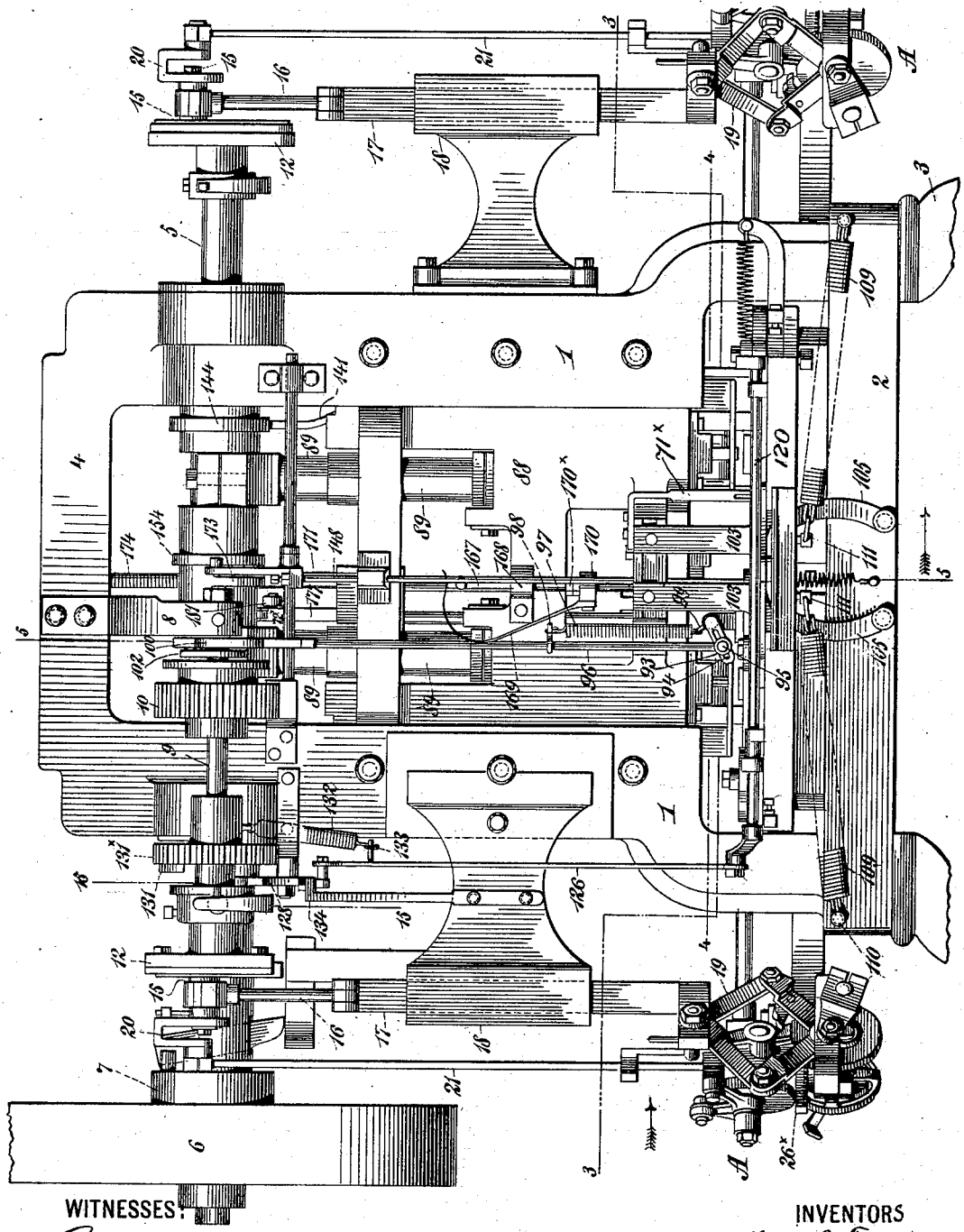
No. 654,616. Patented July 31, 1900.

A. D. FIELD, F. MARGGRAFF & J. DRAHER.

METAL WORKING MACHINE.

(Application filed Feb. 24, 1899.)

(No Model.) 16 Sheets—Sheet 1.



WITNESSES:

Gustave Dietrich.

Charles E. Smith

INVENTORS

Albert D. Field
Frederick Marggraff
John Draher

BY Briesen & Knauth

their ATTORNEYS

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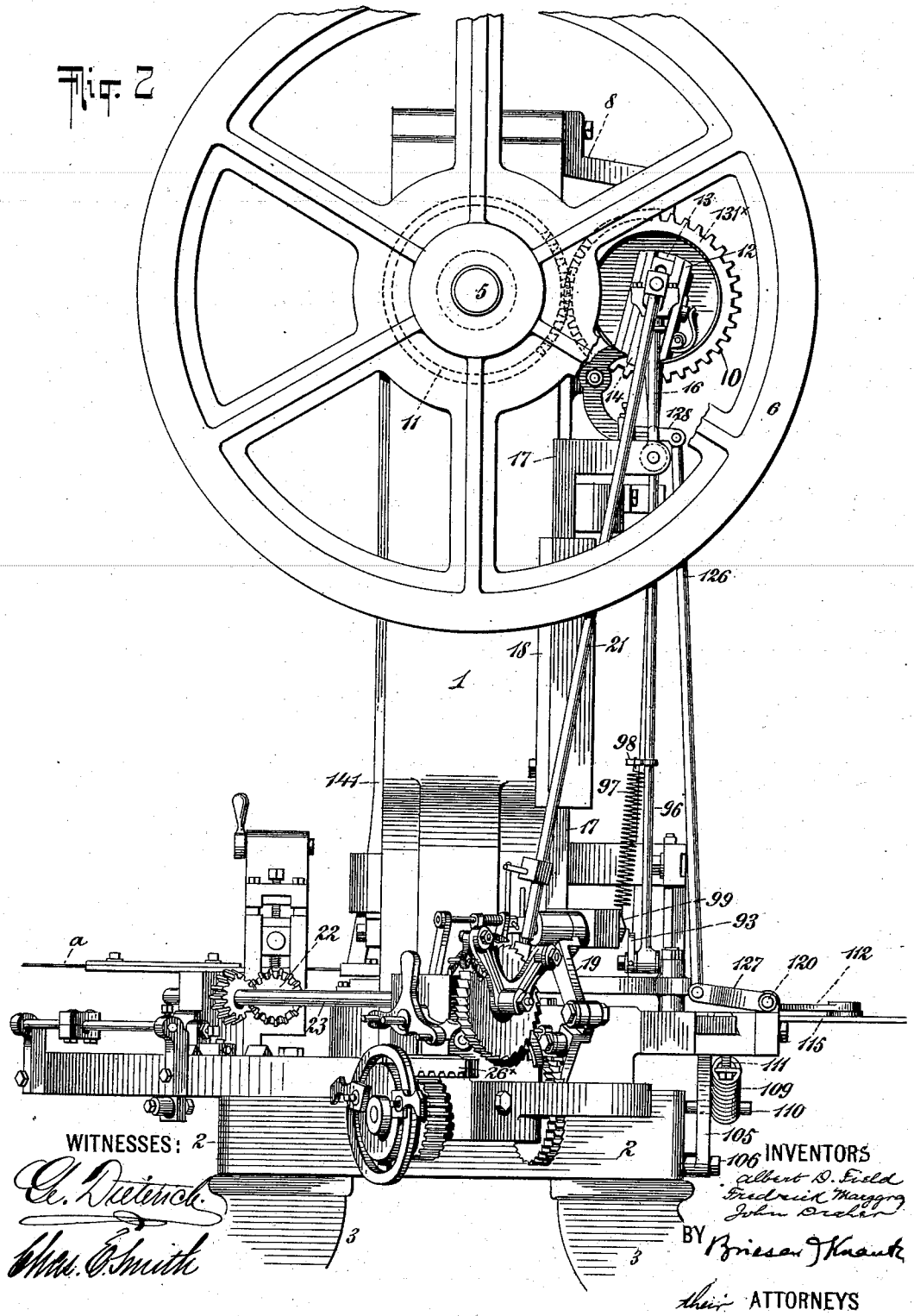
Fig. 2



WITNESSES: 2

C. Dieterich.

Thos. E. Smith

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John Draher

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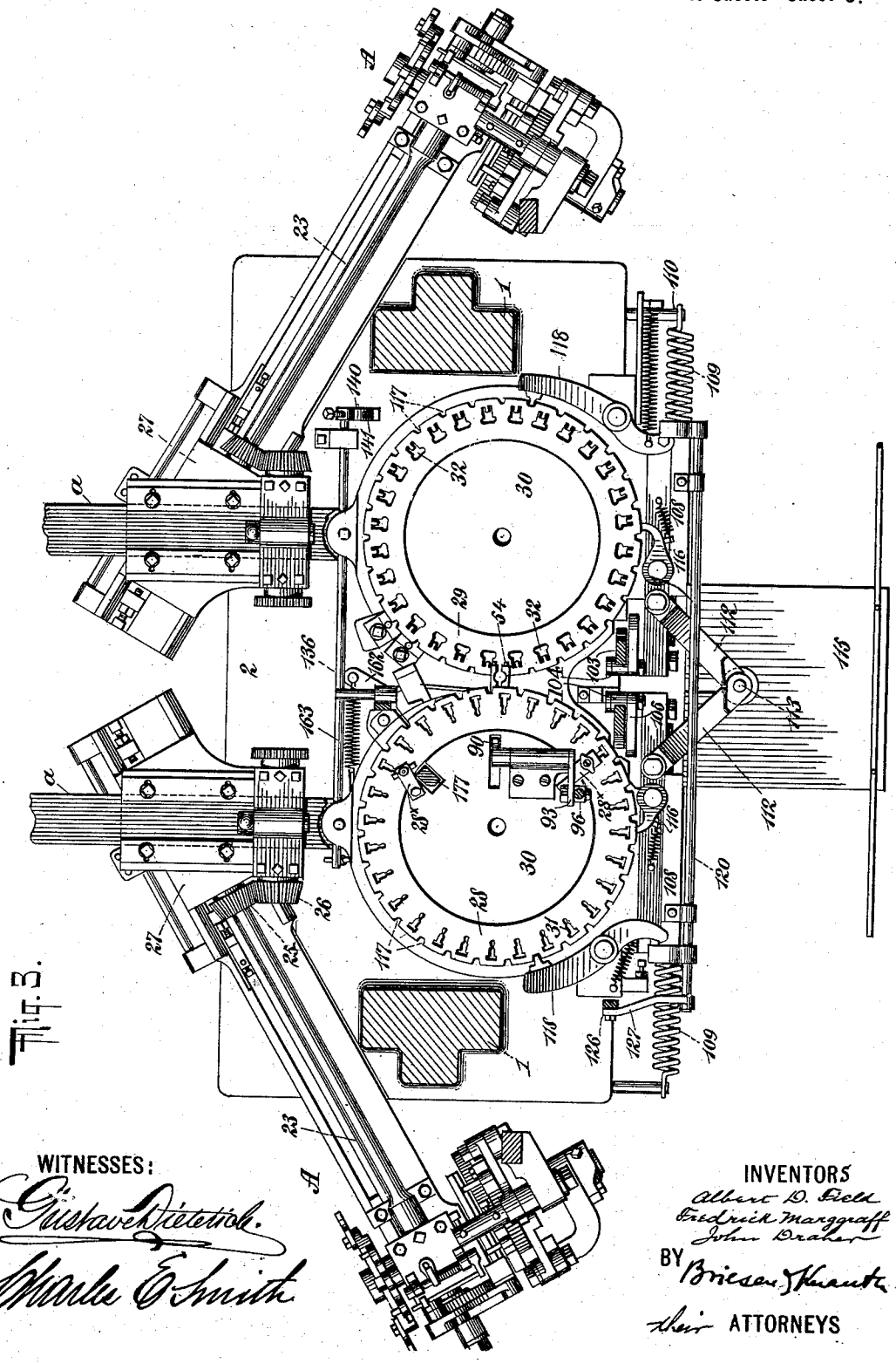

Fig. 3.

WITNESSES:

Gustave Dietetich.

Charles E. Smith

INVENTORS

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Fredrick Marggraff

John Draher

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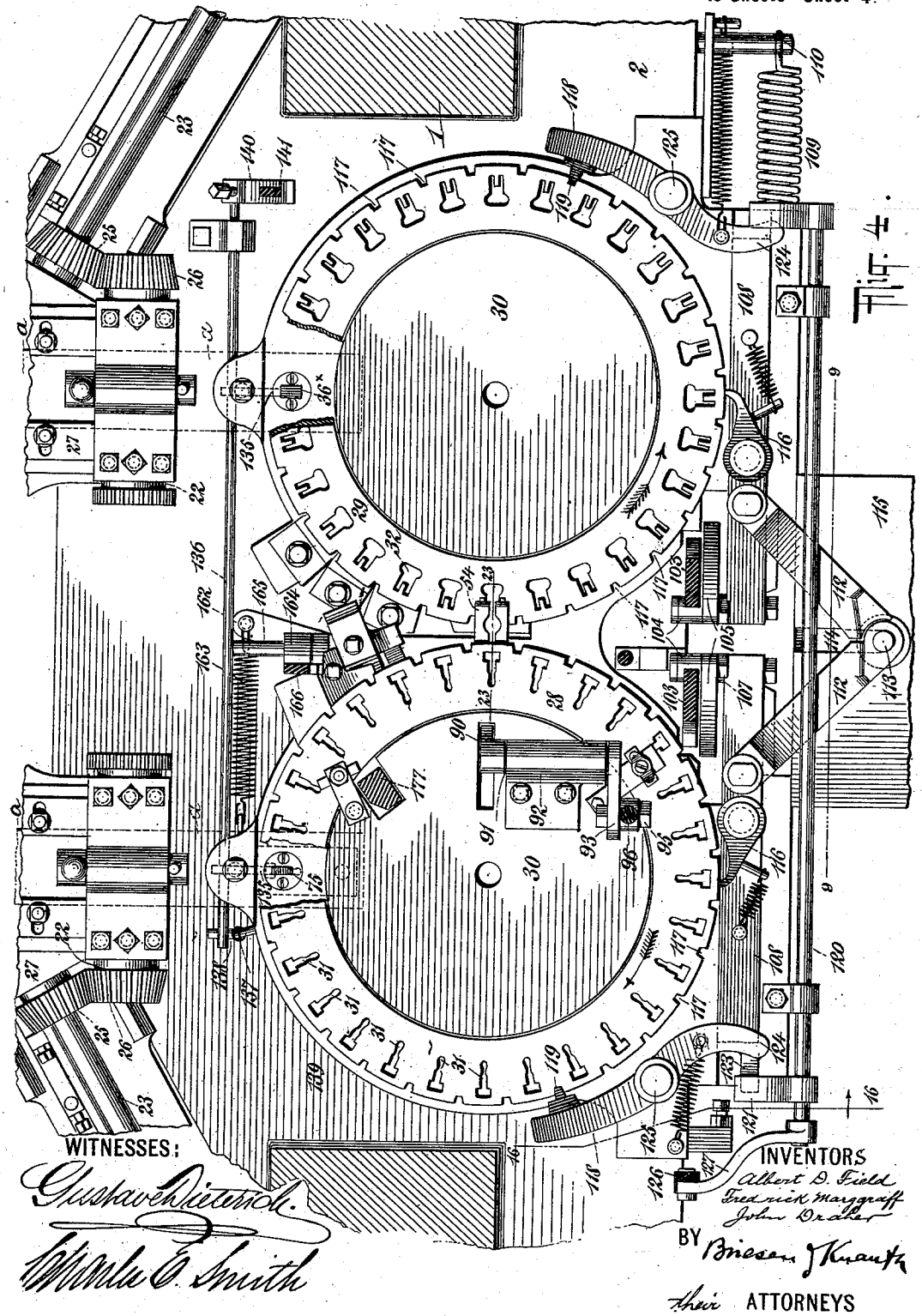

Fig. 4.

