(No Model.) 8 Sheets—Sheet 1.

C. C. SMALL.

HEEL MACHINE.

No. 467,242. Patented Jan. 19, 1892.

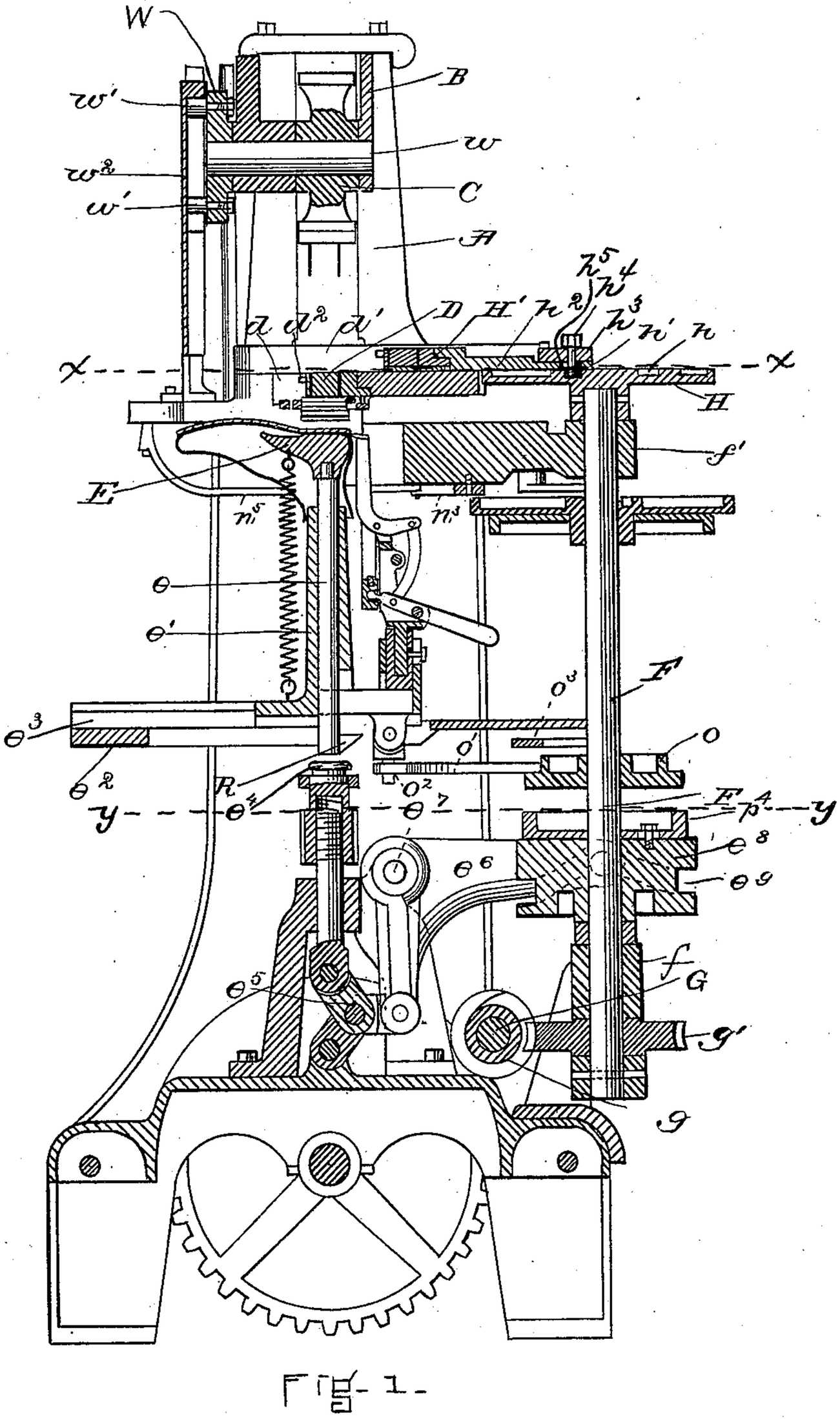

FIG. 1.

WITNESSES.

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by his attys

Clarke & Raymond

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C. C. SMALL.

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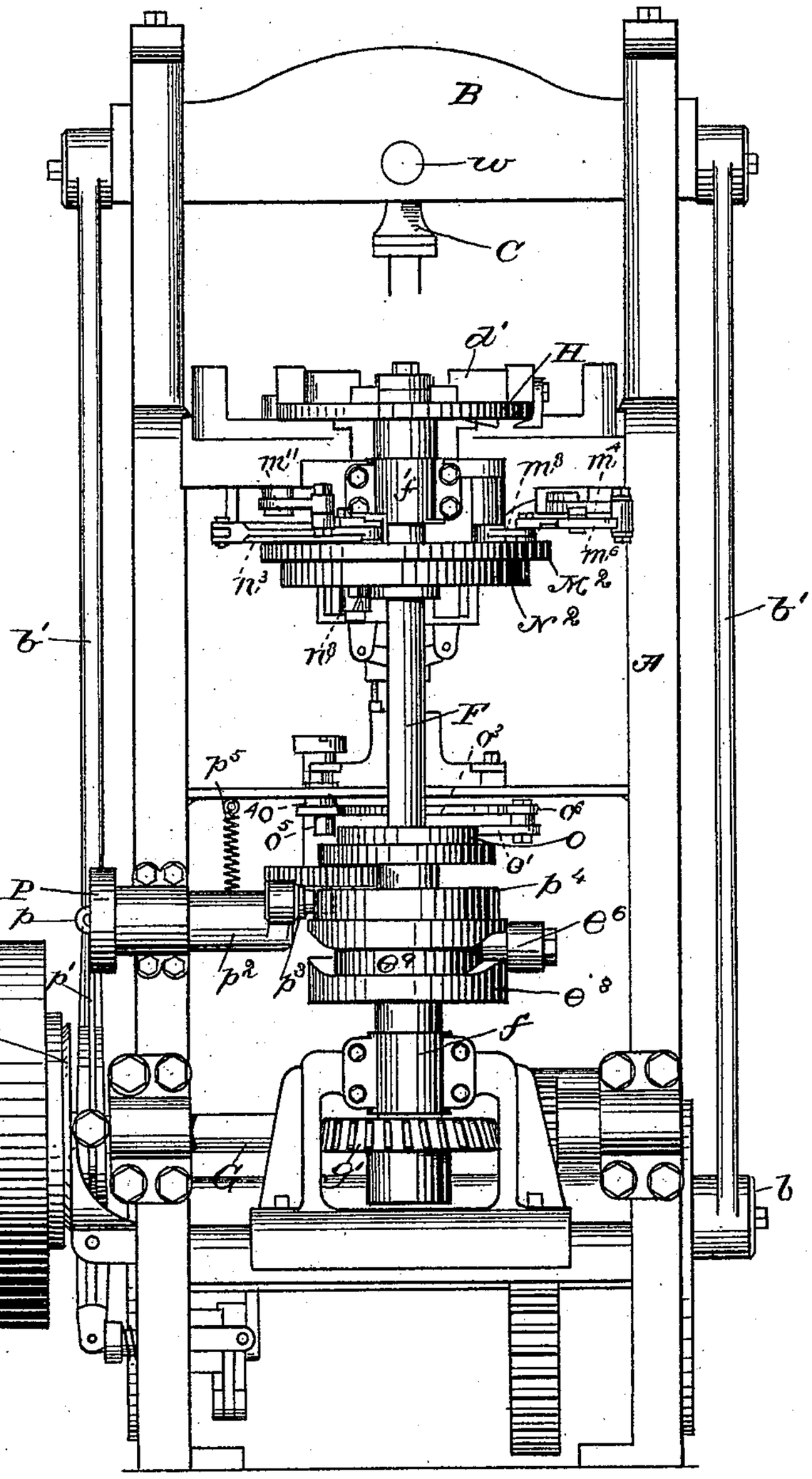

Fig. 2.

WITNESSES.

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(No Model.)

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C. C. SMALL.

HEEL MACHINE.

No. 467,242. Patented Jan. 19, 1892.

