

July 7, 1942.

W. A. PURTELL
APPARATUS FOR FORGING

2,288,643

Filed Jan. 22, 1941

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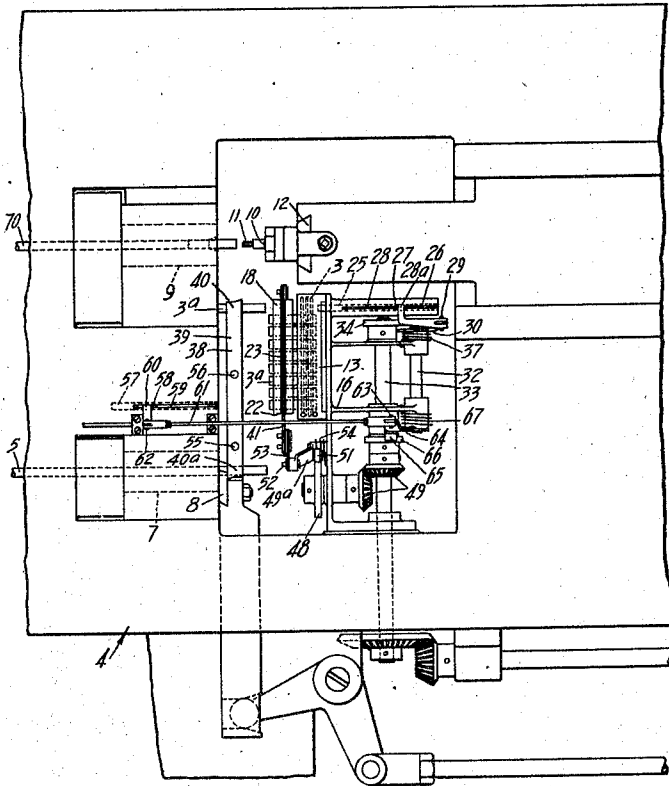


Fig. 2.

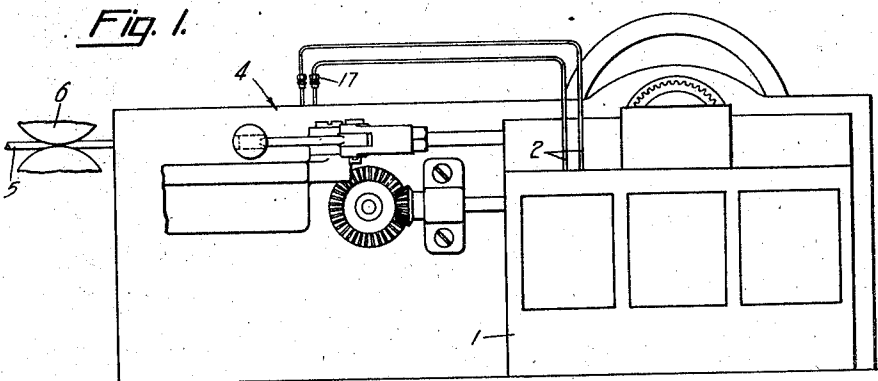


Fig. 1.