WITNESSES:

Gustave Dieterich.

Wm. E. Smith

INVENTORS

Albert D. Field

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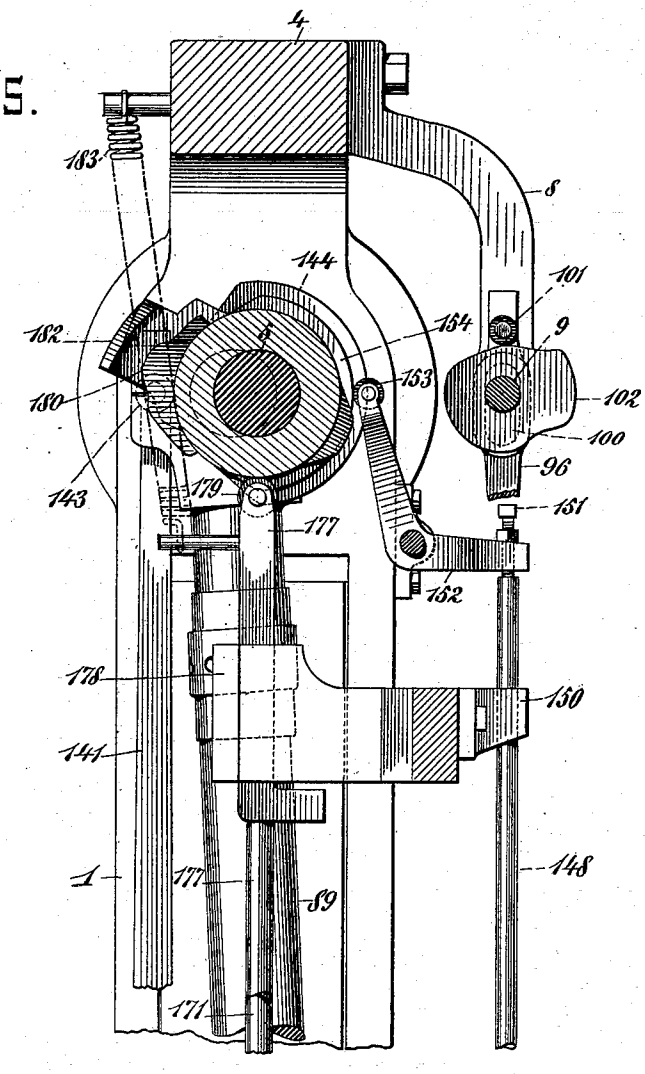
Fig. 5.



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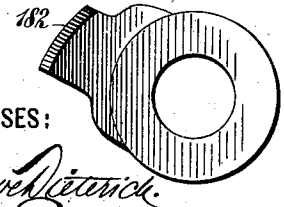

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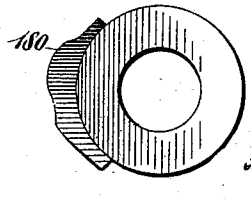

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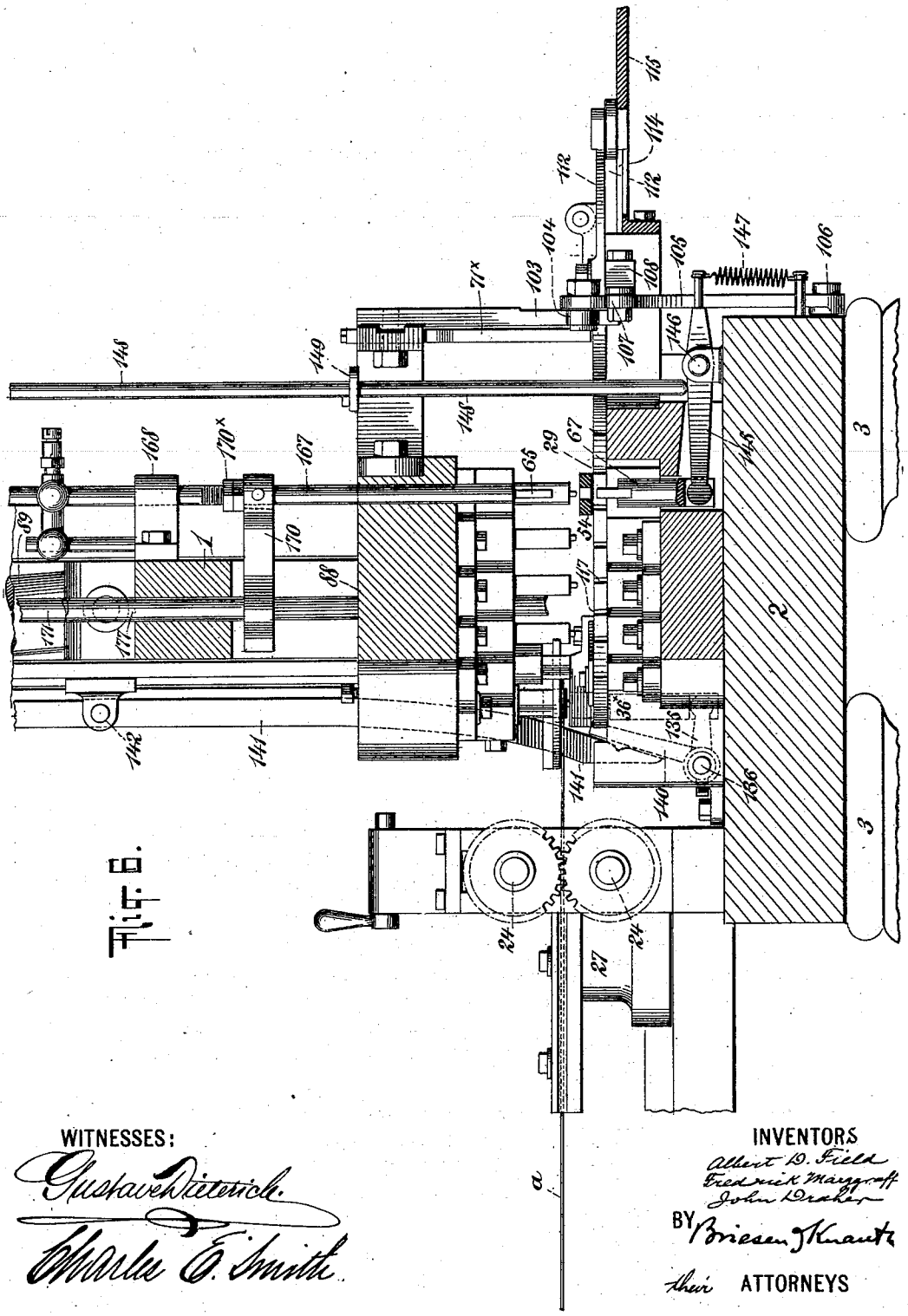

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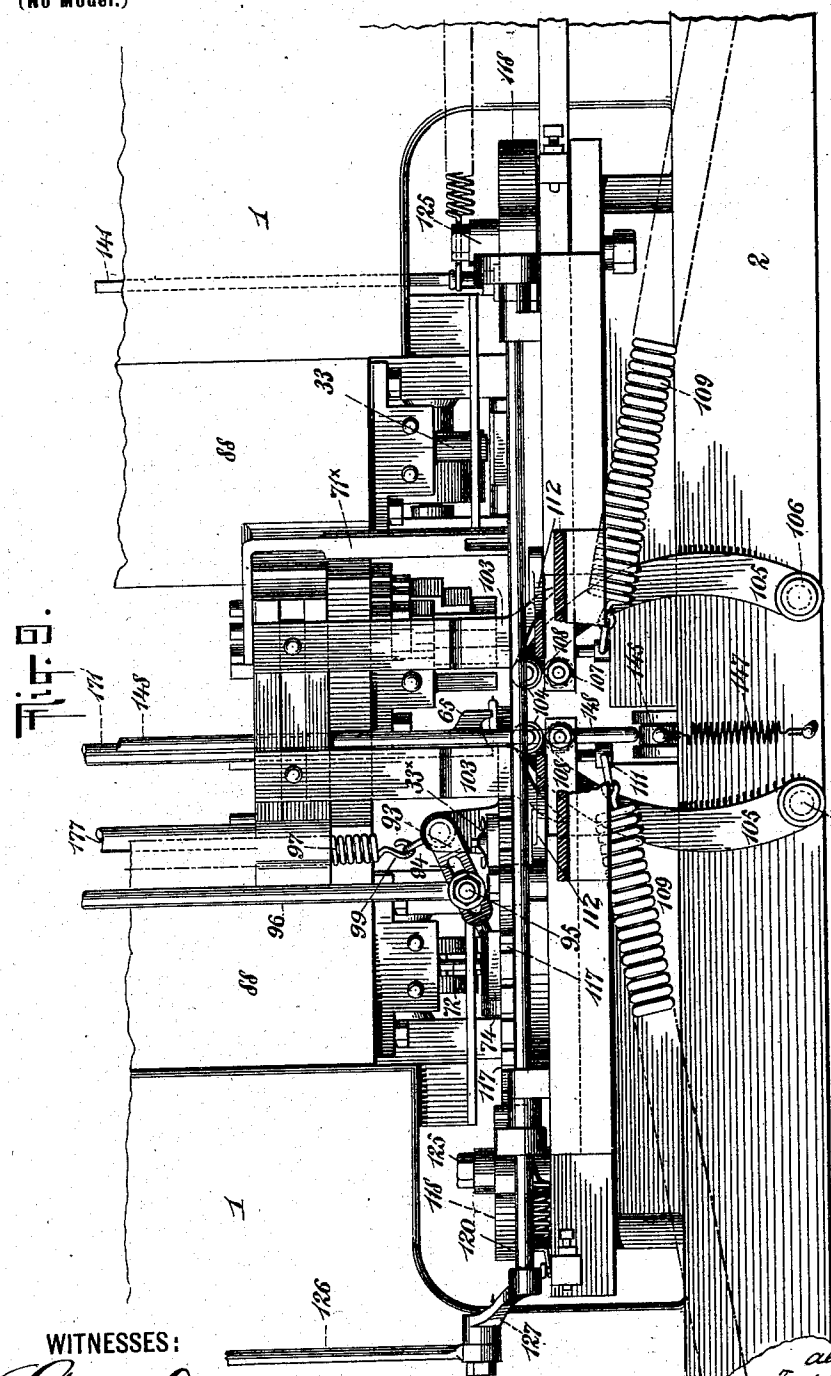

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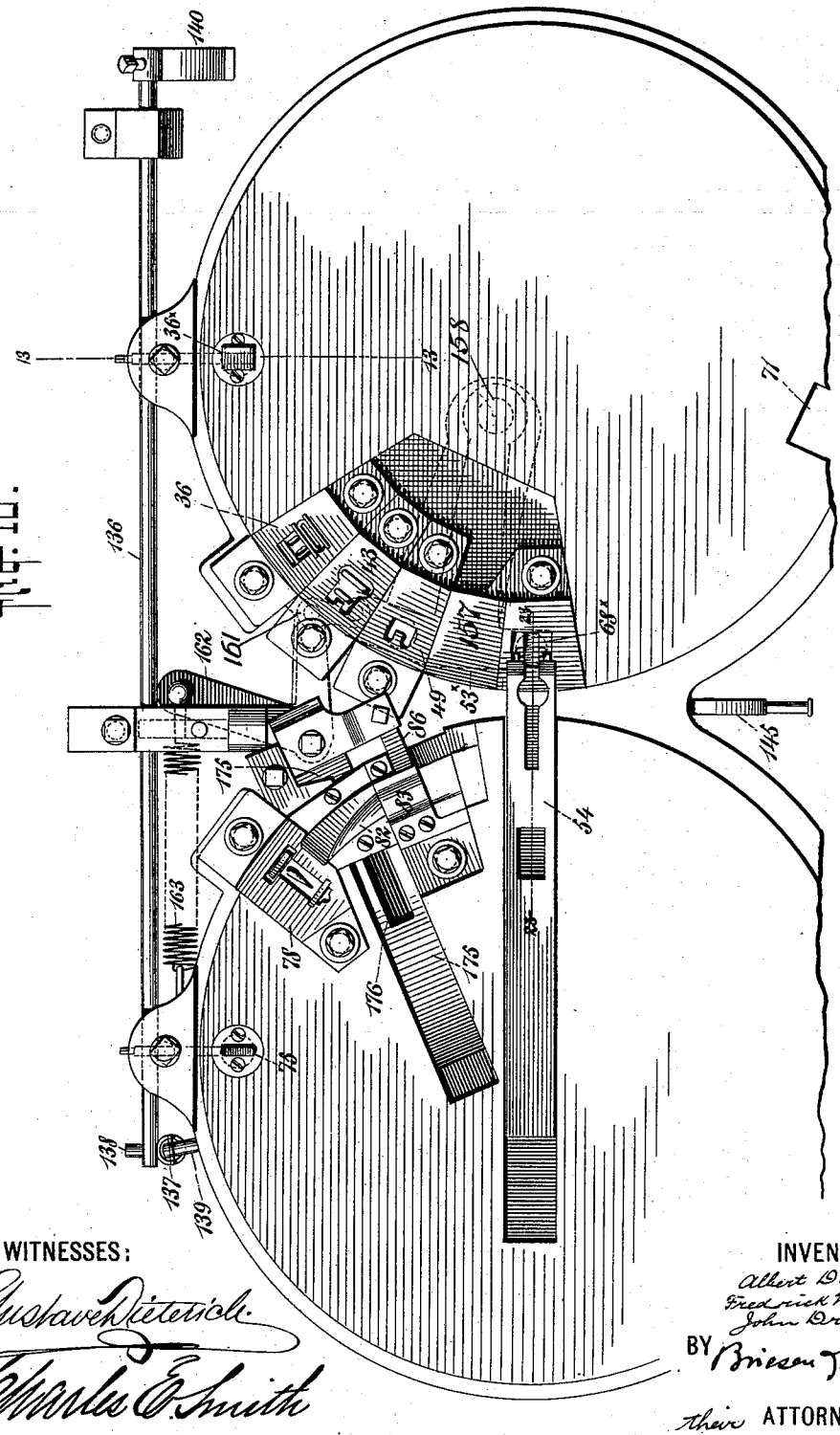
Fig. 10.