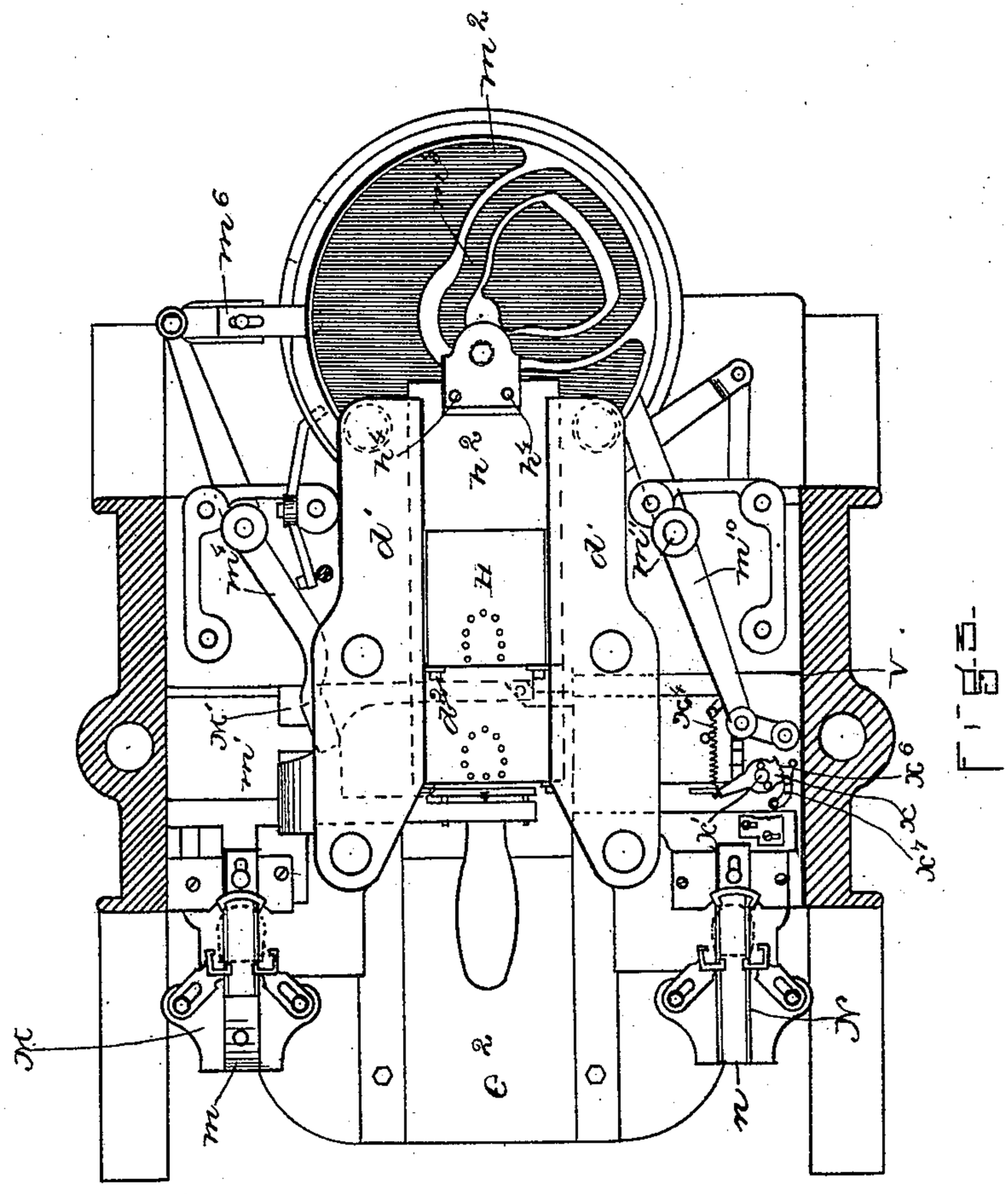

FIG 5.

WITNESSES-

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(No Model.)

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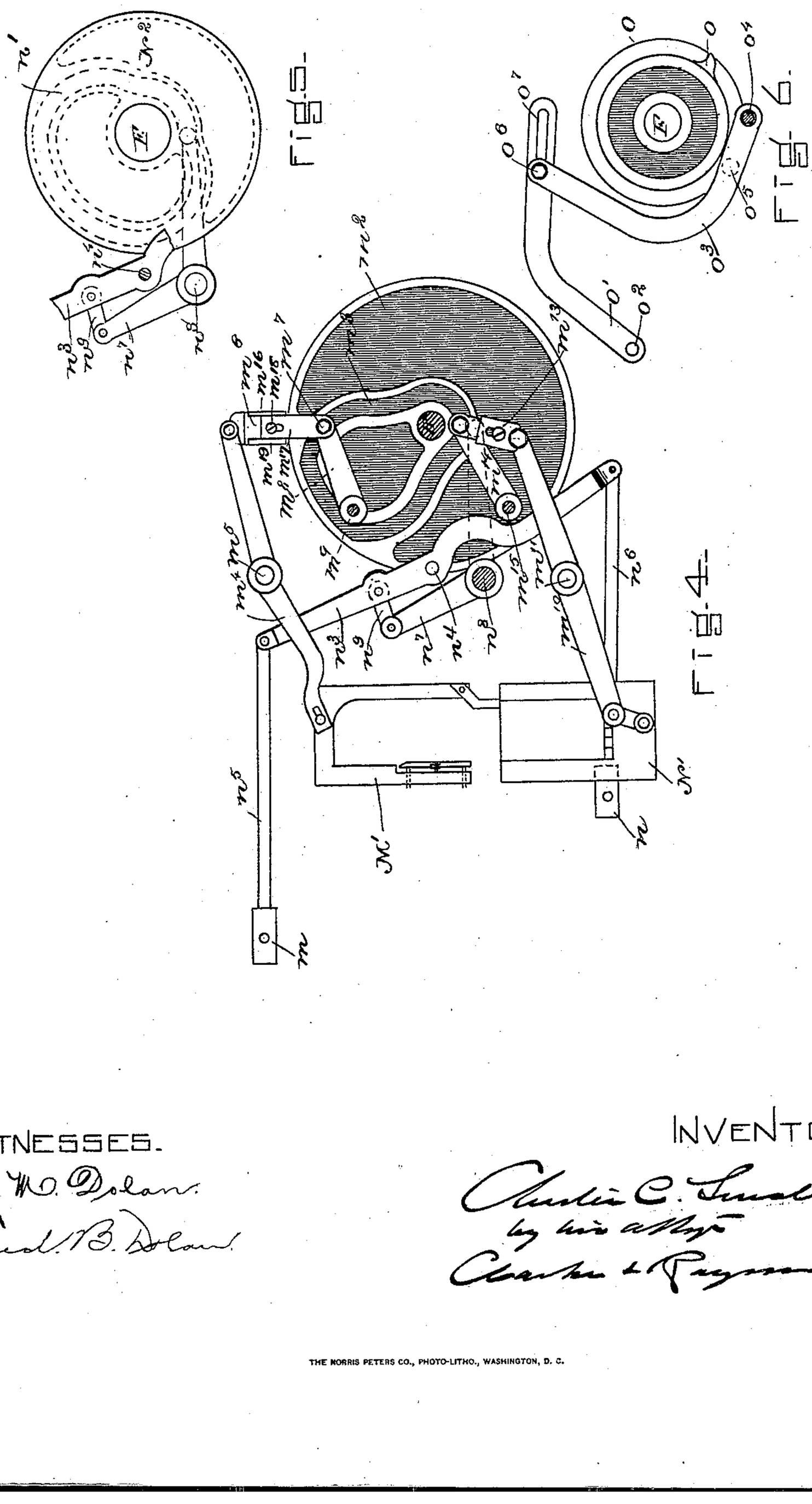
C. C. SMALL.

HEEL MACHINE.

No. 467,242. Patented Jan. 19, 1892.



WITNESSES.

J. W. Dolan.

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(No Model.) 8 Sheets—Sheet 5.

C. C. SMALL.

HEEL MACHINE.

No. 467,242. Patented Jan. 19, 1892.

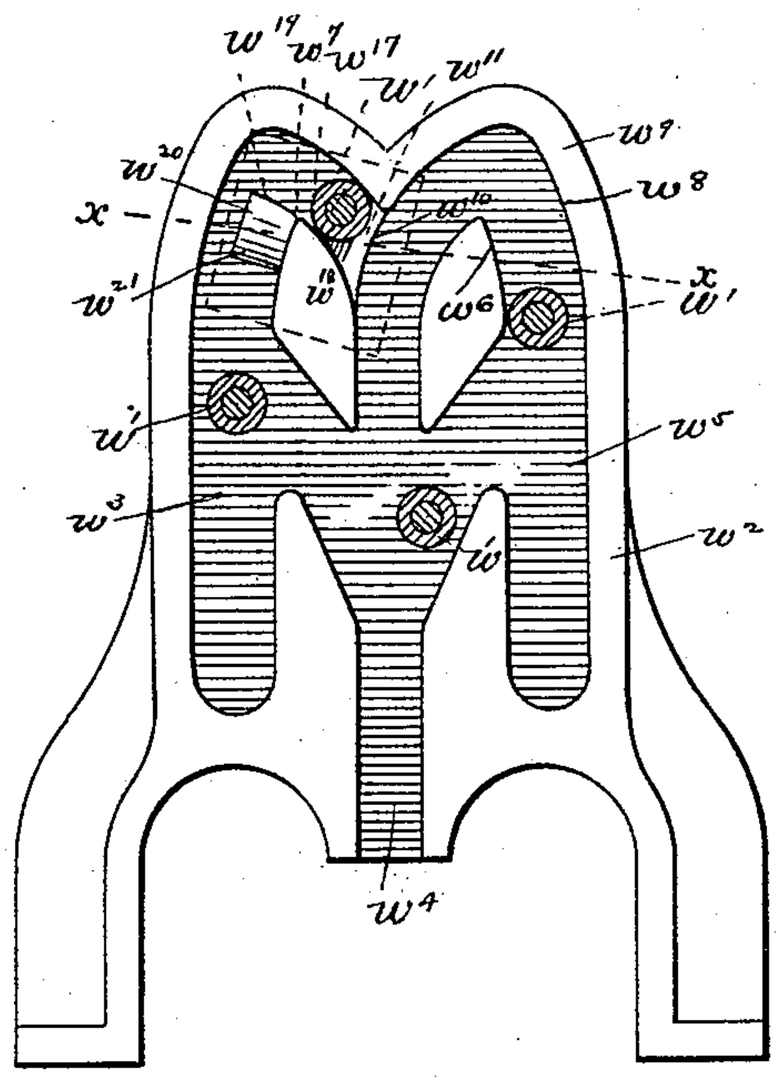

Fig. 7.

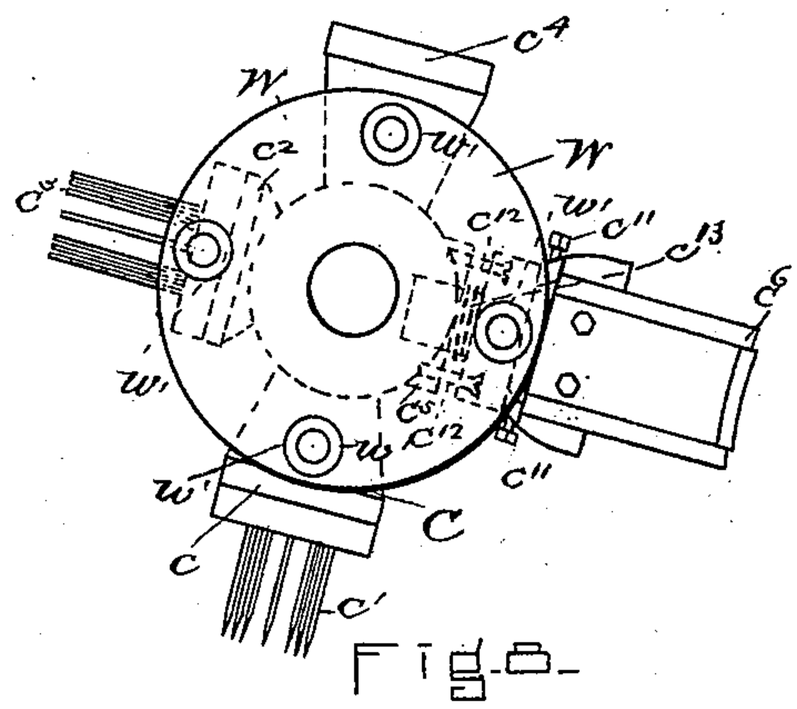

Fig. 8.