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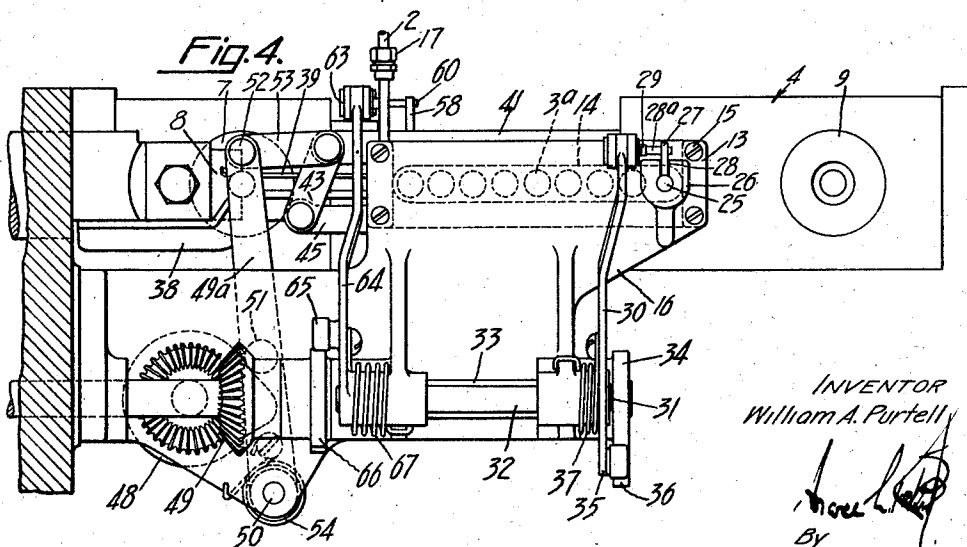
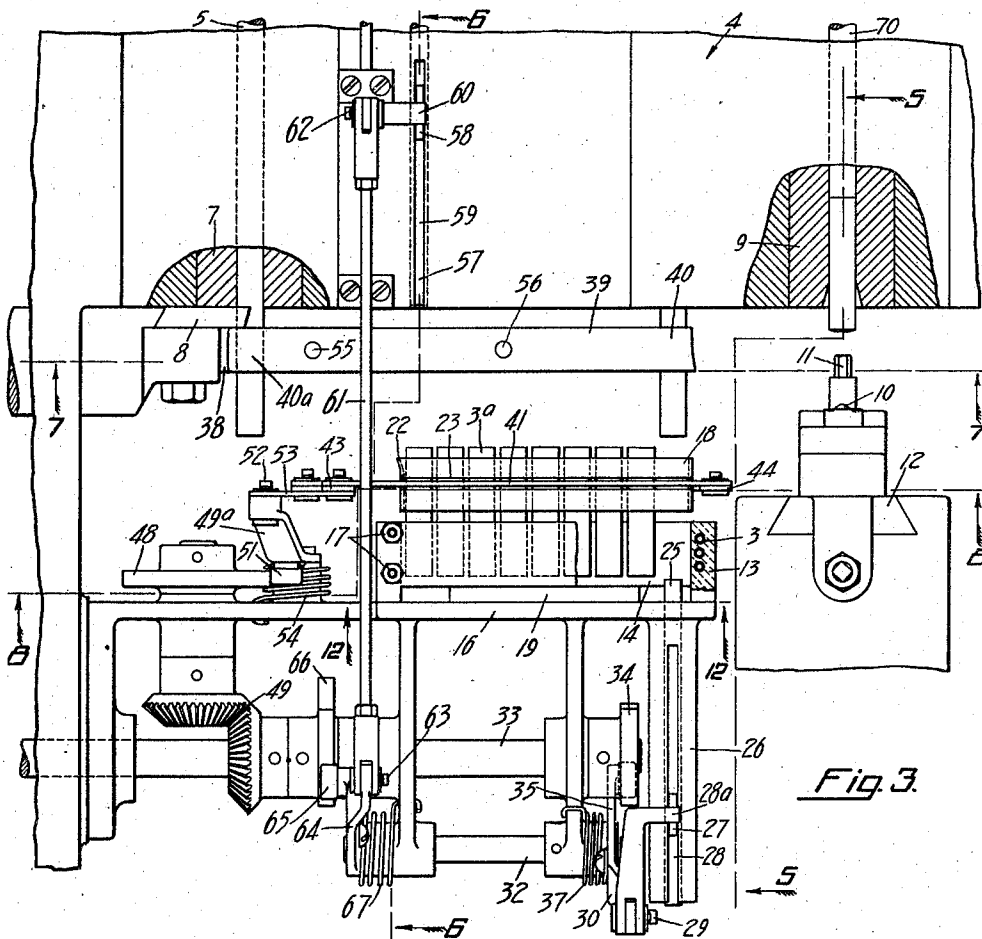
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4 Sheets-Sheet 2



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APPARATUS FOR FORGING

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4 Sheets-Sheet 3

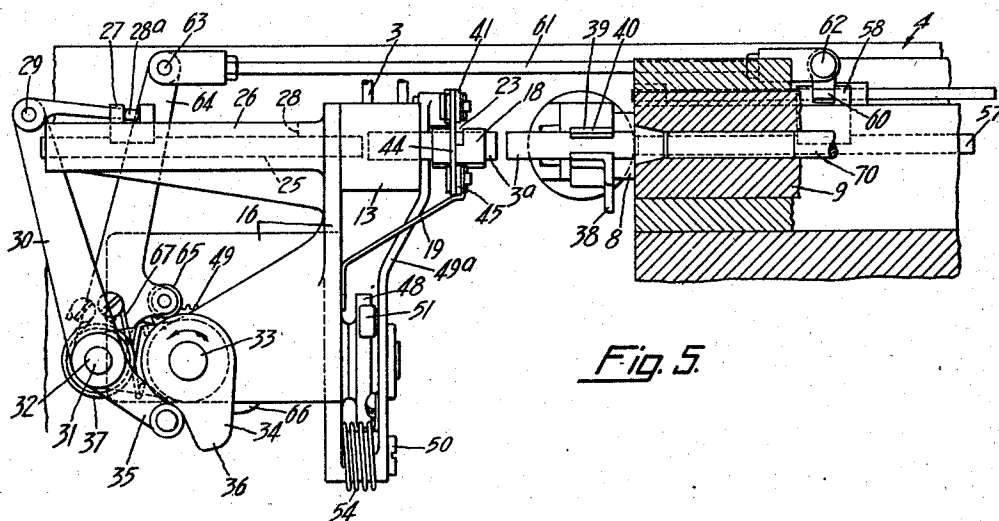


Fig. 5.