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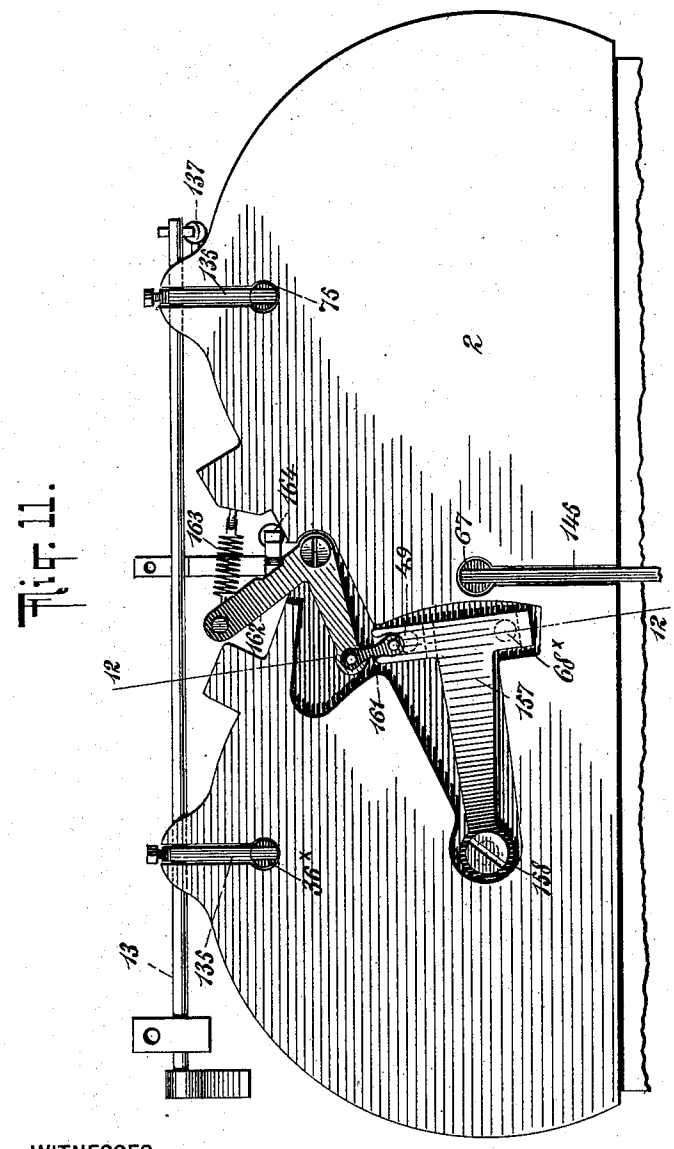

Fig. 11.

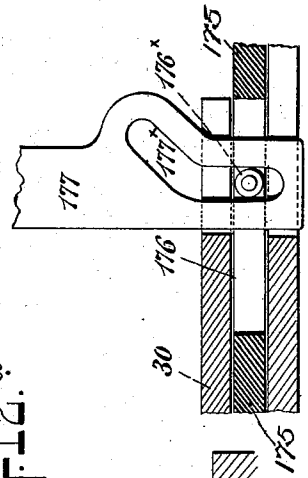

Fig. 12a.

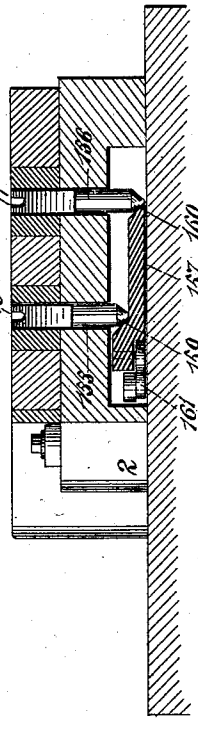

Fig. 12.

WITNESSES:

Gustave Peterich.

Charles E. Smith

INVENTORS

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John Draher

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Fig. 13.

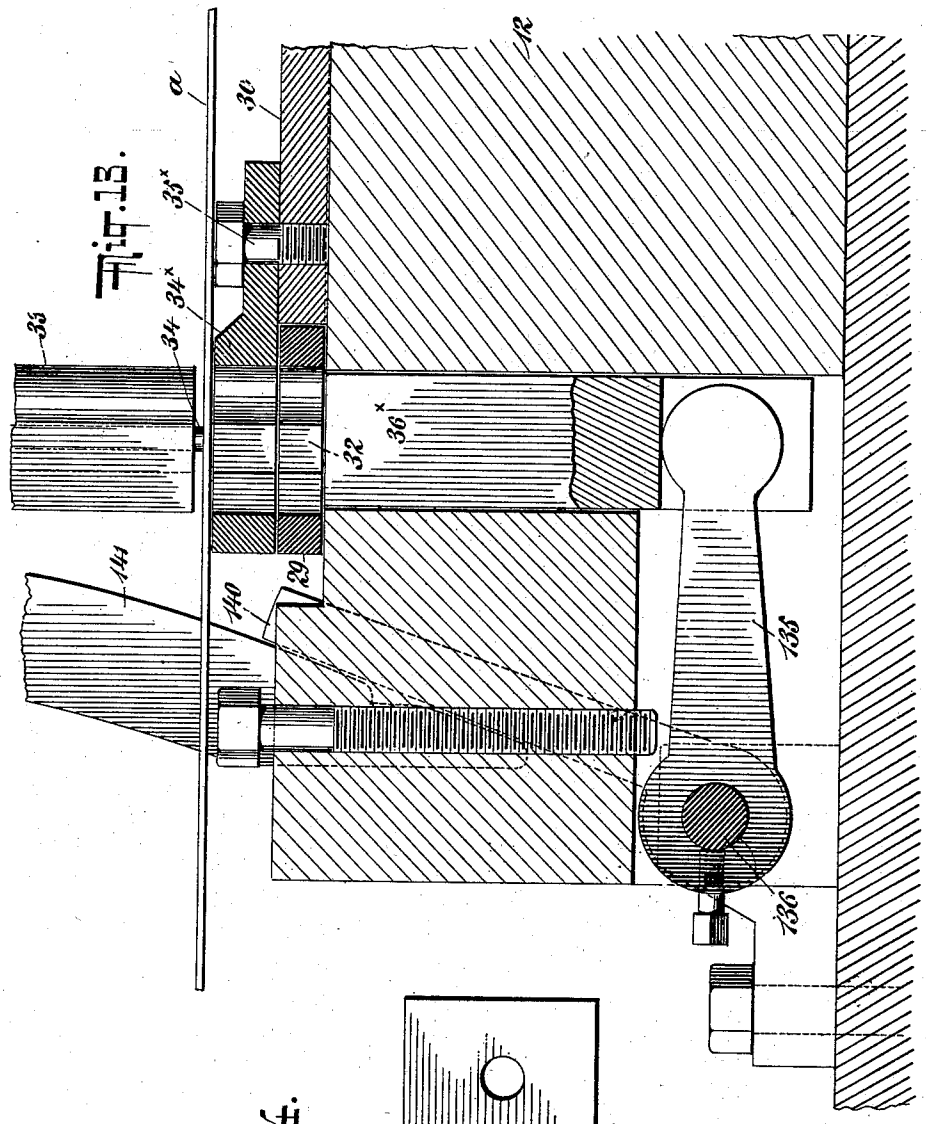

Fig. 14.

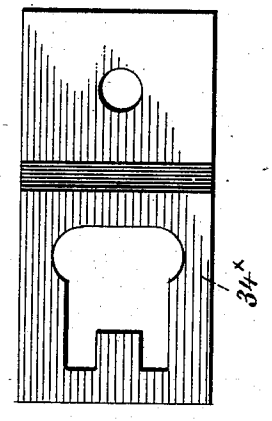

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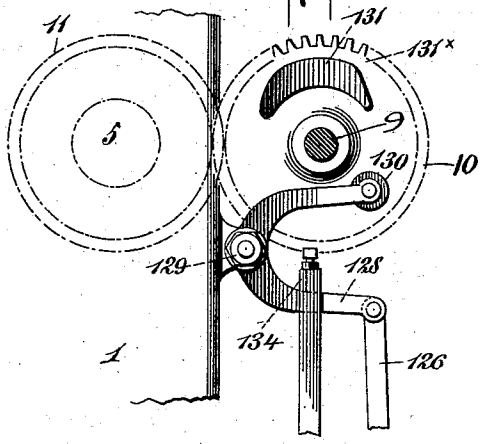
Fig. 15.



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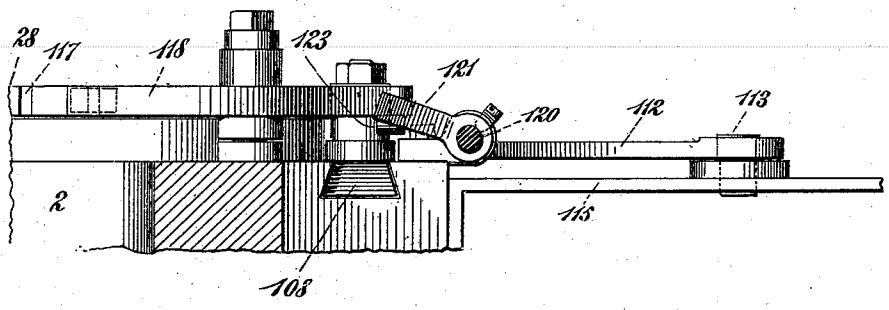

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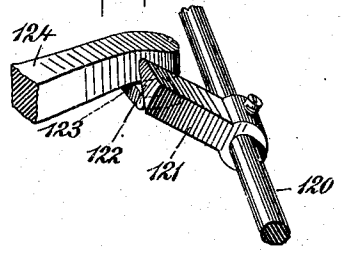

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Fig. 18.

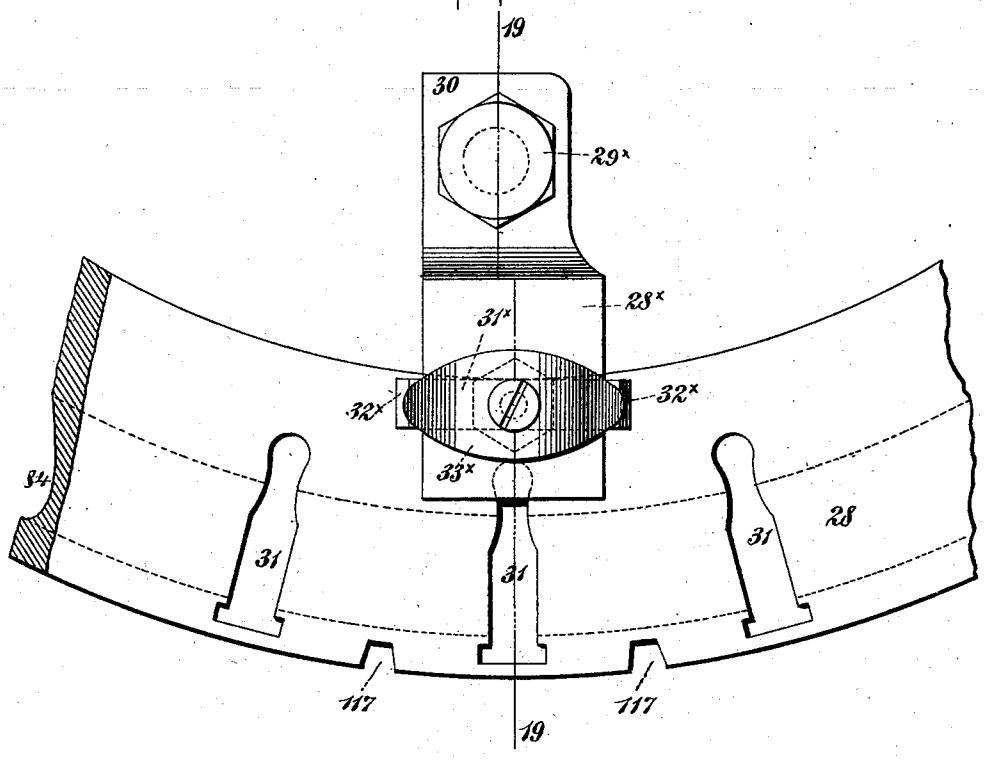
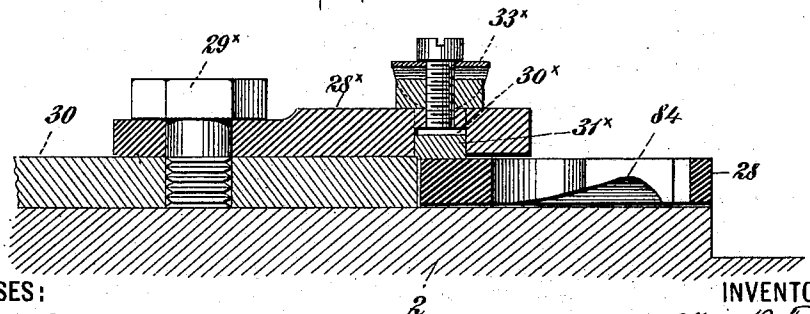


Fig. 19.



WITNESSES:

Gustave Peterich

Charles E. Smith

INVENTORS

Albert D. Field

Frederick Marggraff

John Draher

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Fig. 20.

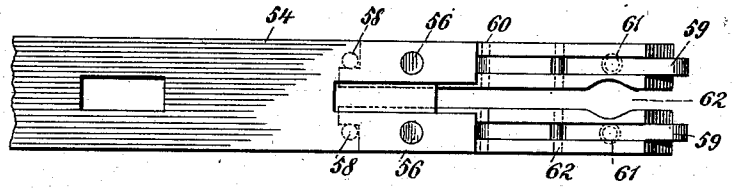
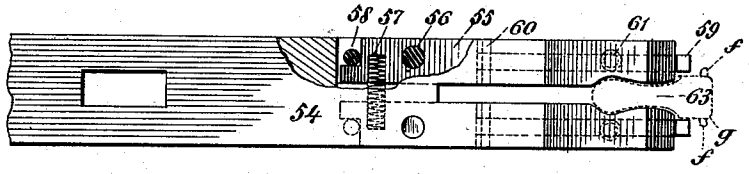


Fig. 21.