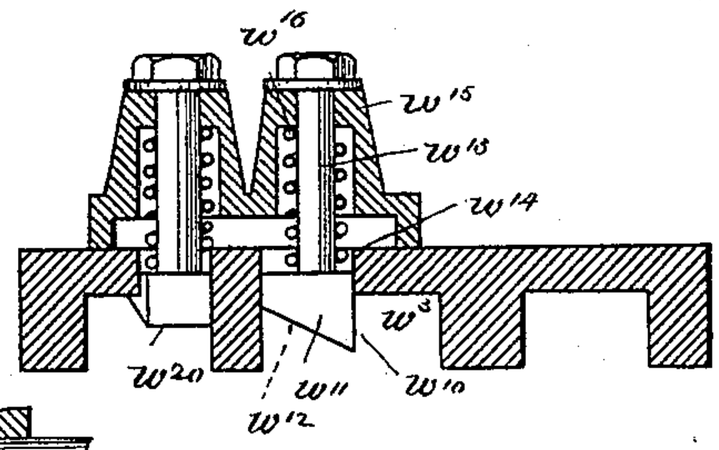

Fig. 9.

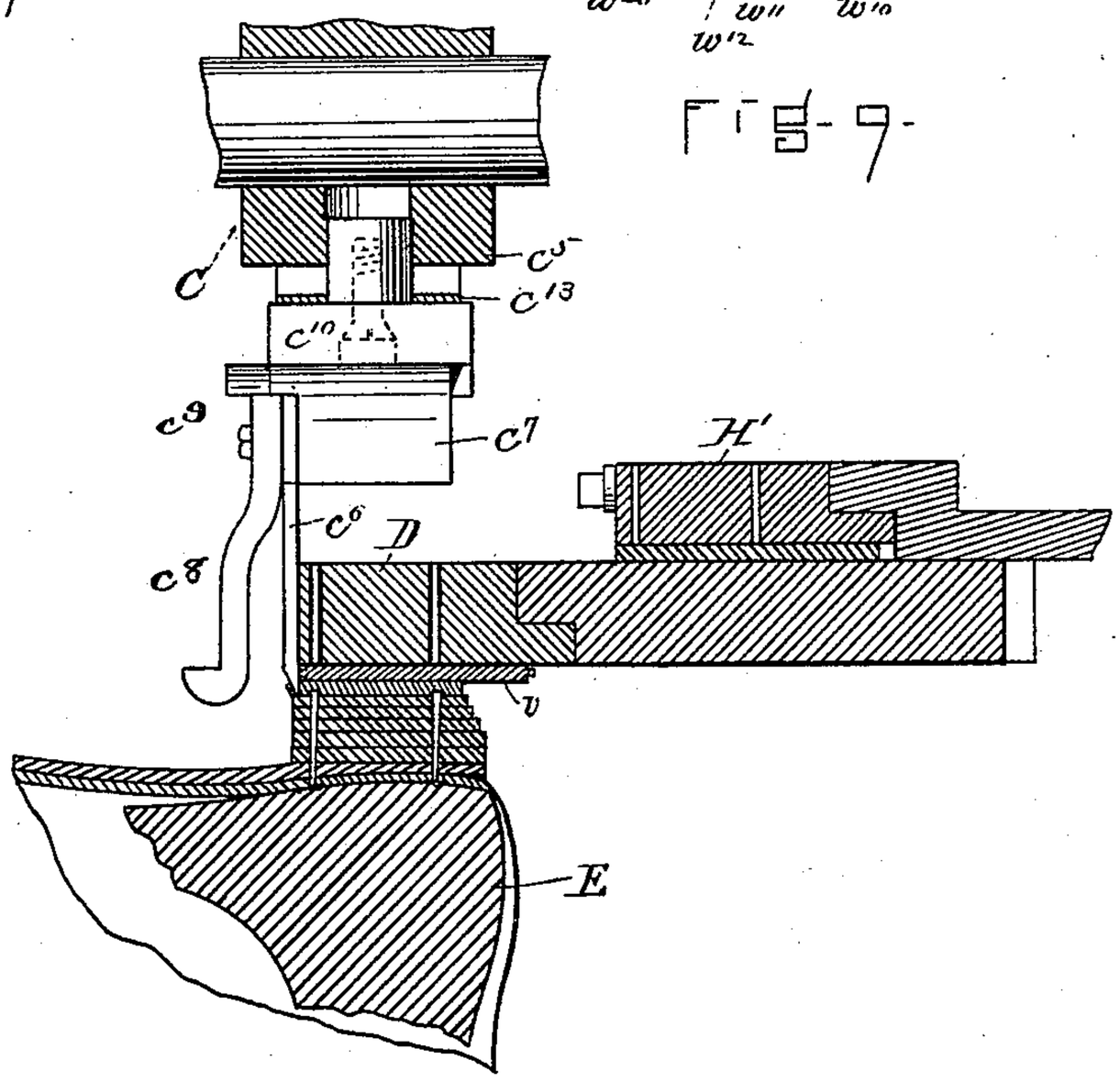

Fig. 10.

WITNESSES.

J. M. O. Dolan

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(No Model.)

8 Sheets—Sheet 6.

C. C. SMALL.

HEEL MACHINE.

No. 467,242. Patented Jan. 19, 1892.

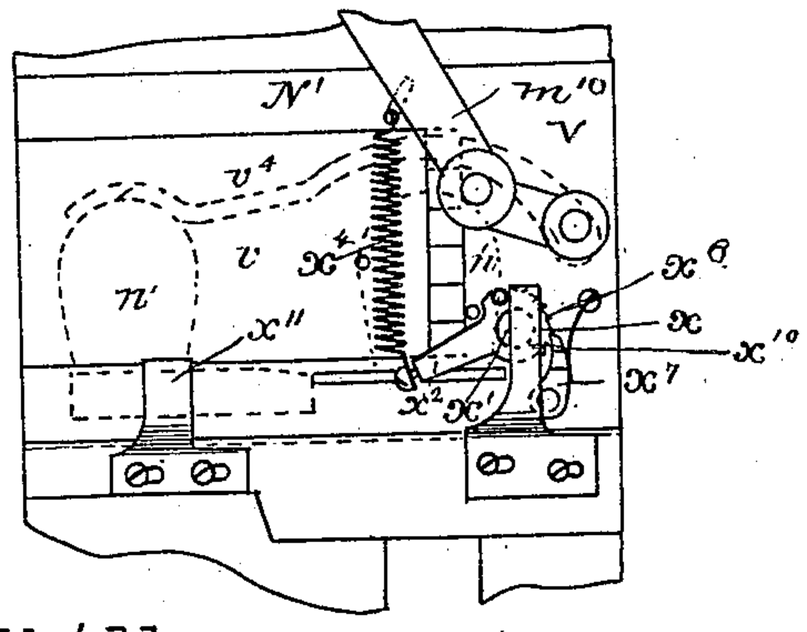

Fig. 11.

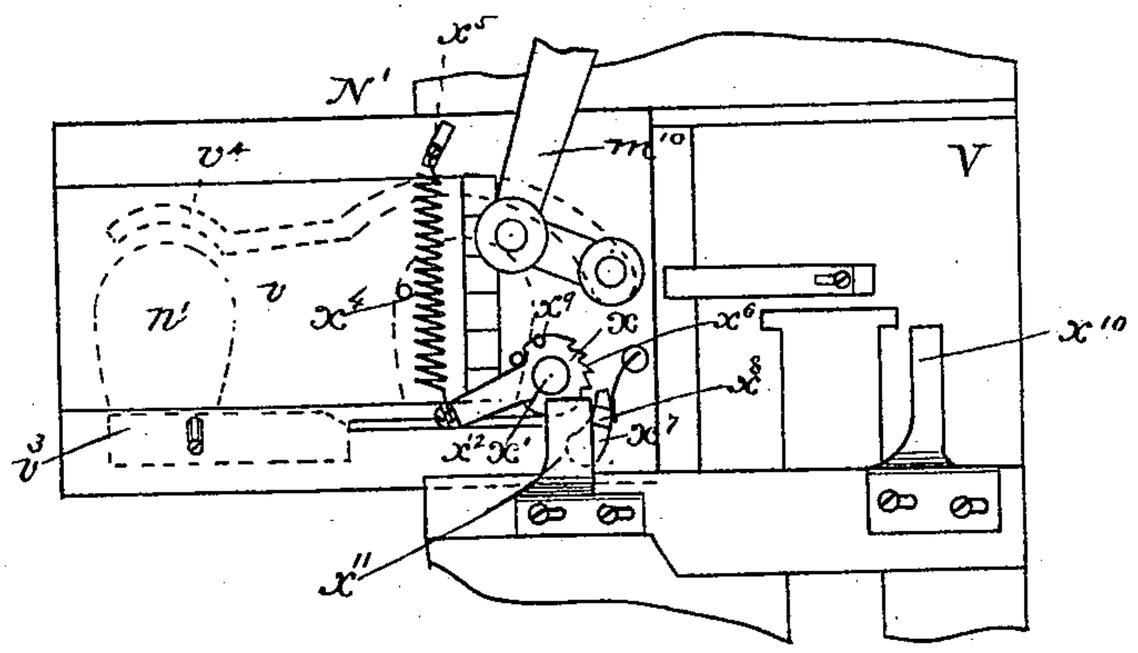

Fig. 12.