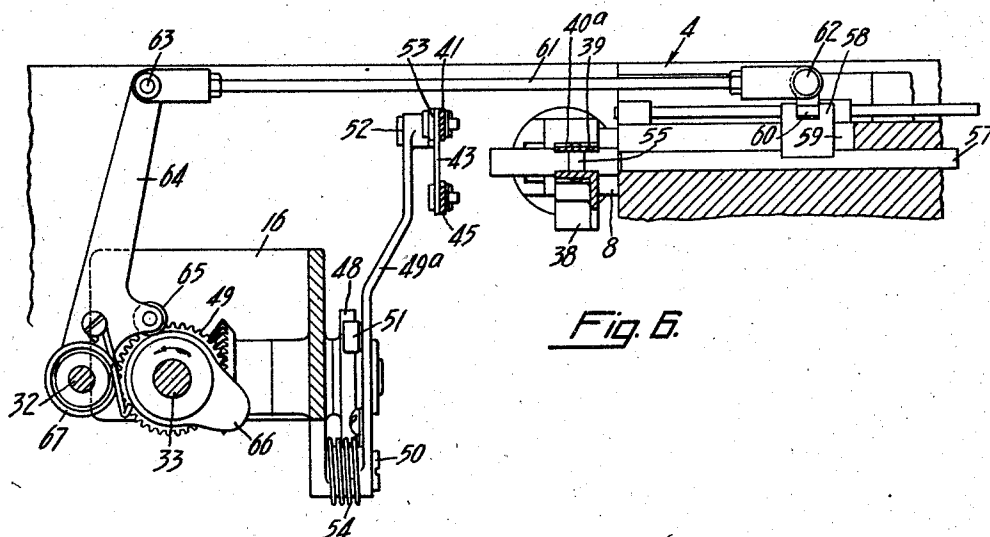
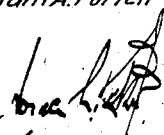


Fig. 6.

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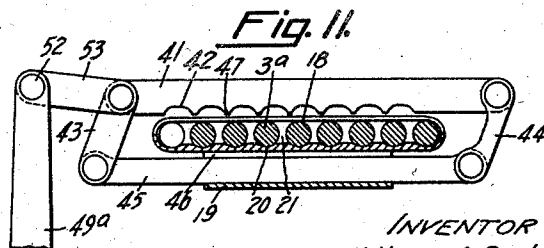
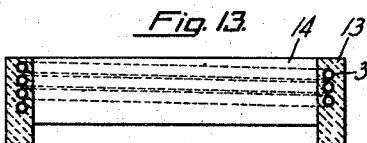
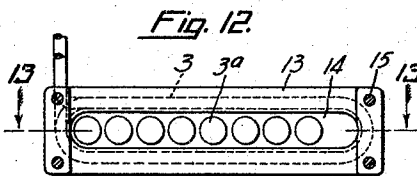
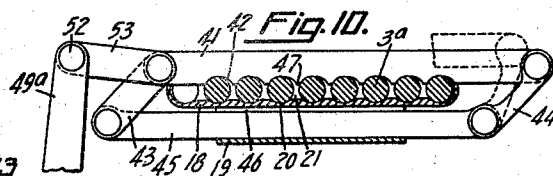
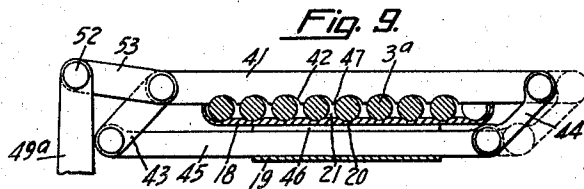
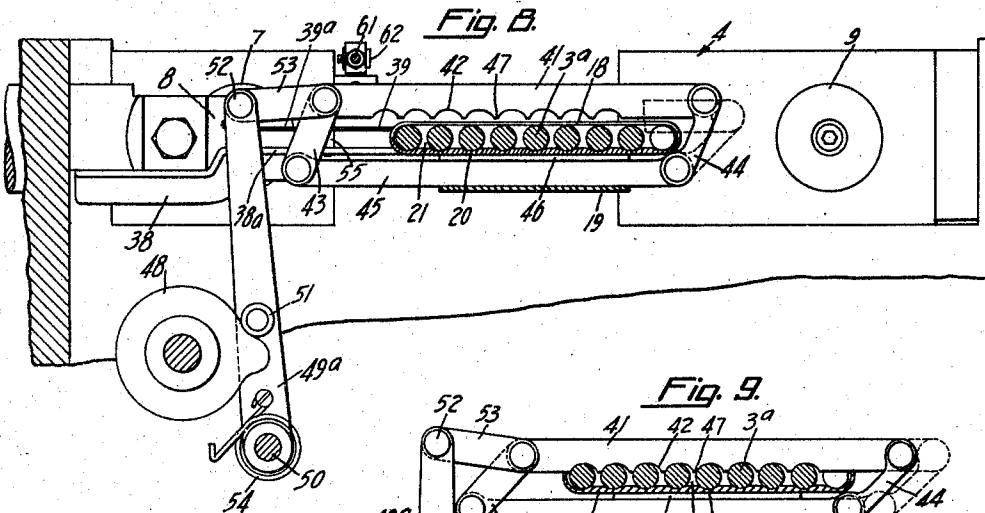
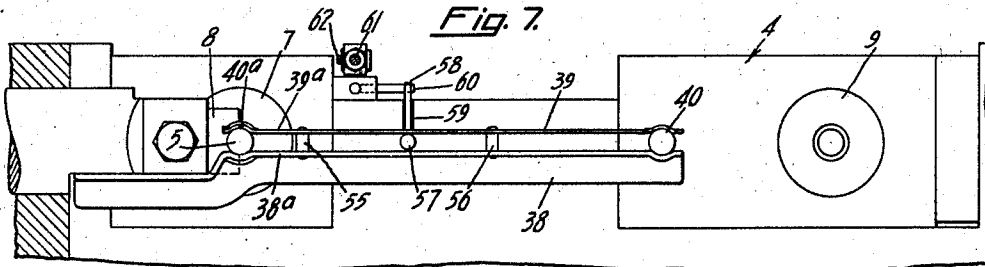
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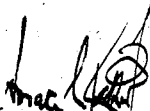
APPARATUS FOR FORGING