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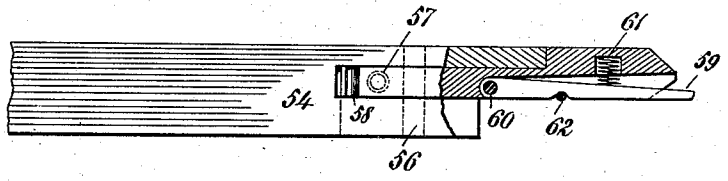

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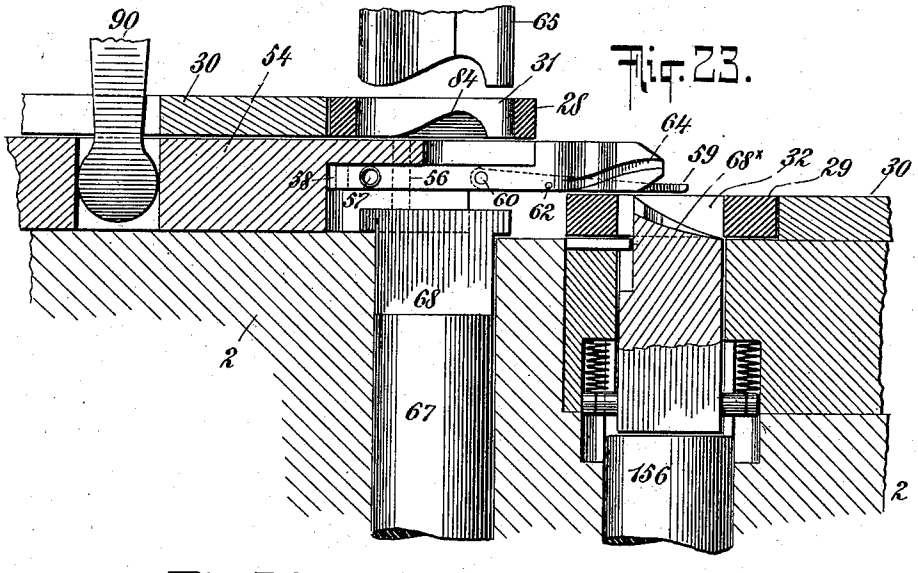

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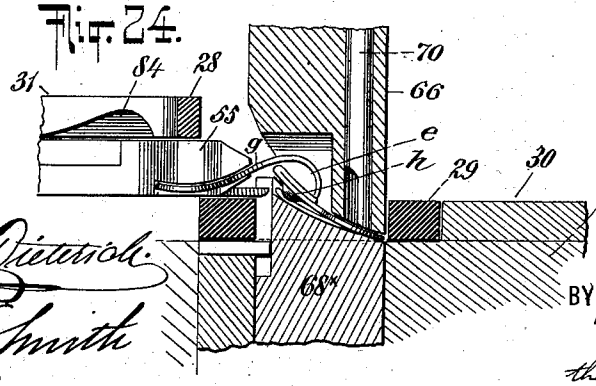

WITNESSES:

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INVENTORS

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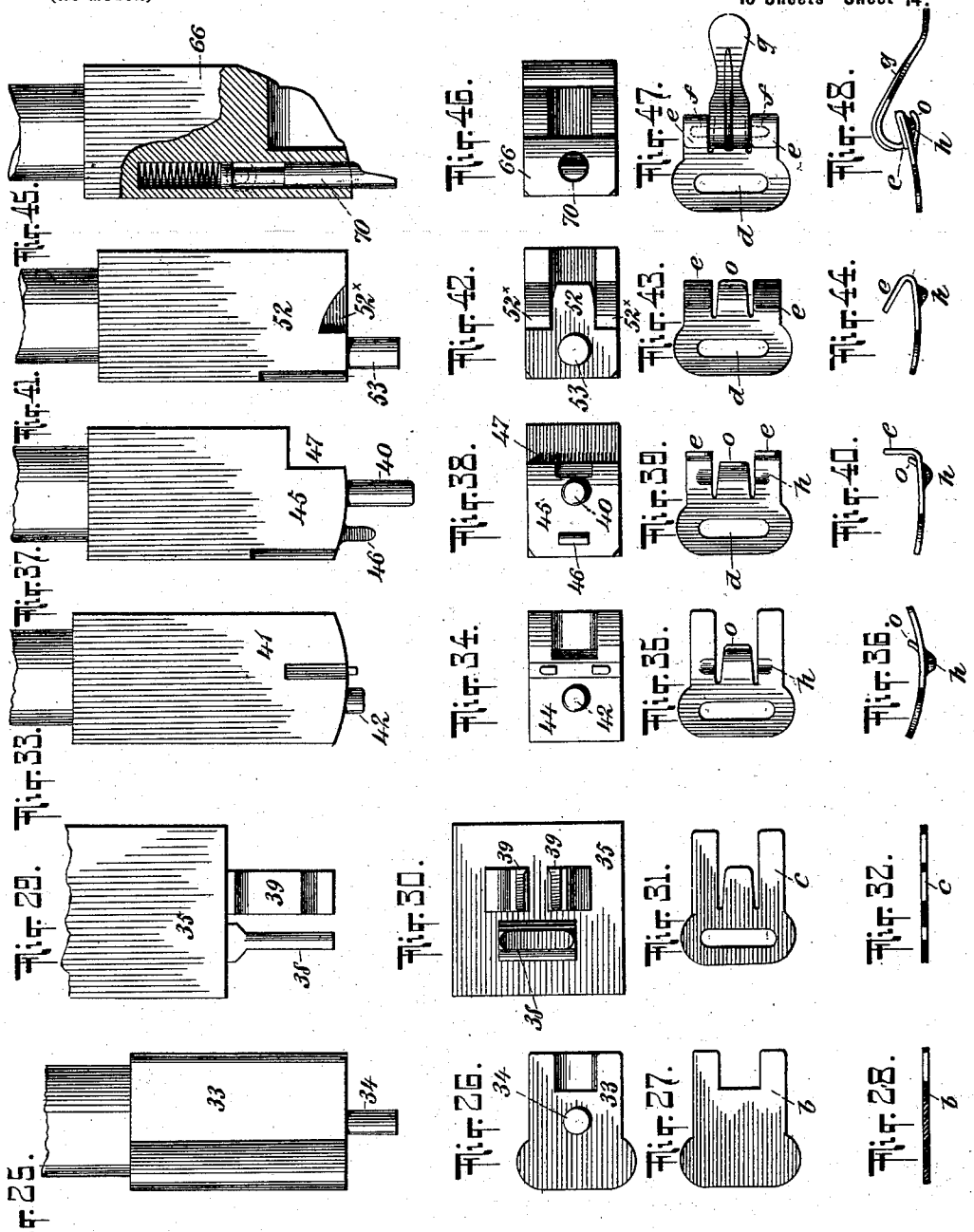

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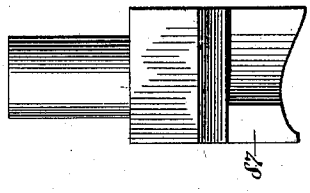
Fig. 61.



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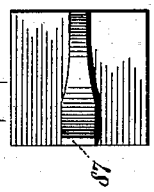

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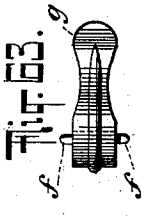
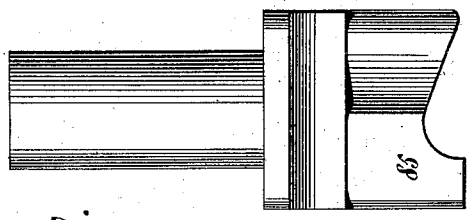


Fig. 64.

Fig. 57.



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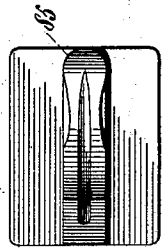

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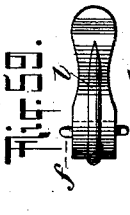
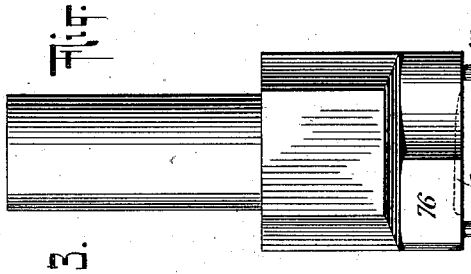


Fig. 60.

Fig. 53.



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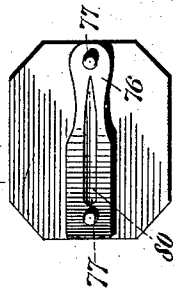


Fig. 55.

Fig. 56.

Fig. 49.

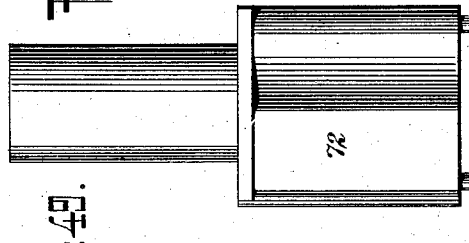
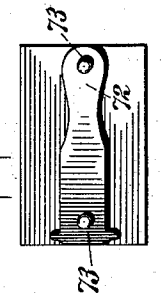


Fig. 50.



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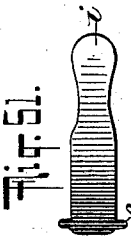

Fig. 52.

WITNESSES:

Gustave Dieterich.

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John Draher

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Fig. 71.

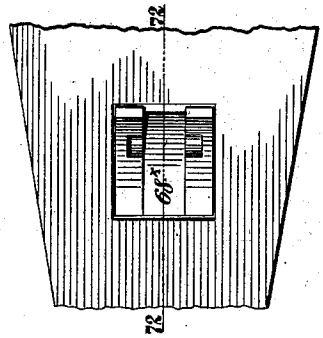


Fig. 72.

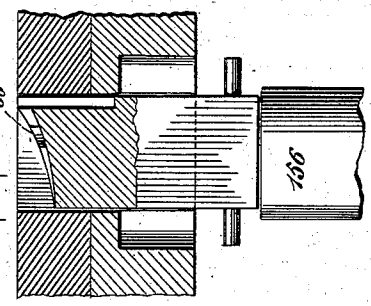


Fig. 69.

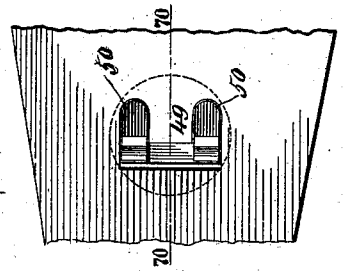


Fig. 70.

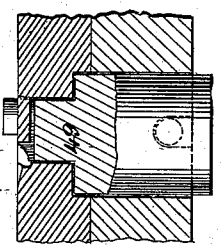


Fig. 74.

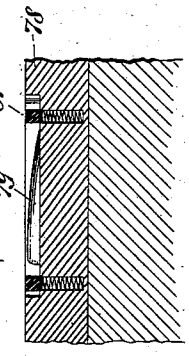


Fig. 67.

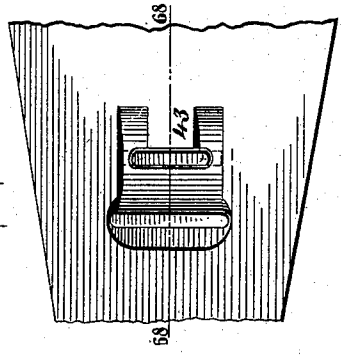


Fig. 68.

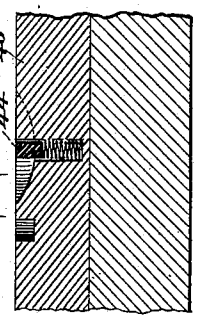


Fig. 73.

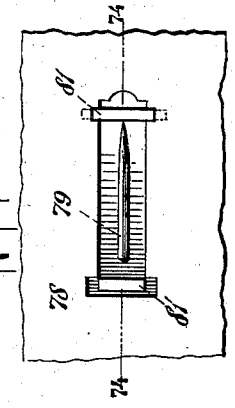


Fig. 65.

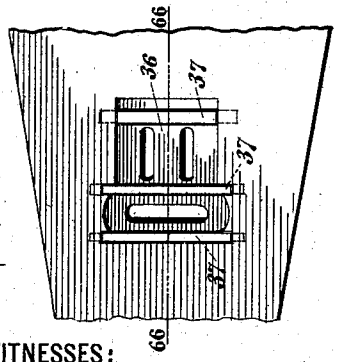
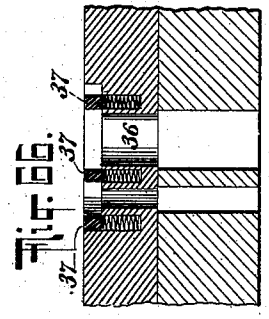


Fig. 66.



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UNITED STATES PATENT OFFICE.

ALBERT D. FIELD, FREDRICK MARGGRAFF, AND JOHN DRAHER, OF WATERBURY, CONNECTICUT, ASSIGNORS, BY DIRECT AND MESNE ASSIGNMENTS, TO THE SHOE HARDWARE COMPANY, OF SAME PLACE.

METAL-WORKING MACHINE.

SPECIFICATION forming part of Letters Patent No. 654,616, dated July 31, 1900.

Application filed February 24, 1899. Serial No. 706,656. (No model.)

To all whom it may concern:

Be it known that we, ALBERT D. FIELD, FREDRICK MARGGRAFF, and JOHN DRAHER, residing at Waterbury, New Haven county, Connecticut, have invented certain new and useful Improvements in Metal-Working Machines, of which the following is a specification.

Our invention relates to metal-working machines generally, and the particular mechanism shown and described is for stamping up sections of shoe-buckles and for uniting the parts—that is to say, sheet metal is automatically fed to the machine and blanks are cut therefrom, the blanks are formed, and the parts assembled and united to produce complete buckles.

The object of the invention is to produce an efficient mechanism of the character described which will produce completed buckles and wherein there is little, if any, liability of the parts becoming broken or disarranged during the operation of the machine.

To these ends our invention consists in the novel arrangement and combination of the parts hereinafter described and claimed.