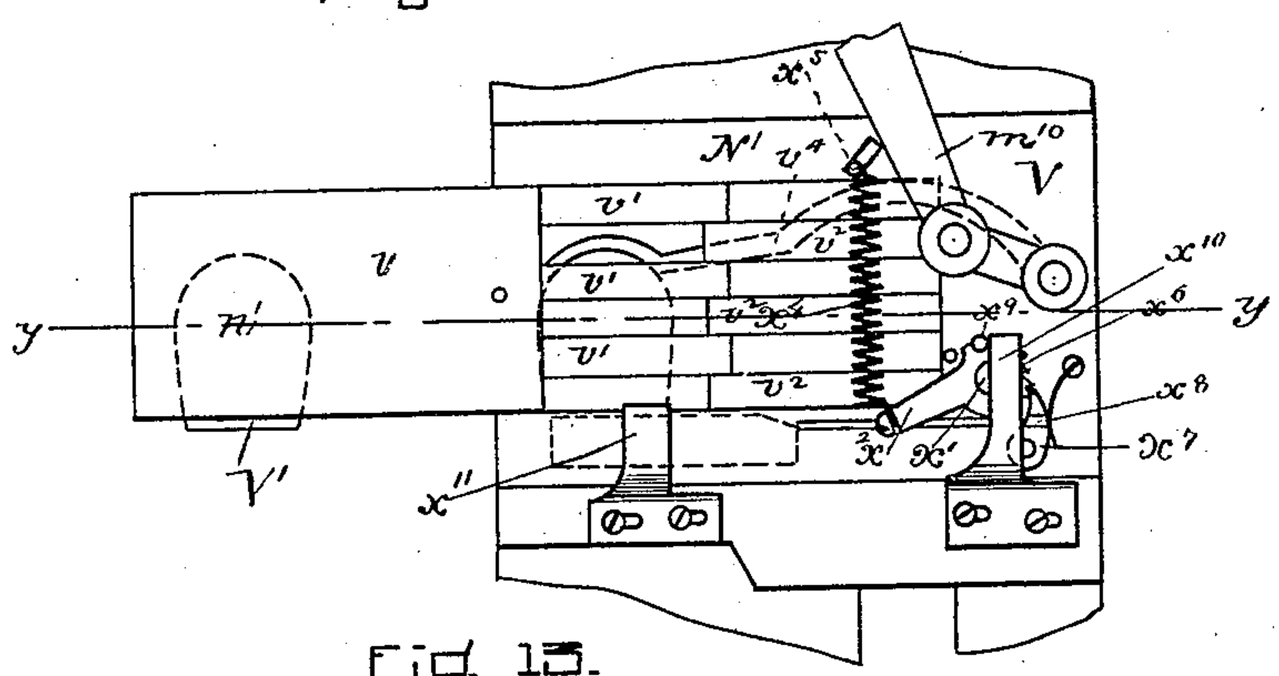

Fig. 13.

WITNESSES.

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(No Model.) 8 Sheets—Sheet 7.

C. C. SMALL.

HEEL MACHINE.

No. 467,242. Patented Jan. 19, 1892.

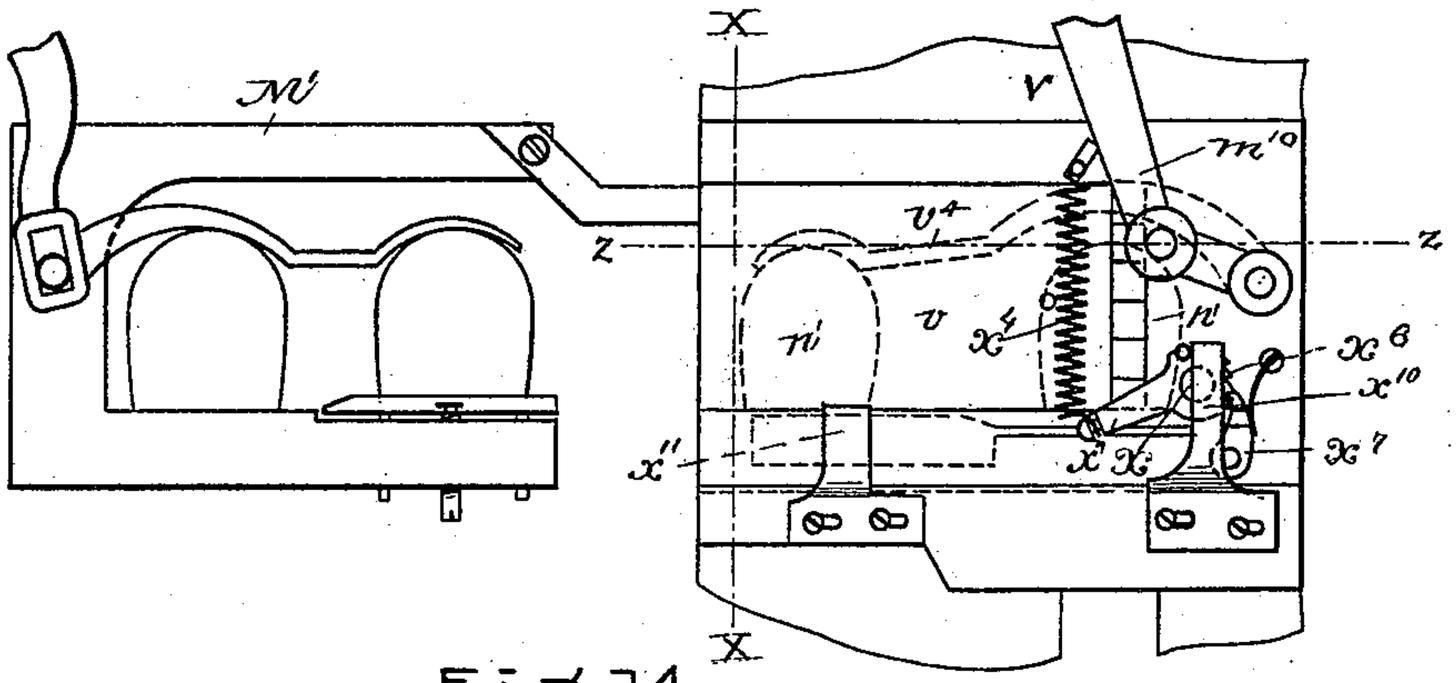

Fig. 14.

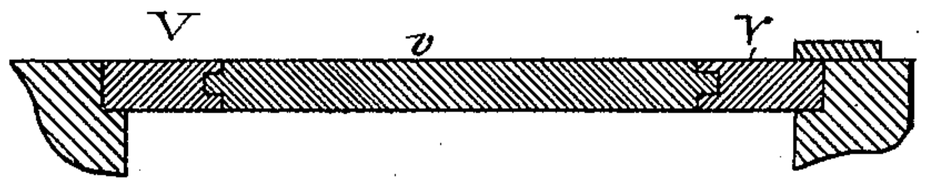

Fig. 15.

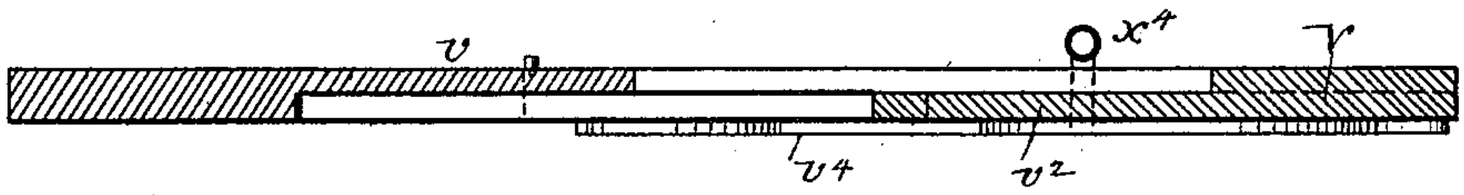

Fig. 16.

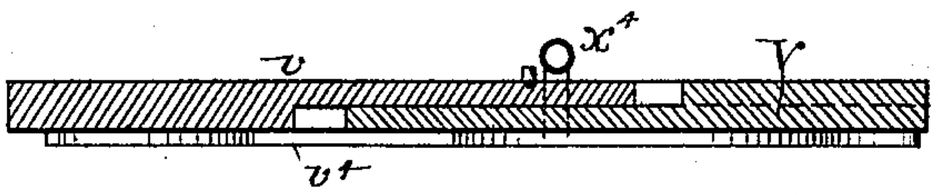

Fig. 17.

WITNESSES.

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(No Model.) 8 Sheets—Sheet 8.

C. C. SMALL.

HEEL MACHINE.

No. 467,242. Patented Jan. 19, 1892.