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4 Sheets-Sheet 4



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2,288,643

APPARATUS FOR FORGING

William A. Purtell, West Hartford, Conn., assignor to The Holo-Krome Screw Corporation, a corporation of Connecticut

Application January 22, 1941, Serial No. 375,412

15 Claims. (Cl. 10—11)

My invention relates to apparatus for forging. It has among its objects to provide an improved forging apparatus wherein, as the stock is in process of being fed and while it is moving through the forging apparatus, it is heated in an improved manner to prepare it for forging. A further object of my invention is to provide such an improved apparatus adapted to utilize high frequency induction heating and whereby it is made possible to minimize both manual handling of the stock and the apparatus required, while also enabling the forged article to be produced markedly more expeditiously and inexpensively. A still further object of my invention is to provide such an improved apparatus especially adapted to use in the manufacture of socketed screws and to reduce the handling and apparatus required in the manufacture thereof wherein blanks have heretofore been severed from the wire while cold and thereafter forged, also while cold, or so preliminarily forged and then annealed in a separate furnace and finally forged in another separate forging apparatus. Other objects of my invention are to provide an improved apparatus wherein the stock is entirely automatically fed and while being fed is brought up to a proper forging temperature. A further object of my invention is to provide such an improved apparatus wherein, in the process of delivery of the cold stock to the forging dies, the stock is brought up to the desired forging temperature by improved high frequency electrical heating means of the induction type. Still another object is to provide an improved induction type heating means and improved associated blank feeding mechanism so disposed relative to and cooperating with the other mechanisms in a header as to feed the blanks to these heating means and from the same after a predetermined heating period, all in timed relation to the operation of the other mechanisms and while the stock is being automatically passed through the header. These and other objects and advantages of my improvements will, however, hereinafter more fully appear.

In the accompanying drawings, I have shown for purposes of illustration, one form of my improved apparatus adapted to the manufacture of socketed set screws, but it will be understood that my invention is not limited to use in connection therewith.

In these drawings:

Figure 1 is a side elevation of a complete apparatus including a suitable high frequency induction heater suitably connected to a cooperating forging apparatus or header, both the induction heater and header being shown in simplified diagrammatic form to facilitate illustration;

Fig. 2 is a plan view of the operating end of the

header, certain parts of usual header construction being omitted to facilitate illustration;

Fig. 3 is an enlarged plan view of the stock feeding, heating, and forging mechanism of the header shown in Figure 2, certain parts being shown in section to facilitate illustration;

Fig. 4 is an end view of the mechanism shown in Figure 3 as seen from the bottom of that figure;

Fig. 5 is a section on line 5—5 of Figure 3;

Fig. 6 is a section on line 6—6 of Figure 3;

Fig. 7 is a section on line 7—7 of Figure 3;

Fig. 8 is a section on line 8—8 of Figure 3, with the blank feeding mechanism in the raised position occupied thereby between blank feeding operations;

Fig. 9 is a detail view showing the blank feeding mechanism of Figure 8 in full lines in its lowered position ready to feed the blanks, and in dotted lines in the position occupied after the completion of this feeding movement;

Fig. 10 is a similar view showing the parts in full lines after completion of the feeding movement;

Fig. 11 is a like view showing the blanks in the position occupied after each rolling operation and with the rolling member in process of returning to its position shown in Figure 8;

Fig. 12 is a section on line 12—12 of Figure 3, and

Fig. 13 is a section on line 13—13 of Figure 12. In the illustrative apparatus, I have shown an improved apparatus including a suitable high frequency source or unit 1 having terminals 2 extending therefrom and suitably connected to an improved induction heating coil 3 disposed in an improved manner in the forging apparatus 4, herein in the form of a header; the wire stock 5 being fed by usual feeding mechanism 6 into a usual cut off die 7 in the header, and cut off by usual cutting off mechanism including a knife 8, and thereafter being transferred in an improved manner to the coil 3, heated therein in an improved manner, and then transferred in an improved manner to the forging die 9 wherein the heated blank is successively operated on in a usual manner by the upsetting punch 10 and socketing punch 11, carried on the usual header gate or slide 12, to complete the socketed blank, all as hereinafter more specifically described.

Referring more particularly to the high frequency unit 1, the same is illustrated as a standard form of induction heating unit such as heretofore used for induction hardening. The unit illustrated is of the well known "Tocco" type, and accordingly need not be further specifically described than to say that the terminals or bus members 2 thereof comprise usual tubular copper members having a cooling water circuit supplied therethrough, and that the same are adapted to

provide a high frequency field in a suitably connected coil in a manner usual in such induction type hardening mechanisms, with the frequency and water flow controllable as desired through usual controlling mechanism (not shown) embodied in the unit 1.