In the accompanying drawings, wherein like reference characters illustrate corresponding parts in the various views, Figure 1 is a front elevation of a machine embodying our invention. Fig. 2 is an end elevation of the same looking in the direction of the arrow in Fig. 1. Fig. 3 is a horizontal sectional view of the same on the line 3 3 of Fig. 1. Fig. 4 is an enlarged horizontal sectional view of a portion of the apparatus with parts broken away, the view being taken on the line 4 4 of Fig. 1. Fig. 5 is a transverse vertical sectional view of the upper portion of the apparatus, the view being taken on the line 5 5 of Fig. 1, looking in the direction of the arrow in the said last-named figure. Fig. 6 is a transverse vertical sectional view showing a continuation of the parts represented in Fig. 5 and the lower portion of the machine, the said view being taken on the line 5 5 of Fig. 1. Figs. 7 and 8 are detail side views of certain of the operating-cams to be hereinafter described. Fig. 9 is a front elevation of a portion of the machine with parts broken away and omitted for the purpose of clearer illustration, the view being taken through the line 9 9 of Fig. 4. Fig. 10 is a plan view of the bed-plate or those portions of the bed-plate immediately under the dial-plates, the view showing the various dies and the transverse assembling-slide. Fig. 11 is a detail bottom view of the mechanism for operating certain of the dies of the apparatus. Fig. 12 is a transverse sectional view of the same on line 12 12 of Fig. 11. Fig. 12^a is a fragmentary detail sectional view of parts to be hereinafter referred to. Fig. 13 is an enlarged detail sectional view of the blanking punch and die and the mechanism coöperating therewith, the view being taken on the line 13 13 of Fig. 10. Fig. 14 is a detail face view of the blanking-die. Fig. 15 is a detail side view of one of the operating-cams and its coöperating mechanism. Fig. 16 is an enlarged detail transverse sectional view of a portion of the dial-plate-controlling mechanism. Fig. 17 is an enlarged detail perspective view of a portion of the same. Fig. 18 is a fragmentary top view of one of the dial-plates and the clamping mechanism for maintaining the same in position. Fig. 19 is a transverse sectional view of the same on the line 19 19 of Fig. 18. Fig. 20 is an enlarged detail bottom view of the transverse slide. Fig. 21 is a top view of the same with portions broken away. Fig. 22 is a side view of the transverse slide with portions broken away. Fig. 23 is an enlarged detail vertical sectional view of the transverse slide and the closing-die with which said slide coöperates. Fig. 24 is a like view of the same, showing the buckle assembled and the closing punch and die in contact therewith to bring about the closing operation. Fig. 25 is a full-sized detail side view of the blanking-punch for the body-plate of the buckle. Fig. 26 is a full-sized face or end view of the same. Figs. 27 and 28 are face and central longitudinal sectional views, respectively, of the blank made by the punch illustrated in Figs. 25 and 26. Fig. 29 is a full-sized detail side view of the next blanking-punch which operates upon the blank illustrated in Fig. 27. Fig. 30 is a full-sized detail face or end view

of the same. Figs. 31 and 32 are face and longitudinal sectional views, respectively, of the blank made by the punch illustrated in Figs. 29 and 30. Fig. 33 is a full-sized detail side view of one of the forming-punches. Fig. 34 is a full-sized face or end view of the same. Figs. 35 and 36 are face and side views, respectively, of the partly-struck-up blank formed by the punch illustrated in Figs. 33 and 34. Fig. 37 is a full-sized detail side view of the second forming-punch. Fig. 38 is a full-sized face or end view of the same. Figs. 39 and 40 are full-sized face and side views, respectively, of the blank as it is formed by the punch illustrated in Figs. 37 and 38. Fig. 41 is a detail side view of the third forming-punch for the body-plate of the buckle. Fig. 42 is a full-sized end view of the same. Figs. 43 and 44 are face and side views, respectively, of the buckle-body as it is formed by the punch illustrated in Figs. 41 and 42. Fig. 45 is a side view, with portions broken away, of the turning or uniting punch. Fig. 46 is a full-sized end view of the same. Figs. 47 and 48 are bottom and side views, respectively, of the completed buckle. Fig. 49 is a detail side view of the blanking-punch for the tongue of the buckle. Fig. 50 is an end view of the same. Figs. 51 and 52 are face and side views, respectively, of the blank made by the punch illustrated in Fig. 49. Fig. 53 is a side view of one of the forming-punches for the tongue. Fig. 54 is an end view of the same. Figs. 55 and 56 are face and side views, respectively, of the blank for the tongue as it is formed by the punch illustrated in Fig. 53. Fig. 57 is a full-sized side view of the second forming-punch for the tongue. Fig. 58 is an end view of the same. Figs. 59 and 60 are plan and side views, respectively, of the tongue as it is formed by the punch illustrated in Fig. 57 and its coöperating mechanism. Fig. 61 is a full-sized side view of the third of the forming-punches for the tongue. Fig. 62 is an end view of the same. Figs. 63 and 64 are plan and side views, respectively, of the tongue of the buckle as it is formed by the punch illustrated in Fig. 61. Figs. 65, 67, 69, and 71 are plan views of the dies which coöperate with the punches illustrated in Figs. 29, 33, 37, and 45. Figs. 66, 68, 70, and 72 are longitudinal sectional views through said dies, the views being taken on the lines 66 66, 68 68, 70 70, and 72 72, respectively, of Figs. 65, 67, 69, and 71. Fig. 73 is a face view of the die for the tongue which coöperates with the punch illustrated in Figs. 53 and 54. Fig. 74 is a longitudinal sectional view of the same on the line 74 74 of Fig. 73.

Our invention may be said to comprise several sets of mechanism, all of which coöperate to produce a complete buckle. The machine, briefly stated, may be said to comprise mechanism for feeding the metal or other material to be treated to the punches and dies, a separate set of punches and dies for operating upon the body-plate of the buckle, separate sets of punches and dies for operating upon the tongue of the buckle, and mechanism for assembling and uniting the body-plate and tongue after they have been operated upon by the blanking and forming punches and dies. The machine likewise embodies mechanism for successively carrying out these various operations, and in the machine hereinafter shown and described there are five blanks of the body-plates and four blanks of the tongue constantly being treated during the operation of the machine. We will first make general reference to the manner in which these operations are brought about.

Automatically-operated feed mechanism A is provided at each side or end of the machine, which coöperate to feed the metal strips *a* to the blanking punches and dies. One of these automatic feed mechanisms A feeds the material to the punches and dies for forming the tongues of the buckle, whereas the feed mechanism at the opposite end of the machine is employed to feed a metal strip *a* to the punches and dies for forming the body-plates of the buckles. As these parts are progressively operated upon they are conveyed to an automatically-operated assembling-slide, (represented in detail in Figs. 20, 21, 22, 23, and 24 of the drawings,) by means of which they are conveyed to the closing punch and die, and there completed buckles are formed and discharged from the apparatus. The apparatus is automatic in all of its operations and the parts so timed with relation to each other that each mechanism takes up its operation at a predetermined time and completes its operation and the article is conveyed to the next mechanism, and so on until the blanks which are cut from the metal strips *a* are turned out in the form of completed buckles.

Reference being had to the accompanying drawings, 1 represents the main framing of the machine, which is supported upon a bed-plate 2, that is or may be supported by suitable legs 3. The main framing 1 of the machine comprises two upright standards and a cross-piece 4, uniting the same, and in this framing is mounted the main shaft 5, which is connected to a fly-wheel 6, connected with a pulley 7, to which power may be applied by a suitable belt to drive the various portions of the mechanism. Carried by a bracket 8, projecting from the cross-piece 4 of the framing, is a counter-shaft 9, which is provided with a gear-wheel 10, that is adapted to coöperate with a gear-wheel 11, carried upon the main shaft 5 of the machine, and by this means motion is communicated from the main shaft 5 to the counter-shaft 9.

The metal-feed mechanism A, which we are now about to describe, is substantially the same in all its essential details as that shown and described in the patent to Fredrick Marggraff, No. 252,786, dated June 24, 1882, and only a general description thereof and its connection with the punching-machine

will be given, inasmuch as the particular feed mechanism shown constitutes no part of our present invention, and it should be understood that any suitable feed mechanism may be employed. Upon the counter-shaft 9 is carried a head 12, in one face of which is provided a way 13, in which a slide 14 is received. This slide 14 is made adjustable in the head 12 to change the degree of eccentricity of the wrist-pin 15, to which is connected a link 16, that is pivoted to a slide 17. This slide 17 moves in an extension 18, projecting from the framing 1 of the machine, and the lower end of this slide is pivotally connected to the links 19 of the metal-feed A. The purpose of adjusting the wrist-pin 15 in the manner just described is to vary the throw imparted to the links 19 to vary the lateral feed movement imparted to the carriage of the feed mechanism A. Connected with an eccentric 20, projecting from the wrist-pin 15, is a link or rod 21, the lower end of which is adapted to coöperate with the feeding mechanism A to rotate the feed-rollers 22 to feed the strip of metal in a longitudinal direction to the punches. It will be understood that this mechanism is duplicated at each side of the machine and that a strip-feed mechanism A is provided for each set of punches and dies. In describing this mechanism it is sufficient that it shall be understood that the strips *a* shall be fed to the punches in the direction of the lengths of the said strips and that the carriage upon which said strips are supported will receive an intermittent lateral shift to utilize the entire width of the metal operated upon.

In the particular feed mechanism shown the parts are rendered adjustable, so that any width of material can be employed and any desired extent of lateral and longitudinal feed may be given to the material. The parts having been properly set to the material to be operated upon, a rotation of the main shaft will cause the connecting-rods 21 to be moved to operate the feed-rollers. This movement of the rods or links will transmit motion to the shafts 23, which will cause the feed-rollers 22, carried upon the shafts 24, to be rotated through the bevel-gear connections 25 26. The rotation thus transmitted to the feed-rollers will cause them to feed the strips of material *a* between them in a longitudiual direction. When the slide 17 is operated, it transmits motion to a pinion which engages a rack $26^{\times}$ for intermittently transmitting a lateral motion to the carriages 27, which carry the feed-rollers, and thus give an intermittent lateral feed to the material to be operated upon.

In the particular mechanism shown and described two "feed" or "dial" plates 28 29, as we term them, are employed. One of these dial-plates 28 coöperates with the punches and dies for the production of the tongues of the buckles, whereas the dial-plate 29 cooperates with the punches and dies for the production of the body-plates of the buckles. These dial-plates are each formed in the nature of a ring, which is adapted to rotate around a central disk-like projection 30, formed on the bed-plate of the machine. Each of these dial-plates 28 29 is provided with a series of openings or apertures 31 32, respectively, which conform in outline to the outline of the blanks to be carried thereby. Thus, for instance, each of the apertures 31 in the dial-plate 28 has the outline of the blank of the tongue as it is first cut from the material, whereas each of the apertures 32 in the dial-plate 29 conforms in outline to the blank of the body-plate of the buckle as it is first punched from the metal. The dial-plates are maintained in place by suitable means—such, for instance, as those represented in detail in Figs. 18 and 19, wherein a bracket $28^{\times}$ is provided, which is secured to the disk-like portion 30 by a screw $29^{\times}$ and projects over a dial-plate. Vertically movable in a recess $30^{\times}$ in the bracket $28^{\times}$ is a block $31^{\times}$, which is provided with an upwardly-projecting flange $32^{\times}$ on each end thereof and is adapted to bear upon a dial-plate, as represented in Fig. 19. A leaf-spring $33^{\times}$ is adjustably secured to the bracket $28^{\times}$, and the free ends of this spring are adapted to bear upon the flanges $32^{\times}$ of the block $31^{\times}$ and maintain a spring-pressure thereon to retain the dial-plate in place. By referring to Fig. 10 of the drawings, in which the dial-plates have been removed, it will be observed that the base of the bed-plate on which these dial-plates 28 and 29 revolve is differently formed at the different points in their extent. Thus, for instance, a considerable portion of each of the bed-plates where the dial-plates revolve is made flush, so that a blank stamped into one of the apertures in one of the dial-plates will be conveyed by the dial-plate over the flush or flat portions of the bed-plate referred to. However, at different points in the bed-plate where the dial-plates revolve, and which we will hereinafter refer to as the "trackways" of the dial-plates, are located dies which cooperate with the punches, to be hereinafter referred to, for the production of the blanks contained in the pockets or apertures in said dial-plates.

We will now proceed to describe the operation of each of the punches and the mechanism coöperating therewith to punch and stamp up the different portions which go to form the buckle. It should be understood that several sets of punches and coöperating dies are employed for each part of the buckle and that each punch and its coöperating die perform a portion of the operation, and the part is then transferred to the next punch and its coöperating die, and so on until the parts are brought into the position to be united. We will first describe the punches and dies of the body-plate of the buckle with which the dial-plate 29 coöperates. Thus the metal is fed to the first punch 33, which punch is repre-