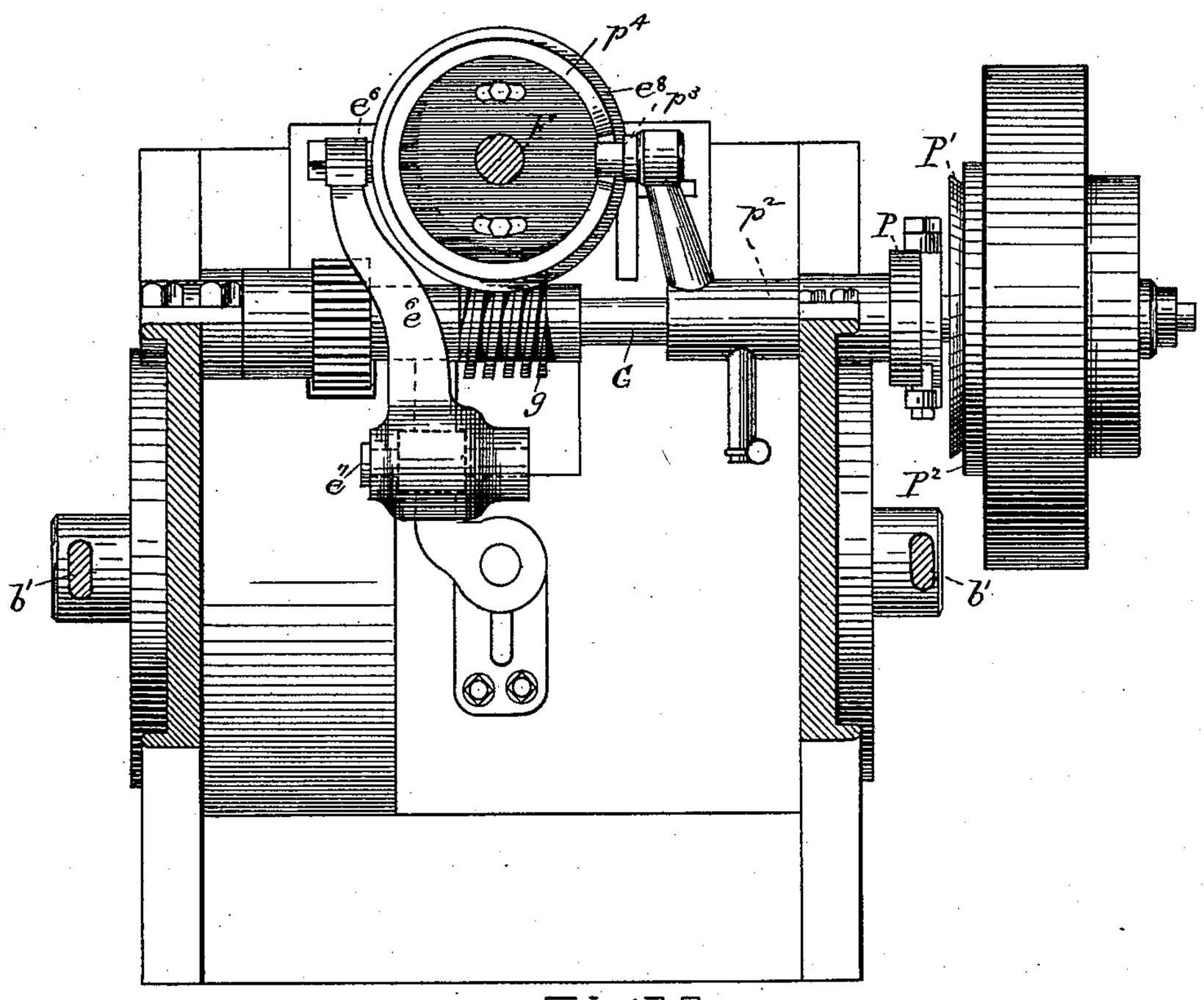

Fig. 18.

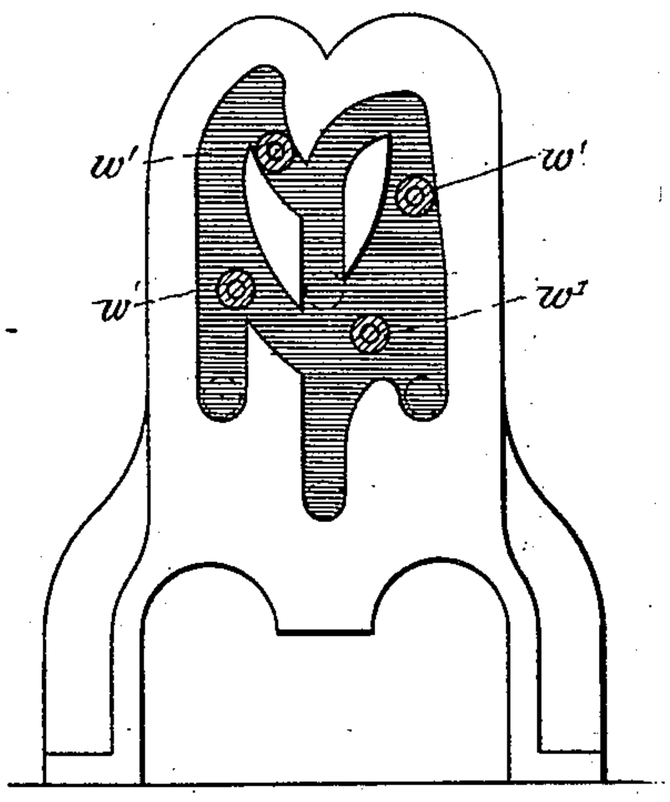

Fig. 19.

WITNESSES.

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Fred. B. Dolan.

INVENTOR.

Charles C. Small.

by his Attys

Charles A. Raymond.

UNITED STATES PATENT OFFICE.

CHESTER C. SMALL, OF MALDEN, ASSIGNOR TO FREEBORN F. RAYMOND, 2D, OF NEWTON, MASSACHUSETTS.

HEEL-MACHINE.

SPECIFICATION forming part of Letters Patent No. 467,242, dated January 19, 1892.

Application filed April 19, 1887. Serial No. 235,316. (No model.)

To all whom it may concern:

Be it known that I, CHESTER C. SMALL, a citizen of the United States, residing at Malden, in the county of Middlesex and State of Massachusetts, have invented a new and useful Improvement in Heel-Attaching Machines, of which the following is a full, clear, and exact description, reference being had to the accompanying drawings, forming a part of this specification, in explaining its nature.

The invention is an improvement upon that described in the application of Freeborn F. Raymond, 2d, executed April 16, 1887, Serial No. 234,985, and it relates, especially, to various details of organization and construction whereby the machine described in said application is simplified and improved. This result is obtained in part by making the templet stationary instead of movable and by making more direct connections between the various operative parts.

Referring to the drawings, Figure 1 is a vertical central section of the machine without the nail-feeding devices. Fig. 2 is a view in rear elevation thereof. Fig. 3 is a view in plan and horizontal section below the line $x\,x$ of Fig. 1. Fig. 4 is a view illustrating the cam and connections for moving the heel-blank and top-lift-feeding devices and also a portion of the devices for moving the heel-blank and top lift from their respective stacks into a position to be moved by their respective carriers. Fig. 5 is a view in plan of the cam and also a portion of the connecting mechanism for moving the heel-blank and top-lift slides. Fig. 6 is a view in plan of the cam and connections for moving the jack out of operative position upon the rotation of the work of the machine. Fig. 7 is a view in rear elevation of the cams for rotating the head. Fig. 8 is a view in front elevation of the revolving head. Fig. 9 is a section across the cam-plate shown in Fig. 7 upon the line $x\,x$. Fig. 10 is a view in vertical section, enlarged, to show the relation of the breasting devices to the templet and heel when operating. Figs. 11 to 14, inclusive, are views of the top-lift carrier in different positions. Fig. 15 is a section, enlarged, upon the line $x\,x$ of Fig. 14. Fig. 16 is a section, enlarged, on the line $y\,y$ of Fig. 13. Fig. 17 is a section, enlarged, on the line $z\,z$ of Fig. 14. Fig. 18 is a view in horizontal section upon the line $y\,y$ of Fig. 1 and in plan of the parts below said line to show the stop-motion mechanism. Fig. 19 is a view in elevation of a modified form of device for turning the revolving head.

A is the frame of the machine.

B is the cross-head. It carries the revolving head C, which is rotated by mechanism essentially like that described in the Henderson and Raymond patent, No. 317,647, although it varies in some minor features, which will be hereinafter specified. The head B is reciprocated by means of the cranks b and pitmen b', as described in said Henderson and Raymond patent.

D is the templet. It is stationary during the operation of the machine, but is removable from the table d. It is represented as fastened in place beneath the caps d' by the bolts d^2; but any other means may be employed for securing it or locking it in place in a manner to permit its ready removal and the substitution of another having a different arrangement of holes.

E is the last or heel-support. It is mounted on the vertically-movable spindle e, which is carried by the jack-post e', which is arranged to slide upon the table e^2 in the ways e^3. The jack-post is moved vertically by a movable head or spindle e^4, which is like that described in said application, is supported in a similar manner, is vertically adjustable, and is operated by the toggle e^5, lever e^6, pivoted at e^7, and the cylindrical block e^8, having the cam-groove e^9 upon the vertical shaft F. This vertical shaft is represented as connected with the main shaft G by means of the worm-wheel g upon the main shaft and a worm-wheel g' upon the shaft F, which meshes with it. I may use, however, bevel-gear in lieu of the worm and worm-gear, if desired. The vertical shaft F carries at its upper end the cam-disk H, having a cam-groove h, which receives the cam-pin h', connected with the nail-carrier slide-plate h^2, which supports at its front end the nail-carrier H'. The cam-pin preferably is carried by a block h^3, which is horizontally adjustable in relation to the slide-plate h^2 by means of bolts h^4 and slots h^5, formed in said plate. The heel-blanks are

carried in the stack M and the top lifts in the stack N, and are fed therefrom respectively by the heel-blank slide and the top-lift slide n, substantially as described in said Raymond application, although the method of operating these slides is somewhat different. The heel-blanks are fed to a pocket m' and are fed therefrom by the heel-blank carrier M', and top lifts fed to the pocket n' and carried therefrom by the top-lift carrier N', as described in said application; but the mechanism for moving the plates is somewhat different and the top-lift carrier is also of an improved construction.

For moving the heel-blank and top-lift carriers M' and N', I employ a cam-disk m^2 on the vertical shaft F, having the cam-groove m^3, the said cam being connected with the heel-blank carrier M' by the lever m^4, pivoted at m^5 and connected by a link m^6, preferably adjustable with the cam-pin m^7, the end of the link m^6 preferably being attached to another link m^8, pivoted at m^9. The top-lift carrier N' is connected with the cam by means of the lever m^{10}, pivoted at m^{11} and connected with the cam-pin m^{12} by a link m^{13}, preferably adjustable, and the inner end of this link m^{13} is also preferably attached to a link m^{14}, which is pivoted at m^{15} to a stationary support. The links m^6 and m^{13} are each made adjustable in the same manner and for the same purpose, and that is to govern the delivery position of the heel-blank and top-lift carriers, so that the position at which the heel-blanks and top lifts are delivered may be varied in relation to the templet and the work-support. Each link is made in two parts m^{16} m^{17}. The part m^{16} has a bolt m^{18} and the side extensions m^{19}. The part m^{17} has a slot which receives the bolt, and is of a width to extend between the side extensions m^{19} and to be supported thereby. It is obvious that by this means the link may be extended or shortened in length, and that this shortening and extension of the links varies the starting and stopping positions of the carriers M' N'.