In my improved construction, however, it will be noted that, instead of the usual elongated round coil connected to these members 2 and into which the stock is ordinarily inserted longitudinally, my coil 3 is of an improved construction and so supported and disposed as to enable a series of blanks to be simultaneously heated therein and to enable cold blanks to be successively inserted in one end thereof and heated blanks to be successively removed from the opposite end thereof. Further, this coil 3 is imperforate, i. e. free from water discharge passages, heretofore used for quenching, the water circuit in my improved construction being provided solely for cooling purposes, i. e. to prevent the coil from being burned up during operation. Herein, the coil 3, as shown in Figures 12 and 13, is also of elliptical form in such manner as to provide an elongated space between the upper and lower reaches thereof and enable a series of blanks 3a to be disposed uniformly in parallel spaced relation therein, as shown in Figure 3. As illustrated in Figure 12, the coil is of such dimensions as to provide space for nine blanks therein and thereby enable each blank to remain sufficiently long in the coil to be brought to proper forging temperature as hereinafter described, but obviously the dimensions of the coil may be varied as desired to accommodate a different number of blanks. Further, it will be noted that the coil 3 is embedded in a suitable likewise generally elliptical coil supporting or carrying member 13 of insulating material, and that the turns of the coil are uniformly spaced from one another therein. Thus, the coil is also protected by the insulation so that the blanks cannot come in contact with or injure the coil, while an elliptical blank receiving opening 14 in one side face of the insulating member and generally conforming to the cross section of the coil 3, enables the blanks to be inserted laterally into the member 11 through one side thereof. Further, it will be noted that the member 13 is herein horizontally disposed in such manner that the blanks may be projected horizontally into the opening 14 and have their ends remain therein as shown in Figure 3. Herein, the horizontal member 13 is also suitably supported, as by insulating connecting members 15, against the vertical face of a transverse bracket 16 carried on the header 4 in longitudinally spaced relation from and between the cut off die 7 and forging die 9. Thus, when the terminals 2 leading from the induction heater 1 are suitably connected as at 17 to the top of one end of the insulating support 13, it will be observed that a high frequency field is generated in the area surrounded by the elliptical coil 3, i. e. in the opening 14, in such manner that the inner ends of a series of blanks therein are subjected to this field and a high temperature is generated in these ends of the blanks, all while the coil 3 is effectively insulated from the header.

Operatively associated with this improved induction heating mechanism including the coil 3 is improved blank supporting mechanism adapted to support a series of blanks, herein nine, in the parallel spaced relation and with their inner extremities spaced from the bracket member 16, as

shown in Figures 3 and 5. This mechanism as shown includes a blank supporting member 18, preferably formed of any suitable heat resisting and non-magnetic material, disposed in alignment with and spaced in front of the coil support 13 and between the aperture 14 and the plane of movement of the cut off knife 8. As shown, the member 18 is hollow and generally elliptical in cross section and is fixed to and supported on a bracket 19 which is, in turn, suitable supported on the bracket 16, as shown in Figure 5. In a preferred construction, a series of longitudinal parallel grooves 20 is provided in the bottom of a blank receiving chamber 21 in this member 18 in such manner as to provide spaced parallel blank receiving grooves constituting blank stations and so disposed that a blank inserted in the left hand groove 20, Figure 8, may be successively rolled as hereinafter described from that groove into the next groove and so on, progressively, over into the succeeding grooves until after the eighth rolling operation, it reaches the groove at the opposite edge of the chamber 21 from which it is transferred to the forging dies as hereinafter described. Herein, this member 18 is also spaced in front of the member 13 as shown in Figure 3 in such manner as to minimize heating. It is also of such width that when the blanks are supported in the grooves 20 therein in the relation shown in Figure 3, the ends of the blank being heated in the heating member 13 will be maintained in the desired relation in the aperture 14 shown in Figure 12. Here it will also be noted that the end of the member 18 toward the knife 8 is preferably slightly flared as shown at 22 to facilitate entry of the cut off blanks, and that a transverse slot 23 is provided in the top of the member 18 to receive a transversely disposed blank transfer or rolling member hereinafter described.

Cooperating with the blank heating and supporting mechanisms above described is also improved blank transferring mechanism. Herein this includes improved mechanism whereby each heated blank, after it has been rolled progressively in the support 18 into the extreme right-hand groove therein, Figure 3, is automatically fed into a position enabling it to be forced into the forging die 9 by the upsetting punch 10. Further, it includes improved blank rolling mechanism, herein acting through the transverse slot 23 in the support 18, for thereupon rolling the remaining blanks in the grooves 20 to the right in such manner as to empty the left-hand groove and thus enable it to receive a cold blank cut off by the knife 8. It further includes improved mechanism for delivering such a cold blank to this empty left-hand groove in the support 20 after each cutting off operation of the knife 8.

Referring first to the mechanism for delivering the heated blank from the right-hand groove into the path of the upsetting punch 10, it will be noted that this mechanism includes improved cooperating means for ejecting the right-hand heated blanks from the blank support 18 and improved cooperating transfer means for receiving and delivering these ejected blanks into the path of the punch 10.