sented in detail in Figs. 25 and 26 of the drawings. At the portion of the machine where this punch 33 is mounted a fixed cutting-die $34^{\times}$, which is clearly shown in Figs. 13 and 14 of the drawings, is secured, as indicated at $35^{\times}$, to the central disk-like plate 30. This die $34^{\times}$ extends over the dial-plate 29, and the aperture therein corresponds to the pockets or apertures 32 in the dial-plate which are adapted to register therewith. Coöperating with the punch 33 is a follower $36^{\times}$, which is automatically operated to act as follows: As the punch 33 descends to cut the blank the follower will be elevated by means to be hereinafter described and passing through an aperture in the dial-plate will bear upon the under side of the metal strip *a*. After the punch cuts the blank the follower will recede as the punch descends and the punch and follower will maintain the blank between them until the follower attains the position represented in Fig. 13, where the face of the follower is flush with the trackway. The punch will then recede, and when the dial-plate is next moved the blank will be carried to the next punch. In order to maintain a constant pressure on the blank while it is being acted upon by the punch, so as to maintain it properly centered in the pocket in the dial-plate, we provide the punch 33 with a spring-pressed finger 34, which projects from the face of the punch and contacts with the metal strip from which the blank is to be cut before the punch reaches contact with the metal. This spring-pressed pin 34 may be arranged in any suitable manner—such, for instance, as that represented in Fig. 45 of the drawings, wherein the parts are broken away to indicate the manner of mounting a corresponding pin in one of the other punches. After the punch has been withdrawn from the die and the pocket in the dial-plate 29 the said dial-plate is automatically given a partial rotation to convey said pocket in which the cut blank is contained to the next succeeding punch 35, which is represented in detail in Figs. 29 and 30 of the drawings. When the dial-plate conveys the blank *b* to the punch 35, the said blank is brought over a die 36 in the trackway of the dial-plate. This die 36 is represented in detail in Figs. 65 and 66 of the drawings and is preferably provided with spring-pressed plungers 37, which are normally maintained flush with the trackway of the dial-plate, as indicated in Fig. 66, so that after the cut has been made the blank will be in a position to be moved by the dial-plate over the trackway. When the dial-plate is stopped and the punch 35 is brought to bear upon the blank, the cutters 38 and 39 on said punch penetrate the metal of the blank and produce such a blank as is indicated at *c* in Figs. 31 and 32 of the drawings. When the punch retracts, the dial-plate 29 is again automatically moved to a point where the blank *c* is conveyed to the next punch, which is a forming-punch and is indicated in detail at 41 in Figs. 33 and 34 of the drawings. This punch is provided with a spring-pressed finger 42, similar to that described in connection with the punch 33. This finger is brought to bear upon the blank before the punch bears thereon in order to maintain the blank properly centered in the die. When the blank *c* has been brought by the dial-plate to the punch 41 in the manner described, it is conveyed to a die 43, contained in the trackway of the dial-plate. This die 43 is illustrated in detail in Figs. 67 and 68 of the drawings and is provided with a spring-pressed plunger 44, which is normally maintained flush with the trackway of the dial-plate, as indicated in Fig. 68, in order to force the blank out of the die after the punch has receded therefrom. It will be understood that as the spring-pressed plunger 44 forces the blank from the die after the punch has receded therefrom it will convey said blank into the pocket in the dial-plate, thus allowing the dial-plate to convey the blank to the next succeeding plunger. After the blank has been treated by the punch 41 and its coöperating die in the manner described it is automatically conveyed by the dial-plate 29 to the next succeeding punch 45, which is illustrated in detail in Figs. 37 and 38 of the drawings. This die is provided with a teat 46, which is adapted to project through the aperture *d*, contained in the blank, when the punch reaches contact therewith in order to maintain the blank properly positioned in the die when the blank is operated upon. We likewise provide this punch with a spring-pressed finger 40 to bear upon the blank, as has been hereinbefore described, and with a cut-away portion, as indicated at 47. This punch 45 and its coöperating die, which is represented at 49 in Figs. 69 and 70 of the drawings, converts the blank represented in Figs. 35 and 36 of the drawings into the form represented in Figs. 39 and 40, wherein it will be observed that the projecting arms *e* of the blank are struck up at substantially right angles to the plane of the body portion of the blank. This bending up of the arms *e* of the blank is accomplished by the movable blocks 50 in the die 49. When the blank shown in Figs. 35 and 36 is brought by the dial-plate to the die 49, the blocks 50 will be elevated to cause the arms *e* of the blank to be bent against the vertical face of the punch 45, formed at the cut-away portion 47 thereof. The means for operating the blocks 50 in the die 49 will be hereinafter referred to. Upon reference to Fig. 69 of the drawings it will be observed that the die is of such shape that a considerable portion of the blank will rest upon what constitutes a portion of the trackway of the dial-plate, so that as said dial-plate is moved the blank contained in the pocket thereof over the die 49 will be moved with it. After the blank has been treated by the punch and die 45 and 49, respectively, in the manner described it is conveyed by the dial-plate to the next succeeding

punch 52, which is represented in Figs. 41 and 42 of the drawings, and this punch coöperates with a flat or flush portion of the trackway of the dial-plate, as indicated at $53^{\times}$ in Fig. 10 of the drawings. The object of this punch is merely to bend the arms or projections *e* of the blank into the position represented in Figs. 43 and 44 of the drawings, wherein it will be observed that the said arms are bent from the right-angle position represented in Figs. 39 and 40 to the acute-angle position represented in Figs. 43 and 44 of the drawings, so as to form hook-like portions of said arms. For this purpose the indentations $52^{\times}$ are provided in the punch 52, and the punch is likewise provided with a spring-pressed finger 53, like those hereinbefore described, to bear upon and maintain the blank properly positioned in the pocket in which it is contained in the dial-plate. This last punch completes the formation of the body-plate of the buckle, and it is next conveyed into a position where it is brought into alinement with what we term the "closing" punch and die, which are represented in detail in Figs. 23 and 24 of the drawings. Before this closing-punch 66 operates upon the blank the assembling of the body-plate and tongue is brought about by conveying the tongue from its dial-plate 28 by suitable transfer mechanism into the path of the closing punch and die. In the present instance this transfer mechanism comprises a horizontally-operating slide 54, which is automatically operated in a manner to be hereinafter explained. This slide 54 is shown in Figs. 20 to 24 of the drawings, and said slide is provided with spring-pressed jaws 55, which are pivoted, as indicated at 56, and are normally maintained in the position indicated in Figs. 20, 21, and 22 by a spring 57, the studs 58 limiting the movement of the arms around their pivots 56. These spring-pressed arms 55 are provided with auxiliary spring-pressed arms 59, which are pivoted at right angles to the pivots of the arms 55, as indicated at 60. The springs 61 of these arms normally maintain the auxiliary arms 59 in the position represented in Fig. 22 of the drawings, and the pins 62 limit the downward motion of said arms. As represented in Figs. 20 and 21 of the drawings, the arms 55 are so mounted as to provide a buckle-body-receiving space 63 between them, and the inner faces of said arms are grooved, as indicated at 64 in Fig. 23 of the drawings, to receive the tongue of the buckle. After the tongue of the buckle has received the form shown in Figs. 63 and 64 of the drawings in a manner to be hereinafter described it is conveyed by the dial-plate 28 into the path of what we term an "assembling-plunger" 65, (see Fig. 23,) the purpose of which is merely to transfer the formed tongue-blank from the dial-plate 28 to the spring-jaws 55 of the transfer-slide 54, to be conveyed thereby into the path of the turning or uniting punch 66. Coöperating with the assembling-plunger 65 is a follower 67, adapted to be automatically operated by means to be hereinafter described. This follower 67 is reduced at the upper end, as indicated at 68, so that it may pass into the elongated aperture between the arms 55 of the slide 54. The operation of the plunger 65 and its coöperating follower is as follows: As the dial-plate 28 revolves it conveys a buckle-tongue stamped up into the form represented in Figs. 63 and 64 of the drawings to a point where the aperture 31, which contains said blank, is brought into register with the plunger 65 and its follower 67. At this time the slide 54 will have been moved to a position where the aperture 63 therein is directly under the tongue. The follower 67 now ascends until the face thereof is flush with the trackway of the dial-plate 28. The plunger 65 now descends and forces the buckle-tongue blank between the spring-pressed jaws 55 of the slide 54, thereby separating said jaws and allowing the blank to rest in the grooves 64 in said jaws. During the descent of the plunger 65 just described the follower 67 descended therewith and the two maintained the blank properly positioned between them. After the tongue-blank has been delivered to spring-pressed jaws in the manner described the plunger and follower will recede to their original positions. The slide 54 will then be moved in a horizontal direction into substantially the position represented in Fig. 23 of the drawings. Before this movement has been imparted to the slide a body-plate blank of the form shown in Fig. 44 will have been conveyed by the dial-plate to the closing-die $68^{\times}$, and when the slide moves forward the spring-pressed arms or fingers 59 will bear upon said blank and maintain it properly positioned in the die. When the parts are in this position, the hook-like portions of the tongue and the body-plate extend in opposite directions and are so positioned with relation to each other that a movement of the parts toward each other will allow the hooks to clear each other. This being the case, an upward movement of the die $86^{\times}$ with the body-plate will cause the hook-like portions on the two parts to be in substantially the same plane. A slight retrograde movement is now imparted to the slide 54, thereby bringing the pivots *f* on the tongue *g* into the pockets *h* (see Figs. 24, 39, and 44) of the body-plate. The parts being maintained in this position, the closing-punch 66 will descend and close the arms *e* of the body-plate (see Figs. 43 and 44) down over the pockets, so as to secure the pivots *f* of the tongue therein, as represented in Figs. 24, 47, and 48 of the drawings, when a complete buckle is formed. The spring-pressed pin 70 bears upon the body-plate during this operation, and before the punch 66 recedes from the buckle the slide further withdraws from the position indicated in Fig. 24, thus freeing itself from the tongue. The complete buckle is then conveyed by the dial-plate 29 to an opening 71 (see Fig. 10) in the bed-plate,

through which it is dropped into a suitable receptacle, and a plunger $71^{\times}$ (see Figs. 1, 6, and 9) passes through a pocket of the dial 29 and into the opening 71 at each operation of the punches to assure the discharge of the completed buckle.

We will now proceed to describe the dial-plate 28 and the punches and dies which coöperate therewith to blank and form the tongues of the buckles. These punches are represented in detail, together with the blanks which are formed thereby, in Figs. 49 to 64 of the drawings. The first of these series of punches, which we term the "blanking-punch," is indicated at 72 in Figs. 49 and 50 of the drawings. This punch is provided with spring-pressed fingers 73, similar to those hereinbefore described and which bear upon the blank to maintain it properly positioned in the pocket in the dial-plate in which said blank is contained. This punch coöperates with a fixed die 74, (see Fig. 9,) similar to that employed for the dial-plate 29, and a blank such as is represented in Figs. 51 and 52 of the drawings is produced. Coöperating with the blanking-punch 72 is a follower 75, (see Figs. 4 and 10,) similar to and operated in unison with the follower $36^{\times}$ for the blanking-punch of the body-plate. This blank *i* having been punched in the manner described is conveyed by the dial-plate to the next succeeding punch 76, which is represented in Figs. 53 and 54 of the drawings. This punch, like some of the others described, is provided with spring-pressed fingers 77, which bear upon and maintain the blank properly positioned in a pocket 31 of the dial-plate 28. The die which coöperates with this punch is represented at 78 in Figs. 73 and 74 of the drawings, wherein it will be seen that a central projection 79 is provided which conforms to the aperture 80 in the punch 76. The purpose of this projection and its corresponding indentation is to form a longitudinal ridge *j* along the tongue, as represented in the blank *k*. (Shown in Figs. 55 and 56 of the drawings.) The die 78 is provided with spring-pressed plungers 81, which operate to convey the blank after treatment to a position flush with the trackway of the dial-plate, so that a further movement or partial revolution of the dial-plate will convey the blank to the next succeeding punch for treatment. By referring to Fig. 10 of the drawings it will be observed that a cam-like projection 82 is provided, which cam-like projection commences flush with the trackway of the dial-plate 28 and gradually increases in height and proportion until it is approximately of the form of the die 83. (Represented in Fig. 10 of the drawings.) In order to allow the dial-plate 28 to pass this fixed cam-like projection and the die 83 adjacent thereto, the under face of the dial-plate is recessed around its entire extent, as is indicated at 84 in Figs. 18 and 19 of the drawings, to conform to the die 83. As the dial-plate 28 is next moved to convey the blank *k* to the next punch 85 (represented in Figs. 57 and 58 of the drawings) the blank is moved up along the cam-like projection 82 and is finally brought to a position where it is placed upon the die 83, hereinbefore referred to, and against which the punch 85 operates to give the curve to the blank *l*, as indicated in Figs. 59 and 60 of the drawings. The turning in of the end *m* of this blank *l* is accomplished by means of an automatically-operated laterally-moving slide carrying a turning-punch 86, which bears against this end *m* of the blank after it has been turned down by the punch 85—that is to say, after the punch 85 turns down the end *m* of the blank the turning-punch 86 will be brought to bear upon the end *m* of the blank which projects below the die 83 and into the path of the punch 86, which is adapted to turn it in, as indicated in Figs. 59 and 60 of the drawings. After the blank *l* of the tongue has been operated upon in the manner described an intermittent movement is given to the dial-plate 28, which causes the aperture in which the blank *l* is contained to be brought to the next succeeding punch 87, which is represented in Figs. 61 and 62 of the drawings. A depression of the punch 87 upon the blank *l* results in the formation of the blank *g*, (represented in Figs. 63 and 64 of the drawings,) wherein the end *m* is given an upward bend. The next movement of the dial-plate 28 conveys the blank *g* to a position where it is brought into the path of the horizontally-moving slide 54 and is transferred to the spring-pressed jaws of said slide by the plunger 65 in the manner hereinbefore described. The said slide is then automatically moved in the direction of its length toward the blank of the body-plate contained in the dial-plate 29, and the parts are assembled and united in the manner before referred to. It will be seen that the pivots *f* of the tongue in the completed buckle are surrounded on all sides and that it is securely united to the body-plate in such a manner that it can be swung on its pivots. The central projection *o* (see Figs. 35, 39, and 43 of the drawings) of the body-plate constitutes a spring which is adapted to bear upon the end *m* of the tongue (see Fig. 64) and exerts a tension to maintain the tongue of the buckle in either the open position (represented in Fig. 48 of the drawings) or in the locked position, which is the reverse of what is shown in Figs. 47 and 48 of the drawings. When the buckle is in the locked position, the free end of the tongue projects in the same direction from the pivot as the body-plate of the buckle.

We have described the various punches and dies and the dial-plates which coöperate therewith, the transfer or assembling mechanism, and the mechanism for uniting the parts to form the complete buckle. We will now proceed to describe the various mechanisms by which the individual parts are operated.

As hereinbefore stated, the shaft 5 is the main shaft of the machine, to which motion

is communicated by the pulley 7, the stock or material feed mechanism A being automatically operated in the manner described to feed the stock *a* to the blanking-punch of each dial-plate. These blanking-punches, together with all the rest of the punches and the plunger $71^{\times}$, are carried by a reciprocating cross-head or gate 88, which is connected to pitman-rods 89, which are combined with suitable eccentrics carried upon the main shaft 5 of the machine, so as to cause a reciprocating movement to be given to the gate. This gate 88 is adapted to slide in suitable ways formed in the upright sides of the framing 1 of the machine, and at each movement of the gate all of the punches are moved with it. As the punches are operated in the manner described the various blanking, forming, and turning operations take place in the manner hereinbefore described. In order to operate the transverse assembling-slide 54, we provide an arm 90, (see Figs. 4 and 23,) which is mounted upon a rock-shaft 91, moving in a sleeve 92, fixed to the central plate 30 of the dial-plate 28. The opposite end of the rock-shaft 91 is connected to a crank-arm 93, which is provided with a slot or slideway 94, as represented in Fig. 1 of the drawings, in which an adjustable pivot 95 may be secured in order to regulate the throw or extent of movement imparted to the slide 54. Connected to this pivot 95 is a link or rod 96, which tends to normally maintain the slide 54 in one position through the action of the spring 97. This spring 97 is secured to the link or rod 96 at one end, as indicated at 98, and the opposite end of this spring is secured to a fixed portion of the machine, as indicated at 99. The upper end of the link or rod 96 (see Fig. 5) is slotted, as indicated at 100, and through this slot projects the auxiliary shaft 9. The upper end of the rod 96 carries an antifriction-roller 101, which is adapted to bear upon the cam 102 on the auxiliary shaft 9. It will thus be observed that the parts which operate the slide 54 are positively moved to the initial position and are spring-pressed in the direction of feed, so that should by any accident a blank become wedged to prevent the slide from moving no injury can result to the machine and the rod 96 will merely be retained elevated, so that the roller 101 thereon will be maintained at the highest portion of the cam 102.