The heel-blank slide m and top-lift slide n are operated by a single cam-groove n' in the cam-disk N^2, (see Fig. 5,) which is on the vertical shaft F. The cam is connected with the slides m n by means of the lever n^3, pivoted at n^4, one end of which is connected with the slide m by a long link n^5 and the other end of which is connected with the slide n by a link n^6. This lever n^3 is connected with the cam n by means of the rock-lever n^7, pivoted at n^8, one arm of which carries a cam-pin that enters the cam-groove n' and the other arm of which has a link n^9, which connects it with the lever n^3. (See Figs 4 and 5.)

The jack is moved out of operative position on the completion of the nailing by means of a cam projection o upon the cam-disk O upon the vertical shaft F. (See Fig. 6.) This cam projection operates to move the jack through the link o', which is connected at o^2 with the jack-plate, and the bent lever o^3, which is pivoted at o^4 and has a cam-pin o^5, with which the cam o comes in contact. The lever o^3 is connected with the link o' by means of a bolt or pin o^6, which enters a slot o^7 in the link, so as to permit of lost motion between the two parts. This is for the purpose of allowing the jack to be moved into position by hand instead of automatically, although by making a cam-groove of proper shape instead of the cam projection o the last can be drawn automatically into place.

The stop-motion, which is similar to that described in the said Raymond application, is permitted to be operated by the movement of a notched cam P, which maintains the driving-disk P' and the driven disk P^2 in contact during the operation of the machine. This cam P, instead of being rotated, is reciprocated to move the notch for the reception of the pin p of the clutch-lever p' into and out of position by means of the rock-shaft p^2, (see Fig. 2,) which carries a cam-pin p^3, which bears upon the edge cam p^4, which has a notch arranged to receive it. The pin is held in contact with the edge of the cam and drawn into the notch by a spring p^5. (See Fig. 2.) This cam p^4 is not fastened directly to the shaft F, but is bolted to the cylinder-cam e^8 by means of bolts passing through suitable slots formed in the cam-disk, which permit its partial rotation for the purposes of adjustment of the cam-disk upon the cylinder-cam, so that the position of the stop-notch in the cam may be varied to stop the machine at any desired time, because it is obvious that the machine will run until this notch is brought into position to permit the rock-shaft to be moved to turn the cam P and release the clutch-lever p', and that by turning this cam p^4 the position of this notch in relation to the shaft F and the cams thereon may be varied to any required degree. The crank-shaft is connected with the driving-shaft G, as described in said Henderson and Raymond patent. The revolving head C has an arm c, carrying a block supporting a gang or group of awls c', an arm c^2, which carries a block supporting a gang or group of drivers c^3, an arm c^4, which has a flat face and which is of a length to strike or come in contact with the upper surface of the templet upon its downward movement, and an arm c^5, which carries the breasting-knives c^6.

The templet D is laid out as specified in another Raymond application of even date—that is, the holes therein are located from the breasting-line of the finished heel. This permits the breasting-knife to be placed in a permanent position on its arm—that is, it needs no horizontal adjustment, but is arranged so as to be moved downward immediately in front of the face of the templet and closely to it, so that it breasts the edge of the heel upon a line substantially or very nearly in continuation of the front of the face of the templet. This construction is essential, because the templet is not movable, as specified in said Raymond

application first referred to. Consequently the heel-blank must be so located as to expose the section of the front edge which is to be removed in breasting. This enables me also to use the top-lift and heel-blank carrier especially constructed and devised to feed the top-lift and heel-blank with especial relation to a permanent front base-line, which is the breast of a finished heel.

By using a top-lift carrier of the construction herein specified I am also enabled to make a cam of somewhat easier throw than that described in said Raymond application. I prefer that the cam for compressing the heel-blank and moving it relatively to the templet G to permit the feeding of the top lift be constructed so as to provide the work-support E with substantially these movements in relation to the templet D: First, upon the starting of the machine a quick upward movement is given to bring the heel-blank against the under surface of the templet and to partially, if not entirely, compress it before the awls enter the heel. Then if the blank has not been sufficiently compressed to continue, but somewhat slowly, the upward movement of the work-support, so that the compressing of the heel-blank shall continue during the upward movement of the awls, the feeding of the nails, and the downward movement of the drivers and the driving of the nails until it is necessary to move the work-support E downward to permit the feeding of the top lift. This comparatively slow method of compression is advantageous, in that it enables me to construct a much more powerful cam. The cam is also constructed so as to move the work-support E rapidly downward after the nails have been driven and immediately upon the beginning of the upward movement of the drivers. The top lift is then fed into place by the top-lift carrier beneath the templet and the work-support carrying the shoe and attached heel immediately moved upward against the same. It is not necessary that the work-support E be moved downward to its lowest position upon this movement, but only sufficiently to permit the movement of the top lift into position, and as soon as the top lift has been so fed the work-plate is immediately moved upward again by the cam, preferably with a somewhat rapid movement, and then with a slower or more gradual movement, it being moved upward sufficiently to compress or spank the top lift solidly upon the compressed heel-blank and also to further compress the heel, the templet being supported or reinforced, if desired, at the instant of the greatest strain by the flat-surfaced arm c^4, which is then at the end of its lowest movement and comes in contact with the upper surface of the templet, or the slow pressure may be continued until the operation of the breasting-knife. The remainder of the cam is constructed, preferably, so as not to move the work-support E downward until after the operation of the breasting device, or it may be constructed to release to a very slight extent the strain or pressure upon the heel-blank, although I do not consider this necessary. This enables me to breast the heel-blank under pressure. To maintain this constant pressure upon the heel-blank, it is necessary to construct the top-lift carrier as hereinafter indicated. The remainder of the cam is constructed to release or move downward the work-support E immediately upon the completion of the downward movement of the breasting-knife to permit the heel-blank for the next shoe in order to be moved into position for attachment before the machine comes to rest. The lower end of the jack-post *e* may have a block or extension R, provided with an inclined under edge to facilitate the placing or moving of the post *e* upon the toggle-head e^4.

The top-lift carrier is shown in Figs. 3 and 4 and 11 to 17, inclusive, and it is made in two sections—namely, the main section V, which slides in ways in the frame of the machine and is connected directly with the operating-lever m^{10}, and the section *v*, which is carried by the main section V, but which is movable horizontally in relation thereto. It is arranged to slide in said plate V in suitable guides arranged therein, and it has the fingers or backward extensions *v'*, (see Fig. 13,) which mesh with the extensions or fingers v^2, extending from the said section V. The front edge V' of this section *v* does not extend beyond the front edge of the templet, and its object is to permit the top lift to be fed into place beneath the templet and to be held compressed with the heel-blank against the under surface of the templet until after the operation of the breasting device, and in the operation of placing a top lift the top-lift carrier, with a blank under the section *v*, held in place against the gage v^3 on the section *v* of the carrier by the holding-arm v^4, which is also attached to the section V of the carrier, is moved beneath the templet to bring the top lift over the attached heel-blank. The attached heel-blank is then moved upward against the top lift with sufficient pressure to compress or spank the top lift upon the heads of the projecting nails, and at the end of this upward movement the section V of the carrier is immediately returned to its original position, while the section *v* of the carrier remains stationary, being held by the pressure of the heel-compressing cam against the under surface of the templet. This backward or reverse movement of the section V removes the gage v^3 of the top lift from in front of the templet, so that the breasting-knife may be immediately reciprocated. (See Fig. 10.)

In order that the top lift which has been fed forward from the pocket by the carrier upon its outward movement may be held down during the backward movement of the section V and also of the section *v*, the fingers v' v^2 are arranged to form continuations of the two sections of the carrier and, in fact,

make it extensible, so that while one part is movable in relation to the other the passage in which the top lifts are moved forward from the pocket and held during the backward movement of both sections of the carrier is not uncovered or opened in a manner to permit the top lift being thrown up between the two sections of the plate when apart or during the backward movement of the section *v*. The section *v* of the carrier is returned to its original position upon the outward movement of the heel-carrier M′, the said section *v* then being released from pressure from the heel by the downward movement of the work-support E, the front edge of the heel-blank carrier M′ or a projection extending from it coming in contact with the section and moving it backward to its original position or that represented in Fig. 14.

The position which the two sections of the top-lift carrier bear to each other immediately before the feeding of a top lift is represented in Fig. 11, its position immediately at the end of the feeding of the top lift beneath the templet in Fig. 12, and upon the operation of the breasting device in Figs. 10 and 13. I do not confine myself, however, to the use of a top-lift-carrier plate of this special construction, and would say that the form of construction herein specified is especially adapted to two purposes: first, to enable the heel-blank to be held under compression continuously after the spanking of the top lift, and, second, to permit the operation of heel-trimming devices. I have not, however, described the heel-trimming mechanism, as I do not claim the embodiment of heel-trimming mechanism with automatic heel-nailing machines of this order. The vertical shaft F has the lower bearing *f* and the upper bearing *f′*.

In operation the boot or shoe is placed upon the last or work-support E with its sole uppermost, the jack being at the forward end of the bed or table e^2. It is locked thereon by any suitable centering or clamping devices, and I have represented those shown and described in said Raymond application, although I would not be understood as confining myself to them. The heel-blank is in position beneath the templet for attachment, having been moved into place at the completion of the nailing of the last heel, and it is held in position by the holding devices of the heel-blank carrier, which bring its front edge or breast slightly in front of the front edge of the templet. The operator moves the jack, with the boot or shoe thereon, into a position to bring the jack-post over the toggle-head and the heel-seat of the boot or shoe beneath the heel. He then starts the machine, and all the subsequent operations thereof are automatic. Immediately upon starting, the heel-blank is compressed against the templet by the upward movement of the heel-support operated by its cam, and the awls immediately enter the heel-blank and prick the holes. The heel-blank carrier is then immediately withdrawn, while the heel-blank is held under compression against the templet, which compression may be increased, as above indicated. The nail-carrier, having received its load of nails from automatic nail-making devices, (not herein shown, but described in patents granted said F. F. Raymond, 2d,) is then moved forward by its cam to deliver its nails to the pricked holes. The drivers meanwhile have been brought into position, and are reciprocated to drive the nails into the heel-blank holes. Immediately upon the beginning of the upward movement of the drivers the work-support, with the attached heel, is moved downward, the top-lift carrier moved to feed or carry a top lift under the templet, and the nail-carrier is moved backward to its original position. The work-support E is immediately moved upward upon the bringing into position of the top lift, but not to so great a height as before, and the top lift applied to the protruding attaching-nails. The section V of the top-lift carrier is then immediately withdrawn, the section *v* of the carrier remaining stationary. This leaves a narrow section of the heel-blank, and also of the top lift, if desired, extending in front of the face or front edge of the templet, which is removed to breast the heel, and the breasting-knife is immediately moved downward to breast the heel, and upon the beginning of its upward movement the work-support E is moved downward, and then the jack is moved outward automatically, while immediately following this movement the heel-carrier is moved out beneath the templet to bring the heel for attachment to the next boot or shoe into position, and at the same time moves the section *v* of the top-lift carrier backward to its original position. Meanwhile a heel-blank and top lift from the heel-blank and top-lift stacks, respectively, have been fed or moved into position to be taken by their respective carriers, and the machine then automatically stops.