The means for ejecting the heated blanks as shown in Figures 3 and 5 includes a cam operated ejector mechanism disposed on the other side of the bracket 16 from the blanks and having an ejector rod 25, preferably of insulating material, in alignment with the right-hand blank and reciprocable through aligned apertures in

the bracket 16 and in the extension 26. As shown, this rod 25 also moves through a rearward extension 26 on the bracket and has raised spaced ears 27 on the top of the rear end thereof movable in a slot 28 in the extension 26. Between these ears 27 an actuating lever 28a extends which is, in turn, pivoted at 29 on an upstanding swinging lever 30 pivoted at its lower end at 31 on a shaft 32 on the bracket 16 in rear of and below the heating coil carrying member 13. As illustrated, a transverse cam shaft 33 is also suitably journaled in the bracket 16 in front of the shaft 32, and this shaft 33 carries an actuating cam 34 rotating counter-clockwise, as shown in Figure 5, while this cam actuates a spring connected cam follower 35 also movable about the shaft 32 in such manner as to swing the lever 30 and thereby reciprocate the plunger 25 to eject the right-hand heated blank from its groove 20 in the support 18. Herein, the follower 35 is also snapped back automatically after the lobe 36 of the cam has passed the same, by means of a spring 37 coiled about the shaft 32 and having fixed abutments at its opposite ends on the lever 30 and a portion of the bracket 16. Also, the cam shaft 33 is suitably driven from the header mechanism and the timing of the cam mechanism is such as to cause the plunger 25 to begin to move as the knife 8 starts each cutting operation.

Cooperating with this mechanism is also the improved transfer means for receiving the ejected heated blank and delivering it to the forging mechanism. As shown, this transfer mechanism is operated by the cut off knife 8. It includes a transfer member 38 movable transversely with the knife 8 and a cooperating spring member 39 spaced above the member 38 and movable therewith; each of these members being provided with grooves 40 adjacent their ends which cooperate to form a suitable socket adapted to receive the ejected heated blank laterally and deliver the same laterally as shown in Figure 3. The timing of this mechanism and the blank ejecting mechanism is such that the heated blank is delivered into the socket 40 as the transfer members 38 and 39 move transversely. Thus, it will be evident that the heated blank will be received in the socket 40 and suitably transferred transversely from the position shown in Figure 3 into alignment with the aperture in the forging die 9 in proper timed relation to the parts in the course of and following each cutting off operation of the knife 8. As a result, the heated blank is so located that it may be forced into the die 9 by the upsetting punch 10 and upset thereby in the die aperture and subsequently socketed by the socketing punch 11 as in the normal operation of the header these punches are successively presented opposite the die aperture by the usual movement of the header gate or slide 12.

While the right-hand heated blank is being ejected from the heater support 18, as above described, the improved mechanism for rolling the remaining blanks in the support 18 is also operated. As shown in Figure 8, this mechanism includes a transversely disposed blank rolling member 41 movable transversely in the transverse slot 23 in the member 18 and having a lower notched edge 42; this member 41 herein being connected by short links 43, 44 of equal length at its opposite ends to a bottom parallel link 45 supported and slidable in a transverse passage or slot 46 beneath the support 18. The notches 42 are

adapted to receive the tops of the blanks located in the eight left-hand grooves 20, and these notches are spaced by projections 47 adapted to enter the spaces between adjacent blanks. Thus, when the member 41 is moved to the right and lowered from the full line position shown in Figure 8 to the dotted line position shown therein, the member 41 will fit the tops of the several blanks with the projections 47 between the latter, the parts then assuming the position shown in full lines in Figure 9. Further, it will be evident that when the members 41 and 45 are then moved bodily to the right into the dotted line position shown in Figure 9 or the full line position shown in Figure 10, the eight blanks will each be rolled out of their grooves 20 into the next right-hand grooves 20 in such manner as to move the right-hand blank into the extreme right-hand groove 20 ready for discharge by the plunger 25 in the next operation thereof, while emptying the extreme left-hand groove 20 ready to receive a new cold blank.

Herein, these movements of the member 41 are effected by a cam mechanism including a cam 48 suitably journaled on the bracket 16 and driven from the cam shaft 33 by a beveled drive 49. As shown, an upstanding cam operated lever 49a is also suitably pivoted at its lower end at 50 on the bracket 16 and carries a cam follower 51 intermediate its ends. The upper end of this lever 49a is also pivotally connected at 52 to a transverse short actuating link 53 which is herein also connected to the parallel link mechanism 41, 43, 44 and 45 by the same pivot connecting the link 43 to the link 41. Further, it will be observed that the swinging lever 49a is spring connected to a coiled spring 54 having its opposite ends acting on suitable abutments on the lever 49a and bracket 16. Thus, with this mechanism timed as heretofore described, it will be evident that following the discharge of each heated blank by the plunger 25, the link mechanism including the link 41 will be operated as above described to advance the several blanks by rolling the same in the heater and to empty the extreme left-hand groove 20 for the reception of a new cold blank.

Cooperating with this mechanism and acting to deliver such a new cold blank into the emptied extreme left-hand groove 20 is also improved transfer mechanism. As shown, this mechanism includes usual transfer mechanism for receiving and transferring laterally each blank as it is cut off by the knife 8; this mechanism herein comprising oppositely disposed extensions 38a and 39a of the members 38 and 39 heretofore described and having a blank receiving socket 40a corresponding to the socket 40. The transfer members 38, 38a and 39, 39a, are connected in spaced relation by suitably spaced connecting members 55, 56, one adjacent the socket 40a and the other spaced therefrom and more remote from the socket 40. Thus, as each blank is cut off by the knife 8, it will be received in the socket 40a and move transversely therein from out of alignment with the cut off die 7 into alignment with the extreme left-hand groove 20 in the support 18.