The mechanism for intermittently rotating the dial-plates is best represented in Figs. 1, 4, 6, and 9 of the drawings and comprises operating-cams 103, carried by the gate 88. Each of these cams 103 is adapted to bear upon an antifriction-roller 104, carried by a link 105, which is pivoted to the bed-plate 2, as indicated at 106. Each of these links bears upon an antifriction-roller 107, (see Fig. 6,) carried by a horizontally-movable slide 108, so as to transmit a positive movement thereto in one direction. These slides 108 operate in suitable ways carried by the framing of the machine, and each of the springs 109 exerts a force to move one of the slides in an opposite direction from that in which it is moved by its link 105. These springs are each secured at one end to a fixed portion of the framing, as indicated at 110, and at the opposite end to a slide 108, as indicated at 111. Each of the slides 108 is pivoted to a link 112, which links are pivoted together to form a knuckle-joint, as indicated at 113, and this pivot 113 extends into a slot 114 in an extension 115 of the framing of the machine. By means of the links 112, operating in the manner described, the dial-plates will be compelled to work in unison or both will be locked against movement. However, this particular feature of the device does not constitute a part of the present invention, and no further reference will be made thereto. Each of the slides 108 carries a spring-pressed pawl 116, the nose of which is adapted to engage in the apertures 117 in each of the dial-plates 28 and 29, and a movement of the slides from each other will cause said dial-plates to be intermittently rotated in opposite directions, as indicated by the arrows in Fig. 4, the distance between two pockets in said plates. Coöperating with the apertures 117 in the dial-plates are spring-pressed locking-pawls 118, the nose 119 of each of which is adapted to engage in an aperture 117 when the pockets of the coöperating dial-plate are in register with the punches. Before intermittent motion is to be imparted to the dial-plates it is necessary to release the locking-pawls 118. For this purpose we provide a rock-shaft 120, which has an arm 121 secured near each end thereof. The lower face of each of these arms is formed with a cam-face 122, as indicated in Fig. 17 of the drawings. This cam-face of each of the arms 121 is adapted to bear upon a finger 123, carried by the tail 124 of each of the locking-pawls 118, and a downward pressure of the arms 121 will cause both of the pawls to be simultaneously rocked around their pivots 125 to release the dial-plates. The rock-shaft 120 is rocked by a rod 126, connected to an arm 127, which is secured to said rock-shaft. This rod 126 is connected at its upper end to one arm of a horseshoe-lever 128, (see Fig. 15,) pivoted at 129. The other arm of this lever 128 carries an antifriction-roller 130, against which the outer face of a cam 131 on the gear-wheel 10 is adapted to bear to depress the rod 126. This rod is normally maintained in the elevated position by a spring 132, (see Fig. 1,) which is secured to the rod 126 at one end, as indicated at 133, and is secured at its opposite end to a fixed portion of the machine. A fixed abutment 134 limits the upward movement of the lever 128 and the parts connected thereto.

The followers $36^{\times}$ and 75 for the blanking-punches of the body-plate and tongue, respectively, are, as has been heretofore described, normally maintained flush with their respec-

tive trackways, (see Fig. 13,) and these followers are each operated by an arm 135, adjustably secured to a rock-shaft 136. This rock-shaft elevates the followers by the action of a spring 137, Fig. 4, which is connected at one end to a projecting pin 138, secured to the shaft, and at the opposite end to a pin 139, projecting from a fixed portion of the machine. Extending from the shaft 136 at the opposite end thereof is an adjustably-secured arm 140, as indicated in Figs. 4 and 13. Bearing upon this arm 140 is the free end of a lever 141, pivoted as indicated at 142 in Fig. 6. The upper end of this lever (see Fig. 5) carries an antifriction-roller 143, against which a cam 144 on the shaft 5 bears to operate the lever, and thus transmits movement to the followers $36^{\times}$ and 75. The cam 144 is so timed that a downward movement of the blanking-punches will carry the followers down with them by contact therewith and against the tension of the spring 137, and when the faces of the followers are flush with their trackways the cam will retain the lever in the position indicated in Fig. 13. The blanks contained in the pockets which coöperate with the blanking-punches may thus be carried around with the dial-plates at the next operation thereof.

The follower 67, which coöperates with the plunger 65 in the manner hereinbefore described, is operated by a lever 145, (see Fig. 6,) pivoted at 146, and is normally maintained in an elevated position by said lever through the action of the spring 147. Bearing upon this lever 145 is a rod 148, which is guided by suitable guides 149 and 150, (see Figs. 5 and 6,) and the upper end of this rod has a set-screw 151 bearing thereon. This set-screw 151 is carried by one arm of a bell-crank lever 152, and the other arm of this lever carries an antifriction-roller 153, which bears against a cam 154, by means of which said rod 148 is depressed and the follower is lowered against the tension of the spring 147. The action of this follower 67 is similar to that of each of the followers $36^{\times}$ and 75 hereinbefore described—that is to say, when the plunger 65 descends and forces the blank tongue into the carrier 54 the said plunger 65 forces the follower 67 down against the tension of the spring 147—and the cam 154 is so timed as to maintain the follower 67 out of the path of the slide 54 when the same is being moved laterally.

The dies 49 and $68^{\times}$ for the buckle-plate are operated by the following means: The said dies 49 and $68^{\times}$ or the movable portions thereof are supported upon vertically-movable blocks 155 and 156, respectively, as clearly represented in Fig. 12 of the drawings. These blocks 155 and 156 are adapted to bear upon a T-shaped slide 157, pivoted, as indicated at 158, in recesses formed in the under side of the bed-plate 2 and provided with cam-surfaces 159 and 160, by means of which the dies are elevated when the pivoted slide is operated. One arm of this slide 157 is pivoted to a link 161, which has its other end pivoted to one arm of a bell-crank 162, maintained in the normal position by a spring 163. By reference to Figs. 4 and 10 of the drawings it will be observed that a lever 164 is pivoted upon a pin 165, and the lever extends downward in an inclined direction, so that the lower free end of this lever bears against one arm of the bell-crank lever 163, as indicated in Fig. 11. Carried by the gate 88 is a downwardly-extending arm 166, Fig. 4, which is adapted to bear against the lever 164 and move it laterally around its pivot, so as to transmit movement to the bell-crank lever 162, and thus elevate the dies 49 and $68^{\times}$. The dies are lowered by the action of the spring 163, when the parts are permitted to move by the withdrawal of the extension or plunger 166 when the gate 88 is elevated.

We will next describe the means by which the assembling-plunger 65 is operated. As indicated in Fig. 1 of the drawings, this plunger 65 is extended to form a spindle 167, which is guided by a bracket 168, carried upon the gate 88. The free end of a C-spring 169 bears upon the upper end of this spindle 167, and the lower end of the spring is secured to a carrier 170, through which the spindle freely moves, the nuts $170^{\times}$ limiting the downward movement of the spindle with relation to the carrier. This carrier 170 is secured to a suitably-guided slide 171, as indicated in Fig. 6, and this slide extends upwardly toward the main shaft, as indicated in Fig. 1, and is provided at its upper end with an antifriction-roller, (not shown,) against which a cam 173 on the main shaft is adapted to bear. The slide 171 is elevated by a spring 174, secured in a similar manner as is the spring illustrated in Fig. 5 of the drawings. It will thus be understood that a downward movement is imparted to the plunger 65 at each revolution of the main shaft and that the plunger 65 and its spindle 167 will move with the carrier 170 through the action of the spring 169 as long as there is no obstruction to overcome the tension of said spring. Should, however, a blank be improperly positioned in the slide 54 or in the pocket of the dial-plate which coöperates therewith, the blank will not be jammed with undue force into position; but when the resistance is sufficient to overcome the tension of the C-spring 169 the carrier 170 will be moved down without imparting motion to the plunger 65 or the spindle 167, which carries it, the carrier merely causing the spring 169 to be deflected, so that no damage to the machine can result.

The last of the operating means to be described are those which transmit movement to the turning die or slide, by which the bending in of the hook-like portion *m* of the tongue is accomplished, as illustrated in Figs. 59 and 60 of the drawings. As hereinbefore described, the bending of the tongue-blank is accomplished by the bending-punch 86, (see

Fig. 10,) which is carried by a suitable slide 175. This slide 175 is slotted, as indicated at 176, and an antifriction-roller $176^{\times}$ is carried by said slide and spans the slot 176. Coöperating with this roller $176^{\times}$ is an interior cam $177^{\times}$, as indicated in Fig. 12^{a} of the drawings. This cam is formed in the lower end of a rod 177. This rod 177 extends upwardly, as indicated in Figs. 5 and 6, and is guided in a suitable bracket 178, and the upper end thereof is provided with an antifriction-roller 179, against which a cam 180 is adapted to bear to depress the rod and transmit movement to the slide 175. Another antifriction-roller 181, Fig. 1, projects from the side of said rod 177 and with which a cam 182 on the main shaft coöperates to elevate the rod, while a spring 183, Fig. 5, maintains the rod in the elevated position when it is free from both of said cams. The cams 180 and 182 are shown in detail in Figs. 7 and 8 of the drawings.

From the foregoing description it is thought that the operation of the machine will be understood. However, a brief description of the operation will be given.

The strips of metal *a* being fed to the machine in the manner described, the blanking-punches 33 and 72 descending with the gate 88 will simultaneously cut the initial blanks *b* and *i*. When the gate ascends with the punches, the dial-plates are simultaneously given an intermittent movement to convey the blanks *b* and *i* to the next punches 35 and 76, respectively. At the next descent of the gate new blanks *b i* will be cut and the former ones will be submitted to the action of the punches 35 and 76, respectively, and so on until a tongue-blank *g* is conveyed by its dial-plate into the path of the assembling-plunger 65. At this time the carrier or transfer-slide 54 will be properly positioned under the plunger 65, so as to receive the completed blank tongue when said plunger descends, and a completed body-plate will be carried by its dial-plate into line with the transfer-slide. It will be seen that the dial-plates 28 and 29 are mounted in different horizontal planes and that the slide 54 is interposed in a horizontal plane between the two plates. By reason of these facts a blank may be forced down from the upper dial-plate into the jaws of the transfer-slide and the transfer-slide may be moved longitudinally to convey the said blank to a point above a pocket in the other dial-plate, as is clearly represented in Figs. 23 and 24 of the drawings. When the transfer-slide has been moved with the tongue in the manner hereinbefore described, said tongue will be "assembled" with the body-plate, while the latter remains in the turning-die $68^{\times}$, where it has been conveyed by its dial-plate, and when the closing-punch 66 descends the separate parts of the buckle are united, and the buckle is completed. The next intermittent movement of the dial-plates will convey the finished buckle over the opening 71 in the bed-plate, and the descending plunger $71^{\times}$ will assure the discharge of the buckle through said opening.

It will be observed that in every instance throughout the construction of the machine where there is any liability of an undue obstruction being interposed in the path of a movable part the said part is spring-pressed in the direction in which said obstruction is liable to occur and is moved by positive pressure in an opposite direction.

While we have shown and described with considerable detail the construction and operation of one form of machine embodying our invention, we would have it understood that many changes in the construction and operation may be made without departing from the spirit of our invention and in order to adapt the invention to the manufacture of articles of different construction and configuration.

Having described our invention, what we claim, and desire to secure by Letters Patent, is—

1. In a sheet-metal-buckle machine, the combination of a plurality of feed-plates each adapted to contain a plurality of blanks, a closing-punch for uniting the separate sheet-metal parts of a buckle and means for automatically conveying the said separate sheet-metal parts to the closing-punch.

2. In a machine of the character described, the combination of a plurality of feed-plates each adapted to contain a plurality of blanks, a closing punch and die for automatically uniting the separate sheet-metal parts of a buckle and means for automatically conveying the said separate sheet-metal parts to the automatically-operated closing punch and die.

3. In a machine of the character described, the combination of sheet-metal punches and dies for blanking and forming a sheet-metal part of a buckle, the face of each blanking-punch employed and the outline of the coöperating die conforming substantially to the outline of the buckle-section to be formed, mechanism for uniting the separate sheet-metal parts thereof and means for automatically conveying the said separate sheet-metal parts to the uniting mechanism.

4. In a machine of the character described, the combination of sheet-metal punches and dies for blanking and forming the separate sheet-metal parts of a buckle, the face of each blanking-punch employed and the outline of the coöperating die conforming substantially to the outline of the buckle-section to be formed, mechanism for uniting said sheet-metal parts and means for automatically conveying the sheet-metal parts from the blanking and forming punches and dies to the uniting mechanism.

5. In a machine of the character described, the combination of automatically-operated sheet-metal punches and dies for blanking and forming the separate sheet-metal parts of a buckle, the face of each blanking-punch

employed and the outline of the coöperating die conforming substantially to the outline of the buckle-section to be formed, automatically-operated mechanism for uniting said sheet-metal parts, means for automatically conveying the sheet-metal parts from the blanking and forming punches and dies to the uniting mechanism and means for automatically discharging the completed buckles from the machine.

6. In a machine of the character described, the combination of automatically-operated punches and dies for blanking and forming the separate sheet-metal parts of a buckle, the face of each blanking-punch employed and the outline of the coöperating die conforming substantially to the outline of the buckle-section to be formed, means for automatically conveying sheet metal to the blanking and forming mechanism, automatically-operated mechanism for uniting the said sheet-metal parts, and means for automatically conveying the parts from the sheet-metal blanking and forming punches and dies to the uniting mechanism.

7. In a machine of the character described, the combination of a series of sheet-metal blanking and forming punches and dies for each part of the buckle the face of each blanking-punch employed and the outline of the coöperating die conforming substantially to the outline of the buckle-section to be formed, and mechanism for automatically conveying the sheet metal successively to the different punches and dies and means for automatically assembling said separate sheet-metal parts.

8. In a machine of the character described, the combination of a series of sheet-metal blanking and forming punches and dies for each part of the buckle, the face of each blanking-punch employed and the outline of the coöperating die conforming substantially to the outline of the buckle-section to be formed, a uniting punch and die for uniting the separate sheet-metal parts and mechanism for automatically conveying the sheet metal successively to the different sheet-metal blanking and forming punches and dies and to the uniting punch and die.