The device for rotating the head C is somewhat different from that described in the said Raymond application and enables the head to be rotated easier at a greater speed than that therein described, because instead of rotating the head a quarter-revolution upon the upward throw of the cross-head I rotate it about one-eighth of a revolution upon the upward movement and about one-eighth upon the downward movement. This mechanism comprises the disk W, (see Figs. 1 and 8,) attached to the shaft *w* of the revolving head, which carries four cam-pins *w′*, and the plate w^2, having the stationary cam-grooves w^3 w^4 w^5. Each of the cam-grooves w^3 w^5 is connected with the central cam-groove w^4 near the upper end of the central cam-groove and also about midway its length, these grooves and connections being arranged so as to permit the rotary movement of the disk. This movement is communicated to the disk by

means of the inclined surfaces w^6 w^7. Upon the upward movement of the head a cam-pin w' comes in contact with the inclined surface w^6, which is made up in part of the surface w^8 of the stationary part w^9 of the plate and in part of the surface w^{10} of the latch-block w^{11}, this latch-block being movable horizontally to and from the groove w^3, so as to permit the passage of a cam-pin by it upon the turning of the head on its downward movement, and it then serves by springing out into the passage or groove as a stop in preventing the pin from returning the same way, and its edge acts as a guide in causing the cam-pin to move upon the upward movement of the head along the turning surface w^6. This latch-block w^{11} is made as a solid block of metal having the inclined surface w^{12} and stud w^{13}, and it is movable in a hole w^{14}, cut in the plate w^2, and is held by the plate and by a boss w^{15} cast thereon. A spring w^{16} serves to automatically return it to its original position. (See Fig. 9.) The guiding-surface w^7 is formed by the surface w^{17} of the stationary block w^{18} and the surface w^{19} of the movable block w^{20}. The movable block is mounted and made movable in the same manner as the block w^{11}, and has an inclined surface w^{21}, with which the ends of the cam-pins w' are successively brought in contact upon the upward movement of the head, the surface w^{19} of the block forming both a stop and guide. The principal advantages arising from this construction are those which come from close and direct connections between the cams and the parts operated by them. For instance, the cam-shaft is engaged directly by the main shaft by means of a worm and worm-wheel. The nail-carrier plate is connected directly with its operative cam, so that there is no possibility that it shall not be brought at the proper time into perfect registration with the drivers and the templet-holes. The heel-blank and top-lift carriers are operated by one cam and through the medium of straight levers only. The slides for feeding the heel-blanks and top lifts from their respective stacks to the carriers are operated directly from a single operative cam. By making the templet stationary instead of movable I do away with the cam for operating it, and by providing the vertical breast-line, which is always practically the same, I am enabled to make the templet-plate stationary, and at the same time to use a breasting device, which requires no adjustment, the portion of the heel-blank which is to be removed in breasting being always located in front of the front edge of the templet. Of course the templet D and nail-carrier H′ and the awls and drivers are removable from their respective holding plates and arms, and they may be attached thereto to be made removable in any desired way.

It will be seen that by using a worm and worm-wheel for connecting the driving-shaft with the cam-shaft I am enabled to get a direct connection between the two shafts, and also one that is very strong, and also one that enables me to rotate the driving-shaft at a very considerable speed relatively to that of the cam-shaft.

While I have described the heel-blank and top-lift carriers as operated by a common cam, I would say that I do not confine myself thereto, as I may use two cams instead of a single one, when desired.

It will be seen upon reference to Fig. 7 that at the end of the turning movement of the head caused by the cam-surface w^7 the head is held locked during the greater part of the remainder of its downward movement and also during its upward movement, until it is again partially turned by the cam-surface w^6 by two of the cam-pins w', one above the center of the shaft w and one below it and the groove w^4, so that during the period that it is not rotated or turning, which is during the operation of the awls, drivers, and breaster, the head is double locked and guided, one pin being held and guided by the straight portion of the central groove w^4 above the lower connections of side grooves w^3 w^5 therewith and the other by the portion of the central groove below said connections.

The breasting devices are shown in Figs. 8 and 10 and comprise the block c^7, which holds the knife c^6, and the presser-foot c^8 and which has a shoulder c^9, against which the upper edge of the presser-foot rests. This block c^7 is horizontally movable on the yielding block c^{10} for the purposes of adjustment, and is locked thereto by the screws c^{11}. The block c^{10} is fastened by steady-pins c^{12} to the arm c^5, and has a slight yielding movement in relation thereto in opposition to the spring c^{13}.

It will be seen that not only am I enabled by the use of a vertical shaft to bring the operative cams into closer and better relation to the various parts which they operate, but I am enabled to reduce or narrow the width of the machine to a very considerable extent, thereby making quite a saving in the cost of manufacture, material, and labor.

I have shown in Figs. 3, 11, 12, 13, and 17 a device for providing the top-lift-holding arm with tension to cause it to hold the top lift firmly against the top-lift gage or abutment during its outward movement, and it comprises a latch-block x, which is pivoted at x' to the section V of the carrier, has an arm x^2, which is connected with the holding-arm v^4 by a spring x^4, and a stud x^5, which extends up through a slot in the section V of the carrier, so that the tension device is upon the upper surface of the plate. This block x^2 has ratchet-teeth x^6, which are engaged by the locking-pawl x^7, also carried by the section V. The pawl x^7 has a pin x^8 extending upward from it, and the latch-block has the pin x^9. This pin x^9 is so placed on the latch-bar that it comes in contact with the stop x^{10} near the end of the backward movement of the section V of the carrier and causes the end of the latch-bar to be thrown or moved to draw the

spring x^4, and consequently the top-lift-holding arm v^4 against the top lift, (see Fig. 13,) and the pawl x^7 holds the latch-bar in this position. The latch-bar is released near the end of the outward movement of the carrier by a stop x^{11}, which holds the pawl and causes it by the further movement of the top-lift carrier to be withdrawn from the ratchet, and to release the latch-bar and the spring x^4 and reduce the tension upon the holding-arm v^4, and during the backward movement of the section V of the carrier the parts remain in this position until the pin upon the latch-bar comes in contact with the stop x^{10} near the end of the backward movement of the plate, as above specified. This causes the holding-arm v^4 to be drawn firmly against the end of the top lift and to clamp it against the top-lift abutment or gage.

Having thus fully described my invention, I claim and desire to secure by Letters Patent of the United States—

1. In a heel-attaching machine, the combination of the nail-carrier H′, the plate supporting the same, a cam-pin passing through and depending from the rear of said plate, and a cam with which said pin engages, substantially as described.

2. In a heel-attaching machine, the combination of a nail-carrier plate having a cam-pin and means, as set forth, for adjusting it thereon, with a cam having a groove which receives said pin and which is constructed to move the plate and the nail-carrier supported thereby into and out of operative position, substantially as described.

3. The combination, in a heel-attaching machine, of the carrier-plate h^2, supporting the nail-carrier H′ and having the slots h^5, with the cam-pin h', supported by a block h^3, the bolt h^4, and the cam having the cam-groove h, which receives the cam-pin, as and for the purposes described.

4. The combination, in a heel-attaching machine, of a nail-carrier plate h^2 and a nail-carrier H′, said plate having a cam-pin, with a vertical shaft carrying a cam-disk located upon the shaft in close relation to the nail-carrier plate h^2 and having a cam-groove h, which receives the cam-pin attached to said plate, as and for the purposes described.

5. In a heel-attaching machine, the combination of the stationary templet D with the nail-carrier plate h^2, the nail-carrier H′, the cam-pin supported by said plate h^2, and a cam having the cam-groove h, which receives the cam-pin h', substantially as described.

6. The combination, in a heel-attaching machine, of a heel-carrier for carrying heel-blanks to a position for attachment to a boot or shoe with a vertical shaft F, a cam-disk m^2, carried thereby, and the horizontal lever m^4, as and for the purposes described.

7. The combination, in a heel-attaching machine, of a heel-blank carrier for feeding heel-blanks to a position for attachment to a boot or shoe, a cam, as set forth, for moving the same connected therewith, and an intermediate adjusting device, as set forth, for varying the extent of the outward movement of the said carrier, as and for the purposes described.

8. The combination, in a heel-attaching machine, of the heel-blank carrier, the straight lever m^4, the cam for operating the same carried by the vertical shaft F, the said vertical shaft, and the adjusting device connecting the cam-pin with the end of the lever, comprising an extensible link, as and for the purposes described.

9. The combination, in a heel-nailing machine, of the lever m^4 for moving the heel-carrier with the link made in two parts m^{16} m^{17}, one of which has the bolt m^{18} and stay-pieces m^{19} and the other of which has a slotted end which fits between the stay-pieces and carries a cam-pin, as and for the purposes described.

10. The combination, in a heel-attaching machine, of a top-lift carrier for feeding top lifts to position for attachment to a heel-blank with a cam and a straight lever m^{10} for connecting the cam with the carrier, substantially as described.

11. The combination, in a heel-nailing machine, of the vertical shaft F, having a cam-disk m^2, with the top-lift carrier and the lever m^{10}, having a cam-pin connecting the cam with the carrier, substantially as described.