Acting upon the blank when so positioned is also improved ejector mechanism for delivering the same from the socket 40a of this transfer mechanism into the groove. This mechanism herein is generally similar to that heretofore described for ejecting the heated blank and includes a like plunger 57 moving in a suitable

longitudinal passage in the header and having upwardly projecting spaced lugs 58 on the top thereof movable in a slot 59. As shown, this plunger is actuated by a laterally extending actuating member 60 which is, in turn, actuated by a longitudinally extending link 61 pivoted thereto at one end at 62 and having its rear end pivoted at 63 to a vertical swinging lever 64 pivoted at its opposite extremity on the adjacent end of the shaft 32 and having a cam follower 65 cooperating with a cam 66 rotatable on the cam shaft 33; a coiled spring 67 here also being provided and suitably connected as heretofore to effect a quick return of the mechanism. Thus, it will be apparent that after the left-hand groove 20 in the blank support 18 has been emptied by the blank rolling mechanism, and after the transverse transferring mechanism including the members 38a, 39a has been moved to bring the cut off blank into alignment with this empty groove, the plunger 57 will be reciprocated in such manner as to force the newly cut off cold blank out of the socket 40 and into the empty groove in the position shown in Figures 1 and 3; the plunger then being automatically returned to the position shown in Figure 3 by its connected spring mechanism.

As regards the forging apparatus including the upsetting punch 10 and socketing punch 11 carried on the gate or slide 12 and operating on the heated blanks in the die 9, it will be understood that this apparatus is of usual construction such, for example, as that adapted to produce set screws and described and claimed in my copending application Serial No. 233,611, filed October 6, 1938, now Patent No. 2,236,733, and that the same includes a knock-out 70 adapted to cooperate therewith as described and claimed in that application. Further, it will be understood that the gate 12 of this forging apparatus is connected and operated in usual sequence with the cut off knife 8 through suitable mechanism, not shown, so that after a heated blank has been ejected by the plunger 25 from one end of the induction heater and while it is being upset and socketed in the die 9, a cold blank is being cut off and delivered to the plunger 51 for delivery to the opposite end of the induction heating mechanism, these operations occurring in the interval between the delivery of successive heated blanks.

In the operation of the complete apparatus wherein the several component mechanisms will continue to operate automatically and successively in the sequence described, it will be apparent that each blank will be continuously heated by the induction heating coil 3 throughout the several operations of the machine required to pass the blank through the machine. Thus, for example, if the apparatus is operated to produce sixty screws per minute, i. e. sixty times a minute, each blank will nevertheless remain in the induction heater for eight seconds, i. e. a sufficient time to bring the blank to a forging temperature. It will, of course, be understood that the heat developed may be controlled by usual controlling mechanism provided on the induction heating mechanism which is provided with usual controlling mechanism including means for varying the frequency as desired; this heating mechanism, when suitably adjusted to the needs of the particular stock being operated upon, being run continuously through the operation of the header. Further, it will be apparent that the operation of the header at normal operating

speeds is in no way interfered with, at the same time that it is made possible to obtain a heating period of the blanks which is materially longer than the interval between successive operations of the header. It will, of course, also be evident that the length of the heating operation to which each blank is subjected may also be varied by varying the number of blank stations as desired, while the heating effect obtainable with any given number of stations may also be varied through suitable control of the operation of the induction heater unit in a well known manner.

It will be understood that this invention is not limited to use in connection with set screws or with the particular forging mechanism illustrated, the forging mechanism being capable of being of various types adapted to forge either set or cap screws and my improved heating and feeding mechanism, which operates upon the blanks before they are upset, therefore, being capable of use when making either set screws or cap screws. Moreover, when applied to a single machine having, instead of the set screw forging mechanism of my application mentioned, forging dies and transfer mechanism adapted to make cap screws, my invention makes it possible to eliminate altogether the separate annealing operation now performed between the cold preliminary or upsetting operation performed on one machine and the cold socketing operation performed on a separate machine. Further, it will be evident that, whether making set screws or cap screws, the wear on the dies and punches is also materially reduced as compared with cold forging while the apparatus required in making cap screws is markedly simplified, a single apparatus such as described herein being all that is required. While particularly advantageous in connection with the manufacture of socketed screws, it will also be evident that my improvements may be utilized advantageously in connection with the manufacture of other articles wherein heating is advantageous before upsetting or forging operations. These and other advantages of my improvement will, however, be clearly apparent to those skilled in the art.

While I have in this application specifically described one embodiment which my invention may assume in practice, it will be understood that the same is shown for purposes of illustration, and that the invention may be modified and embodied in various other forms without departing from its spirit or the scope of the appended claims.

What I claim as new and desire to secure by Letters Patent is:

1. In combination, reciprocating forging mechanism, means for providing a high frequency field to heat to forging temperature the stock to be forged, and mechanism for feeding the stock to be forged into operative position in said forging mechanism including means for feeding the stock through said field to bring the stock to forging temperature before delivery to said forging mechanism.