9. In a machine of the character described, the combination of a series of automatically-operated sheet-metal blanking and forming punches and dies for each part of the buckle, the face of each blanking-punch employed and the outline of the coöperating die conforming substantially to the outline of the buckle-section to be formed, an automatically-operated uniting punch and die for uniting the separate sheet-metal parts and mechanism for automatically conveying the sheet metal successively to the different blanking and forming punches and dies and to the uniting punch and die.

10. In a buckle-making machine, the combination of a movable feed-plate having a series of blank-receiving apertures therein, punches and dies coöperating with the apertures in the said feed-plates, means for moving the feed-plate to bring the apertures successively to the punches and dies, mechanism for uniting the separate parts of the buckle and means for conveying the parts from the movable feed-plate to the uniting mechanism.

11. In a buckle-making machine, the combination of a movable feed-plate having a series of blank-receiving apertures therein, punches and dies coöperating with the apertures in said feed-plate, means for automatically moving the feed-plate to bring the apertures successively to the punches and dies, means for automatically operating said punches when the apertures in the movable feed-plate are in register therewith, mechanism for automatically uniting the separate parts of the buckle and means for automatically conveying the parts from the movable feed-plate to the uniting mechanism.

12. The combination of a plurality of movable feed-plates having a series of blank-receiving apertures therein, punches and dies coöperating with the apertures in each feed-plate and means for conveying a blank from an aperture in one feed-plate to a position where said blank can be operated upon by a punch of another feed-plate.

13. The combination of a plurality of automatically-operated movable feed-plates having a series of blank-receiving apertures therein, punches and dies coöperating with the apertures in each feed-plate, mechanism for automatically operating said punches and means for automatically conveying a blank from an aperture in one feed-plate to a position where said blank can be automatically operated upon by a punch of another feed-plate.

14. The combination of a plurality of feed-plates movable in different planes and having a series of blank-receiving apertures therein, punches and dies coöperating with the apertures in each feed-plate and means for automatically conveying a blank from an aperture in one plate to a position where said blank can be operated upon by a punch of another feed-plate.

15. The combination of automatically-operated feed-plates movable in different planes and having a series of blank-receiving apertures therein, punches and dies coöperating with the apertures in each feed-plate, mechanism for automatically operating said punches and an automatically-operated slide adapted to receive a blank from an aperture in one feed-plate and to convey it into the path of a punch of another feed-plate.

16. The combination of a plurality of movable feed-plates having a series of blank-receiving apertures extending therethrough, a series of blanking and forming punches and dies coöperating with the apertures in each

of said feed-plates, automatic means for simultaneously moving said feed-plates an equal extent and to bring the apertures of each of said plates successively to the punches and dies of said plate and mechanism for automatically and simultaneously operating all of the punches.

17. The combination of a plurality of movable feed-plates having a series of blank-receiving apertures therein, the plates being so arranged that an aperture in one plate will be brought into line with an aperture in another plate after each movement of the plates, a series of blanking and forming punches and dies coöperating with the apertures in each of said feed-plates, means for simultaneously moving said feed-plates an equal extent and to bring the apertures of each of said plates successively to all the punches and dies of said plate and mechanism for automatically transferring a blank from an aperture in one plate into the path of a punch of another plate.

18. In a metal-working machine, the combination of a plurality of rotary feed-plates, a plurality of punches coöperating with each of said feed-plates to form the parts therein, operating mechanism for simultaneously and intermittently transmitting a rotary movement to said feed-plates, mechanism for simultaneously automatically locking said feed-plates against movement when the blanks carried thereby are in register with their respective punches and means for automatically and simultaneously throwing the feed-plate-locking mechanisms of all the feed-plates out of the engaging position before the feed-plate-operating mechanism is brought into action.

19. The combination of a rotary feed-plate having a series of blank-receiving openings therein which conform to the shape of the initial blank, a trackway on which said plate rotates, a plurality of punches and dies coöperating with the blank-receiving openings in said plate one of said punches being a blanking-punch which is adapted to blank directly into the blank-receiving openings in the feed-plate and the punches and dies being arranged so that one of said parts operates in the trackway below the feed-plate while the other of said parts operates above the feed-plate and means for intermittently rotating said feed-plate to convey the cut blanks into the path of the successive punches and dies.

20. The combination of a rotary feed-plate having a series of blank-receiving openings therein, a trackway on which said plate rotates, a punch and die coöperating with the blank-receiving openings in the feed-plate and arranged so that one of said parts operates in the trackway below the feed-plate while the other of said parts operates above the feed-plate, means for intermittently rotating said feed-plate to convey blanks successively into the path of said punch and die and assembling mechanism for transferring the blank from said feed-plate and placing it in operative relation to another blank or section of the article to be produced.

21. The combination of a rotary feed-plate having a series of blank-receiving openings therein, a trackway on which said plate rotates, a punch and die coöperating with the blank-receiving openings in the feed-plate and arranged so that one of the said parts operates in the trackway below the feed-plate while the other of said parts operates above the feed-plate, means for intermittently rotating said feed-plate to convey blanks successively into the path of said punch and die, assembling mechanism for transferring the blank from said feed-plate and placing it in operative relation to another blank or section of the article to be produced and means for uniting the parts in the assembled position.

22. In a metal-working machine the combination of a plurality of feed-plates movable in different planes, a punch adapted to coöperate with each of said feed-plates, a movable transfer device operating in a plane intermediate of the planes in which the feed-plates move, said transfer device being adapted to convey a blank from one feed-plate into the path of the punch of another feed-plate and means for moving said transfer device.

23. In a metal-working machine the combination of a plurality of feed-plates movable in different planes, a punch adapted to coöperate with each of said feed-plates, a movable transfer device operating in a plane intermediate of the planes in which the feed-plates move, said transfer device being adapted to convey the blank from one feed-plate into the path of the punch of another feed-plate, a plunger adapted to force a blank from the first-named feed-plate to the transfer device and means for moving said transfer device.

24. The combination with a plurality of feed-plates movable in different planes, a punch adapted to coöperate with each of said feed-plates and a transfer device comprising a slide having spring-pressed clamping-jaws adapted to clamp the blank in place and operating in a plane intermediate of the planes in which the feed-plates move, said transfer device being adapted to convey a blank from one feed-plate into the path of the punch of another feed-plate.

25. The combination of a plurality of feed-plates movable in different planes, a punch adapted to coöperate with each of said feed-plates, a transfer device comprising a slide having spring-pressed clamping-jaws adapted to clamp the blank in place and operating in a plane intermediate of the planes in which the feed-plates move, said transfer device being adapted to convey a blank from one feed-plate into the path of the punch of another feed-plate and a plunger adapted to force a blank from the first-named feed-plate to the clamping-jaws of the transfer device.

26. The combination of a plurality of feed-plates movable in different planes, mechanism for automatically and intermittently moving said plates simultaneously, an automatically-operated punch adapted to coöperate with each of said feed-plates, a movable transfer device operating in a plane intermediate of the planes in which the feed-plates move, said transfer device being adapted to convey a blank from one feed-plate into the path of the punch of another feed-plate, a plunger adapted to force a blank from the first-named feed-plate to the transfer device and means for automatically bringing the blank-receiving portion of said transfer device into register first with said plunger and with a blank in one plate and then with a blank in another plate and means for moving said transfer device.

27. In a machine of the character described, the combination of a transfer device comprising a slide carrying spring-pressed blank-receiving clamping-jaws, means for delivering a blank to said transfer mechanism, a uniting punch and die, means independent of the transfer device for feeding blanks to said punch and die and means for operating said transfer device to convey the blank therein into the path of the uniting punch and die so that the said blanks can be united.

28. In a machine of the character described, the combination of a transfer device comprising a slide carrying spring-pressed blank-receiving clamping-jaws, means for delivering a blank to said transfer mechanism, a uniting punch and die, means independent of the transfer device for feeding blanks to said punch and die and means for operating said transfer device and punch and die to assemble the separate blanks to be united by the uniting punch and die.

29. In a machine of the character described, the combination of an automatically-operated transfer device comprising a slide carrying spring-pressed blank-receiving clamping-jaws, automatically-operated means for delivering a blank to said transfer mechanism, a uniting punch and die, means for automatically operating the same, automatic means independent of the transfer device for feeding blanks to said punch and die and means for automatically operating said transfer device to convey the blank therein into the path of the uniting punch and die so that the said blanks can be united by the operation of said transfer device and of the punch and die.

30. In a machine of the character described, the combination of an automatically-operated transfer device comprising a slide carrying spring-pressed blank-receiving clamping-jaws, automatically-operated means for delivering a blank to said transfer mechanism, a uniting punch and die, means for automatically operating the same, automatic means independent of the transfer device for feeding blanks to said punch and die and means for automatically operating said transfer device and punch and die to assemble the separate blanks to be united by the uniting punch and die.

31. In a machine of the character described, the combination of a series of punches and dies, a feed-plate having a series of apertures therein which conform in outline to the outline of the initial blanking punch and die and which receive the blanks directly from the blanking-die, means for operating said feed-plate to convey the blanks therein to the operation of the successive punches and dies, means for automatically operating said punches and dies to form the blanks within the apertures in the feed-plate so that the blanks may be carried along with said feed-plate, a movable transfer device adapted to receive a blank from an aperture in the feed-plate and to move said blank into the path of an assembling-punch and means for operating said transfer device.

32. In a machine of the character described, the combination of a feed-plate, a trackway on which said feed-plate moves, a punch and die coöperating with the feed-plate, a spring-pressed follower coöperating with the punch and adapted to be forced down against the tension of the spring by said punch and means for maintaining the face of the follower flush with the trackway when the feed-plate is being operated.

33. In a machine of the character described, the combination of a rotary feed-plate having a series of blank-receiving apertures therein, a trackway on which said feed-plate moves, means for intermittently moving said feed-plate, a punch and die coöperating with the feed-plate, a spring-pressed follower adapted to move through the trackway and into an aperture in the feed-plate and to coöperate with the punch and automatically-operated means for maintaining the face of the follower flush with the trackway when the feed-plate is being operated.

34. In a machine of the character described, the combination of a blank-transfer device, a plunger for forcing the blank into said transfer device, a follower coöperating with said plunger to position the blank in the transfer device and means for maintaining the follower out of the path of the transfer device when the same is being operated.

35. In a machine of the character described, the combination of an automatically-operated blank-transfer device, an automatically-operated plunger for forcing the blank into said transfer device, a spring-pressed follower coöperating with said plunger to position the blank in the transfer device and automatically-operated means for maintaining the follower out of the path of the transfer device when the same is being operated.

36. In a machine of the character described, the combination of rotary feed-plates having blank-receiving apertures therein, trackways on which said plates intermittently rotate, a cross-head or gate carrying a series of punches

to coöperate with each of said feed-plates, fixed and movable dies coöperating with said feed-plates and punches, means for intermittently rotating the feed-plates so as to bring the apertures in each of them successively into the path of the punches therefor and means for operating the movable dies when the feed-plates are retained against movement.

37. In a machine of the character described, the combination of rotary feed-plates having blank-receiving apertures therein, trackways on which said feed-plates intermittently rotate, a cross-head or gate carrying a series of punches to coöperate with each of said feed-plates, fixed and movable dies coöperating with said feed-plates and punches, means for intermittently rotating the feed-plates so as to bring the apertures in each of them successively into the path of the punches therefor, means for operating the movable dies when the feed-plates are retained against movement and means for transferring a blank from an aperture in one feed-plate into alinement with an aperture in another feed-plate.

38. In a machine of the character described, the combination of rotary feed-plates having blank-receiving apertures therein, trackways on which said feed-plates intermittently rotate, a cross-head or gate carrying a series of punches to coöperate with each of said feed-plates, fixed and movable dies coöperating with said feed-plates and punches, means for intermittently rotating the feed-plates so as to bring the apertures in each of them successively into the path of the punches therefor, means for operating the movable dies when the feed-plates are retained against movement, means for transferring a blank from one feed-plate into alinement with an aperture in another feed-plate and automatically-operated means for forcing a blank to said blank-transferring means from an aperture in a feed-plate.

39. In a machine of the character described, the combination of rotary feed-plates moving in different planes and having blank-receiving apertures therein, trackways on which said plates intermittently rotate, a cross-head or gate carrying a series of punches to coöperate with each of said feed-plates, fixed and movable dies coöperating with said feed-plates and punches, means for intermittently rotating the feed-plates so as to bring the apertures in each of them successively into the path of the punches therefor, means for operating the movable dies when the feed-plates are retained against movement and a transfer-slide moving in a plane intermediate of the planes of movement of said feed-plates for transferring a blank from an aperture in one feed-plate into alinement with the punch of another feed-plate.

40. In a machine of the character described, the combination of a feed-plate having a blank-receiving aperture therein, a trackway on which said feed-plate moves, a fixed die elevated above the level of the trackway and extending into the path of movement of the apertured portion of the feed-plate, an inclined way extending from the trackway to said fixed die and a punch coöperating with the die.

41. In a machine of the character described, the combination of a rotary feed-plate having a series of blank-receiving apertures therein and a continuous recess extending around the same, a trackway on which said feed-plate moves, a fixed die elevated above the level of the trackway and extending into said continuous recess and into the path of movement of the apertures in the feed-plate, an inclined way extending from the trackway to said fixed die and a punch coöperating with the die.

42. In a machine of the character described, the combination of a feed-plate having a blank-receiving aperture therein, a trackway on which said feed-plate moves, a die elevated above the level of the trackway and extending into the path of movement of the apertured portion of the feed-plate, an inclined way extending from the trackway to said die, a punch coöperating with the die and a second laterally-movable punch adapted to operate on the blank while it is on said die and after said blank has been operated upon by the said first-named punch.

43. The combination of a fixed die, a carrier for conveying a blank to said die, a punch for operating upon said blank while it is in said carrier and a second punch for operating upon said blank while it is in the carrier and after it has been operated upon by the said first-named punch.

44. The combination of a fixed die, a carrier for conveying a blank to said die, means for automatically operating said carrier, a punch for operating upon said blank while it is in the said carrier, means for automatically moving said punch, a second punch for operating upon said blank while it is in the carrier and after it has been operated upon by the said first-named punch and means for automatically operating said last-named punch in the manner stated.

ALBERT D. FIELD.
FREDRICK MARGGRAFF.
JOHN DRAHER.

Witnesses as to Albert D. Field and Fredrick Marggraff:
HENRY W. MINOR,
EMMA JUDGE.
Witnesses as to John Draher:
M. JOHN RYAN,
HENRY W. MINOR.