12. The combination, in a heel-attaching machine, of a two-part top-lift carrier for feeding top lifts to a position for attachment, a cam, as set forth, connected with said carrier, and an adjusting device, as set forth, forming a part of said connection for varying the extent of the outward movement of the carrier, as and for the purposes described.

13. The combination, in a heel-attaching machine, of the cam, the heel-blank carrier, a connecting-lever, and an extensible link connecting the lever with the cam-pin, substantially as described.

14. The combination, in a heel-nailing machine, of the cam provided with a groove m^3 with a cam-pin m^7, the link m^8, pivoted at m^9 and connected with the cam-pin, the link m^6, the lever m^4, and the heel-blank carrier, substantially as described.

15. The combination, in a heel-nailing machine, of the cam provided with a groove m^3, the link m^4, pivoted at m^{15}, the link m^{13}, the lever m^{10}, and the top-lift carrier, substantially as described.

16. The combination, in a heel-attaching machine, of the heel-blank carrier, a common operating-cam m^3, and the levers m^{10} and m^4, having links m^{14} and m^8, with cam-pins connecting the same upon each side of their centers, respectively, with the heel-blank carrier and with the top-lift carrier, substantially as described.

17. The combination, in a heel-nailing machine, of the heel-blank carrier, the top-lift

carrier, the common operating-cam provided with a groove m^3, the lever m^4, connecting the cam with the heel-blank carrier, and lever m^{10}, connecting the cam with the top-lift carrier, as and for the purposes described.

18. The combination, in a heel-attaching machine, of the vertical shaft F and the cam-disk N^2, supported thereby, having the cam-groove n', with the heel-blank slide m and intermediate horizontal connections, substantially as specified.

19. The combination, in a heel-attaching machine, of the vertical shaft F, having the cam-disk N^2, provided with the cam-groove n', substantially as described, with the top-lift slide n and intermediate horizontal connections, substantially as specified.

20. The combination, in a heel-attaching machine, of the vertical shaft F and the cam-disk N^2, carried thereby, with the heel-blank slide m and top-lift slide n and intermediate horizontal connections, substantially as specified, and in a manner to cause them to be alternately actuated, substantially as described.

21. The combination, in a heel-nailing machine, of the heel-blank slide m, the top-lift slide n, their respective links n^5 n^6, the lever n^3, pivoted at n^4, and the rock-lever n^7, pivoted at n^8 and connected with the lever n^3, and having a cam-pin which engages the cam-groove n', as and for the purposes described.

22. The combination, in a heel-nailing machine, of the sliding jack, the vertical shaft F, the cam O, carried thereby, and the connecting devices comprising the link o' and the horizontal lever o^3, pivoted at o^5, and having the cam-pin o^4, substantially as described.

23. In a heel-nailing machine, the combination, with the driving-shaft G and vertical shaft F, of the stop-motion lever p', and the cam P, having a notch to receive a pin on said lever and provided with an oscillating movement by a cam upon the vertical shaft, as and for the purposes described.

24. In a heel-nailing machine, the combination, with the driving-shaft G and vertical shaft F, of the vertical shaft having the cam p^4 with the rock-shaft p^2, having a cam-pin p^3, which is held in engagement with the said cam by a spring p^5 and the cam P carried thereby, and the lever p', having a cam-pin which engages the said oscillating cam P, substantially as described.

25. The combination, in a heel-attaching machine, of a nail-carrier and a heel-blank carrier, their operating-cams H and m^2, supported by a common vertical shaft F and having connecting levers and links, as set forth, and said shaft, as and for the purposes described.

26. The combination, in a heel-attaching machine, of the heel-blank carrier, the top-lift carrier, the heel-blank-feeding slide, and the top-lift-carrier slide, their respective cams m^2 and N^2, carried by a common vertical shaft, levers and links, as set forth, connecting said parts with the said cams, and said vertical shaft F, substantially as described.

27. The combination, in a heel-attaching machine, of a movable nail-carrier, a movable head or support E, the cams H and O, and cylindrical cam-block e^8 for operating the nail-carrier and support E, carried by a common vertical shaft F, and said vertical shaft, substantially as described.

28. The combination, in a heel-nailing machine, of the stationary templet D, the movable nail-carrier H', the movable head or support E, a cam H for operating the nail-carrier, and a cam e^8 for moving the head, carried by a common vertical shaft F, with said vertical shaft, substantially as described.

29. The combination, in a heel-attaching machine, of the movable nail-carrier H', the movable head or work support E, the slide-jack, a cam H for operating the nail-carrier, a cam e^8 for moving the head, and a cam O for moving the jack, all carried by a common vertical shaft F, with said vertical shaft, substantially as described.

30. The combination, in a heel-attaching machine, of a slide-jack and a cam O for moving the same, a head for moving the jack-spindle, a cam e^8 for operating said head, and a vertical shaft F for supporting the said operating-cams, substantially as described.

31. The combination, in a heel-attaching machine, of the templet, a nail-carrier, a heel-blank carrier, a top-lift carrier, a heel-blank slide and a top-lift slide, a movable head e^4, and a vertical shaft F, carrying cams connected by horizontal connections with said nail-carrier, said heel-blank carrier, said top-lift carrier, the heel-blank slide, the top-lift slide, and movable head, and said cams, substantially as described.

32. The combination, in a heel-nailing machine, of the reciprocating head carrying a rotary head supporting a gang or group of awls and a gang or group of drivers and a heel-breasting device arranged in relation to each other, as specified, with the mechanism for rotating the same, comprising the disk W, fastened to the shaft and rotating it and carrying the pins w', and the plate having the passages or grooves w^3 w^4 w^5, provided with the guiding-surfaces indicated, substantially as described.

33. The combination, in a heel-nailing machine, of the cross-head, means for rotating the head an eighth or substantially an eighth of a revolution during the upper part of the downward reciprocation and the upper part of the upward reciprocation of the said head, and a plate having guiding-passages adapted to receive cam-pins attached to or supported by a disk or support attached to said shaft, which passages have guiding-surfaces w^6 w^7, as and for the purposes described.

34. The combination, in a heel-nailing machine, of the cross-head, means for rotating the head an eighth or substantially an eighth of

a revolution during the upper part of the downward reciprocation and the lower part of the upward reciprocation of the said head, and a plate having guiding-passages adapted to receive cam-pins attached to or supported by a disk attached to said shaft, which passages have the guiding-surface w^6 and the spring-stop w^{11}, as and for the purposes described.

35. The combination, in a heel-nailing machine, of the cross-head, means for rotating the head an eighth or substantially an eighth of a revolution during the upper part of the downward reciprocation and the lower part of the upward reciprocation of the said head, and a plate having guiding-passages adapted to receive cam-pins attached to or supported by a disk attached to said shaft, which passages have the guiding-surface w^7 and the spring-stop w^{20}, as and for the purposes described.

36. The combination, in a heel-nailing machine, of the cross-head, means for rotating the head an eighth or substantially an eighth of a revolution during the upper part of the downward reciprocation and the lower part of the upward reciprocation of the said head, and a plate having guiding-passages adapted to receive cam-pins attached to or supported by a disk attached to said shaft, which passages have the guiding-surfaces w^6 w^7 and the spring-stops w^{11} and w^{20}, as and for the purposes described.

37. The combination, in a heel-nailing machine, of the reciprocating head B, carrying a rotary head C, provided with guide-pins w' and with a vertical guide-groove for holding two of said pins in line with each other, simultaneously as and for the purposes described.

38. The combination, in a heel-attaching machine, of a reciprocating head supporting a head carrying a gang or group of awls and a gang or group of drivers and mechanism for moving them successively into operative position with the stationary templet D, the nail-carrier plate h^2, supporting the nail-carrier H′, the latter having a cam-pin h', with a cam carried by the vertical shaft F and having a cam-groove which receives the said cam-pin and said vertical shaft, substantially as described.

39. The combination, in a heel-nailing machine, of the lifting-head e^4 with the jack-post e, having the projection or post R, provided with an inclined surface, as and for the purposes described.

40. In a heel-attaching machine, a top-lift carrier made in two sections, one of which carries the top-lift gage, and top-lift-holding device and the other of which is movable in relation to the first, and devices, as set forth, for clamping and holding the latter in spanking the top lift against the surface of the templet, as and for the purposes described.

41. The combination, in a heel-attaching machine, of the templet with a top-lift-carrier in two parts V and v, one of which is movable in relation to the other, both of which are moved outward together to feed the top lift and one of which is retained beneath the templet to act as a spanking-plate while the other is withdrawn, substantially as described.

42. In a heel-nailing machine, a top-lift-carrier plate having a section V and a section v, movable horizontally in relation to the section V, as and for the purposes described.

43. In a heel-attaching machine, the top-lift plate comprising the section V, having the extensions v^2, and movable section v, having extensions v', which interlock with the said extensions, as and for the purposes described.

44. The combination, in a heel-attaching machine, of a top-lift carrier in two parts V and v, one of which parts is movable in relation to and upon the other and is held beneath the templet to act as a spanker, substantially as described, and a movable slide, as specified, for moving said portion of the carrier back to its original position, as and for the purposes described.

45. The combination, in a heel-nailing machine, of the top-lift carrier or plate in two parts V and v, one of which v is movable in relation to the other to be retained beneath the templet and to act as a spanker while the other part is being returned to its original position, as set forth, with the heel blank carrier, which is adapted to return the said movable section of the top-lift carrier to its original position upon its outward movement to feed a heel-blank in place for attachment, substantially as specified.

46. In a heel-nailing machine, a top-lift carrier having an arm for holding the top lift in contact with the top-lift gage or abutment, a spring connected with said arm and with a movable latch-block x, and latch-blocks having the teeth x^6 and a pin x^9, the pawl x^{14} for engaging the teeth x^6, and also having a pin x^8 and the stops x^{10} x^{11}, whereby upon the end of the outward movement of the carrier-plate the pawl is released, releasing the tension of the spring upon the holding-arm, and at the end of the backward movement the tension of the spring is restored and the holding-arm drawn upon the edge of the top lift, substantially as described.

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In presence of—
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