2. In a forging apparatus, reciprocating forging mechanism, mechanism for successively feeding series of blanks into operative position in said forging mechanism, and induction heating mechanism for heating said blanks to a forging temperature including a high frequency field through which said blanks are successively fed by said feeding mechanism as they move toward said forging mechanism.

3. In a forging apparatus, reciprocating forg-

ing mechanism, mechanism for successively feeding series of blanks into operative position in said forging mechanism, and induction heating mechanism for heating said blanks to a forging temperature including an elongated high frequency field adapted to heat a plurality of blanks and through which said blanks are successively fed by said feeding mechanism while maintaining each blank in said induction heating mechanism during a plurality of operations of said forging mechanism.

4. In a forging apparatus, reciprocating forging mechanism, transfer mechanism for successively feeding a series of blanks into operative position in said forging mechanism, induction heating mechanism for heating said blanks to a forging heat including means for providing a high frequency field, and mechanism for successively feeding said blanks through said field and successively delivering the same to said transfer mechanism.

5. In a forging apparatus, reciprocating forging mechanism, cut off mechanism for successively cutting off a series of blanks, induction heating mechanism, and mechanism for successively feeding blanks cut off by said cut off mechanism through said induction heating mechanism into operative position in said forging mechanism.

6. In a forging apparatus, blank cutting off mechanism for successively cutting off a series of blanks, reciprocating forging mechanism, induction heating mechanism, means for supplying blanks from said heating mechanism into operative position in said forging mechanism, and means for successively supplying blanks from said cutting off mechanism to said induction heating mechanism.

7. In a forging apparatus, blank cutting off mechanism for successively cutting off a series of blanks, reciprocating forging mechanism, elongated induction heating mechanism adapted to operate simultaneously on a plurality of blanks and having means for feeding the same between the ends of said heating mechanism, and mechanism for delivering successive heated blanks from one end of said heated mechanism into operative position in said forging mechanism and successive unheated blanks from said cutting off mechanism to the opposite end of said induction heating mechanism.

8. In a forging apparatus, blank cutting off mechanism, forging mechanism disposed in spaced relation thereto, induction heating mechanism having a plurality of blank heating stations therein and means for feeding blanks therein between said stations, means including a plurality of plungers for moving the blanks out of and into opposite ends of said heating mechanism, and cooperating blank feeding mechanism including a plurality of cooperating means for delivering the cut off blanks to one plunger and receiving the heated blanks from the other plunger and delivering the same to said forging mechanism.

9. In a forging apparatus, forging apparatus including reciprocating forging mechanism, means for feeding articles to be forged into operative position in said forging mechanism, and means for bringing said articles to a forging temperature while they are being delivered to said forging mechanism, including a high frequency coil generating a high frequency field through

which said articles to be forged are fed by said feeding mechanism.

10. In a socketed screw making apparatus, a high frequency induction heating unit, reciprocating forging mechanism, means for successively feeding blanks into operative position in said forging mechanism, and means including a high frequency coil energized by said induction heating unit and generating a high frequency field through which said blanks are passed by said feeding mechanism, for bringing said blanks to a forging temperature before they are delivered to said forging mechanism.

11. In a socketed screw making apparatus, socketing mechanism, mechanism for delivering successive lengths of stock into operative position in said socketing mechanism, and induction heating mechanism for heating a length of stock to be subsequently delivered in said delivering mechanism to said socketing mechanism, while a previously heated length is being socketed by said socketing mechanism.

12. In a socketed screw making apparatus, socketing mechanism, mechanism for delivering successive lengths of stock into operative position in said socketing mechanism, induction heating mechanism for heating a length of stock to be subsequently delivered by said delivering mechanism to said socketing mechanism while a previously heated length is being socketed by said socketing mechanism, and means in said delivering mechanism for maintaining each length of stock in said induction heating mechanism throughout a plurality of operations of said socketing mechanism.

13. In an induction heating mechanism, coil portions disposed in spaced relation to produce an elongated high frequency field therebetween and providing an elongated passage for the objects to be heated, and timing mechanism for effecting a predetermined heating of said objects in said coil portions including means for entering said objects between said portions at one end of said passage and feeding the same longitudinally of said passage and out of the latter at the opposite end thereof.

14. In an induction heating apparatus, a heating coil having closed ends and an open side and an elongated passage for carrying articles to be heated between said closed ends, and timing mechanism for effecting a predetermined heating of each object in said heating coil including plunger mechanism for ejecting a heated object from one end of said coil, transfer mechanism for feeding the remaining objects to be heated longitudinally in said coil, and a cooperating plunger mechanism for delivering a cold object to be heated into the opposite end of said coil.

15. In combination, an induction heating mechanism having coil portions disposed in spaced relation to produce an elongated high frequency field therebetween and providing an elongated passage for the objects to be heated wherein the extremities of a plurality of such objects are adapted to be simultaneously disposed during heating, feeding means for entering said objects between said portions at one end of said passage and feeding the same longitudinally of said passage and out of the latter at the opposite end thereof, and forging mechanism into operative position in which said objects are successively delivered by said feeding means after passing out of said field.

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