, which are diametrically disposed, and immediately following the action of one pair of rollers on the first set of hammers at the left in Fig. 5, and in rapid progression as the shaft 32 is rotated, a pair of rollers engage with the third set of hammer members from the left in Fig. 5 and following this in the same manner, the last set of hammers are acted upon, which are at the right end of Fig. 5, and thence are operated the hammers of the second set and then the hammers of the fourth set, followed by the hammers in the the last set. As has been previously stated the last set of hammers at the right in Fig. 5 are operated twice while the other hammers of each set are only operated once. This progressive timing of the action of the progressive sets of hammer members, and the rollers engaging the same, will be best understood by an examination of Figs. 10 and 11, wherein, the openings 62 have been numbered in the order of the engagement of the rollers of the successive annular rows on the hammers of their corresponding rows. For instance, 1 designates an opening in the first annular row of openings and denotes the first set of rollers to come into operation; 2 designates an opening in the third annular row of openings and denotes the second set of rollers to come into operation; 3 designates an opening in the fifth annular row of openings and denotes the third set of rollers to come into operation; 4 designates an opening in the second annular row of openings and denotes the fourth set of rollers to come into operation; 5 designates an opening in the fourth annular row of openings and denotes the fifth set of rollers to come into operation; and 6 like 3 designates an opening in the fifth annular row of openings and denotes the sixth set of rollers to come into operation. Thus it will be observed that the staggered arrangement of the openings in the cage 58 provides for alternate operation of the progressively disposed swaging and hammer members, with the exception that the last set of swaging and hammer members are operated twice as often as any of the other sets. It is further observed that the arrangement and disposition of the openings 62 in the cage 58 are such that no two sets of swaging and hammer members are operated at the same time, although they are operated in very rapid succession as the shaft 32 is revolved. The average speed of rotation of this shaft in actual operation will be approximately 1200 revolutions per minute. By timing the progressive and successive operations of the respective swaging and hammer members so that no two sets operate at the same time, I accomplish two important things, one is that cobbling of the wire within the swaging mechanism is obviated,

and the other is that the excess material in the wire, due to the successive reductions of diameters therein, is absorbed in the reduced elongations in one or both directions axially of such pointed portion of the wire.

In Figs. 10 and 11 the numerals 7 to 18, both inclusive, are employed to show the further and continuous timing of the operation of the respective swaging and hammer members associated with the rollers disposed within these openings, and shows the resulting operation of the respective swaging and hammer members during the complete and continuous rotations of the shaft 32.

The hardened steel bushing 59 is fixed against rotation within the housing 30 and between the end plates 47 and 48, whereas, the cage 58 and the rings 57 are free for a creeping movement with the shaft 32 and the swaging and hammer members therein, the rollers located in the openings 62 in the cage 58 operating on the hammer members 56 between the spaced rings 57, as best seen in Figs. 5 and 6. Each time that a pair of diametrically disposed rollers come into operative position, whereby, the blow is delivered on the hammer members there is a roller bearing engaging set up with the hardened steel bushing 59, which, if the cage were not permitted to creep, would result in the blows which are imparted being transmitted always to a common point on the hardened steel bushing and it is desirable to avoid this, and this is accomplished by permitting the cage to creep, moving in the direction of the shaft and with it at the time that the contacts are set up between the hammers 56 and the said rollers 61. This is also a desirable movement in that if the cage were not permitted to creep a sliding action would set up, which would not be as effective as the roller bearing action provided for. This also produces a substantially noiseless operation during the reduction of the portions of the wire by the swaging means.

It will be understood from the foregoing explanations that the ends of wires are pointed at a time when it is desired to thread the dies with a new wire, or in the event of breakage of a wire being drawn when it becomes necessary to rethread the dies, and that to point the wire the shaft 32 is set into operation and the end of the wire, by preferably manual operation, is inserted into and through the guide 51 at the left hand end, as shown in Fig. 5, and thence through and into the die faces of the progressively arranged swaging members, a predetermined length of section at the end of a wire being inserted into and between the swaging members, and the successively produced elongations of different diameters absorbing the excess material in such elongations and the pointed wire withdrawn, shaped somewhat as shown in Fig. 9, ready for the threading of the drawing dies as has been previously explained.

The wire pointed in the form depicted in Fig. 9 has its end of least diameter inserted or threaded in the greatest diametered die A of the wire drawing bench, and is then moved until the various diameters, A′, B′, C′, D′ and E′ of the wire are in register with the respective reducing dies A, B, C, D and E, in which position of the wire the drawing process is ready to begin.

In the foregoing description I have pointed out that the process is useful in pointing materials, such as wire and wire rods, and I want it understood that I comprehend such use to cover reductions on the end of a wire, which has already been through a cold drawn operation from a wire rod, or a wire rod which has not gone through a cold drawing operation, and drill rods of whatever character, and in fact any like materials where it is desired to point a predetermined length of section at one end thereof, whereby the same may be used for the purposes herein set forth.

This application is a division of the application filed by me February 20, 1926, bearing Serial No. 89,739, for an apparatus for pointing a wire.

What I claim is:—

The hereindescribed method for pointing and drawing wire or the like through a series of successive reducing dies of a continuous wire drawing bench, which resides in initially shaping the end portions of the wire to provide same with a succession of reduced portions which latter correspond approximately in diameter to the diameters of the reducing dies of a wire drawing bench, and then in threading the end of least diameter into the reducing die of greatest diameter and moving the wire until the various diametered portions are in register with the respective reducing dies of corresponding diameter, and finally in drawing the wire through the reducing dies.

WILLIAM H. SOMMER.