(No Model.)

5 Sheets—Sheet 1.

C. R. WEDELIN.

HORSESHOE MACHINE.

No. 318,838. Patented May 26, 1885.

Fig. IV.

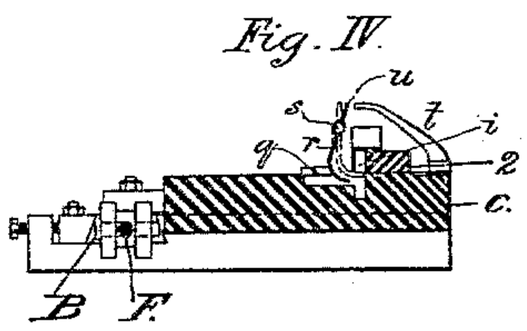
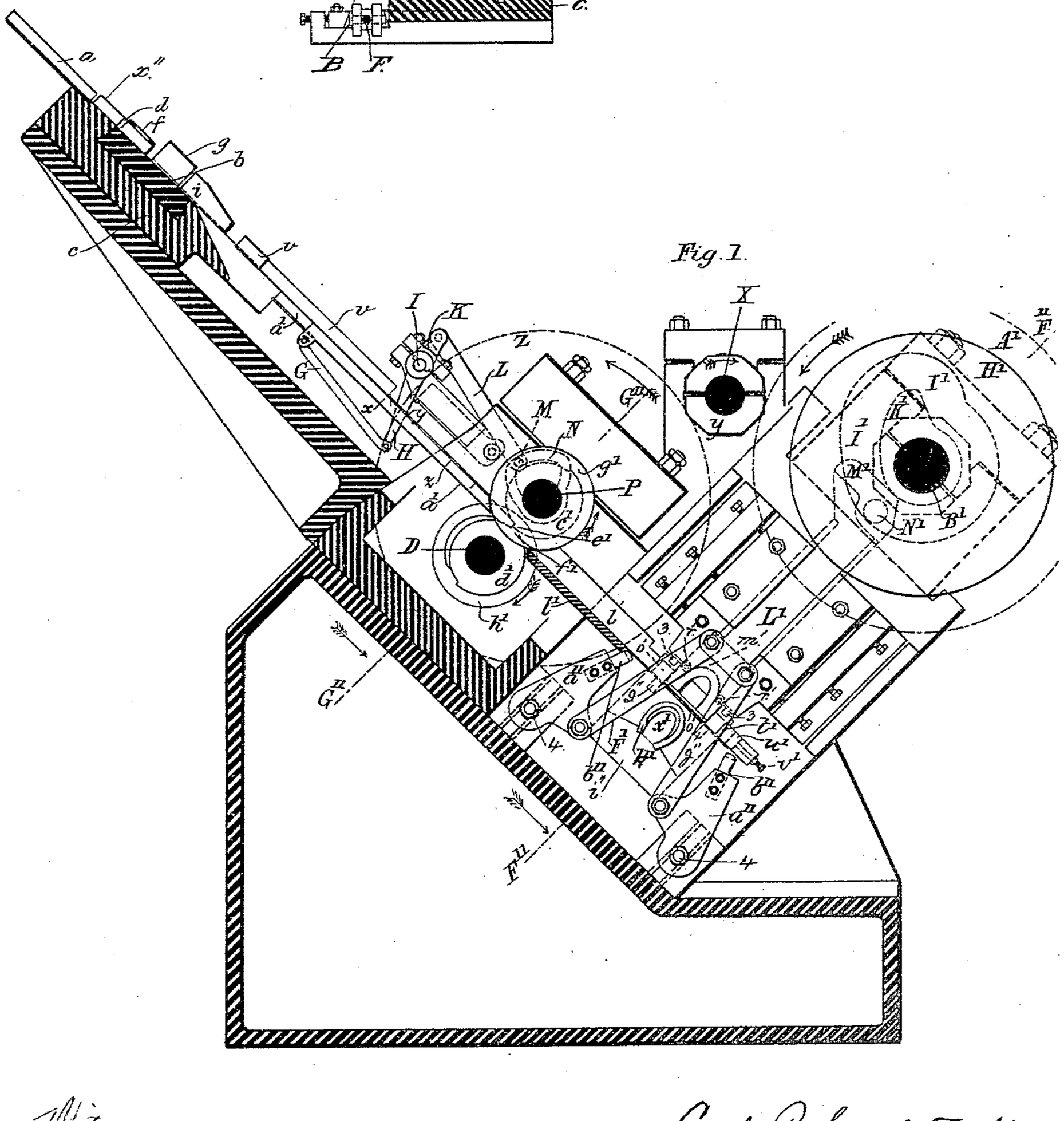


Fig. 1.



Witnesses:
Philip Mauro
C. J. Hedrick

Carl Robert Wedelin
by A. Pollok
his attorney

(No Model.)

5 Sheets—Sheet 2.

C. R. WEDELIN.

HORSESHOE MACHINE.

No. 318,838. Patented May 26, 1885.

Fig. III.

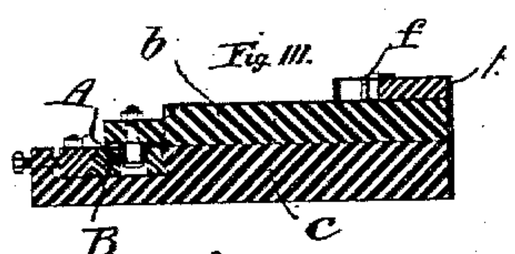


Fig. II.

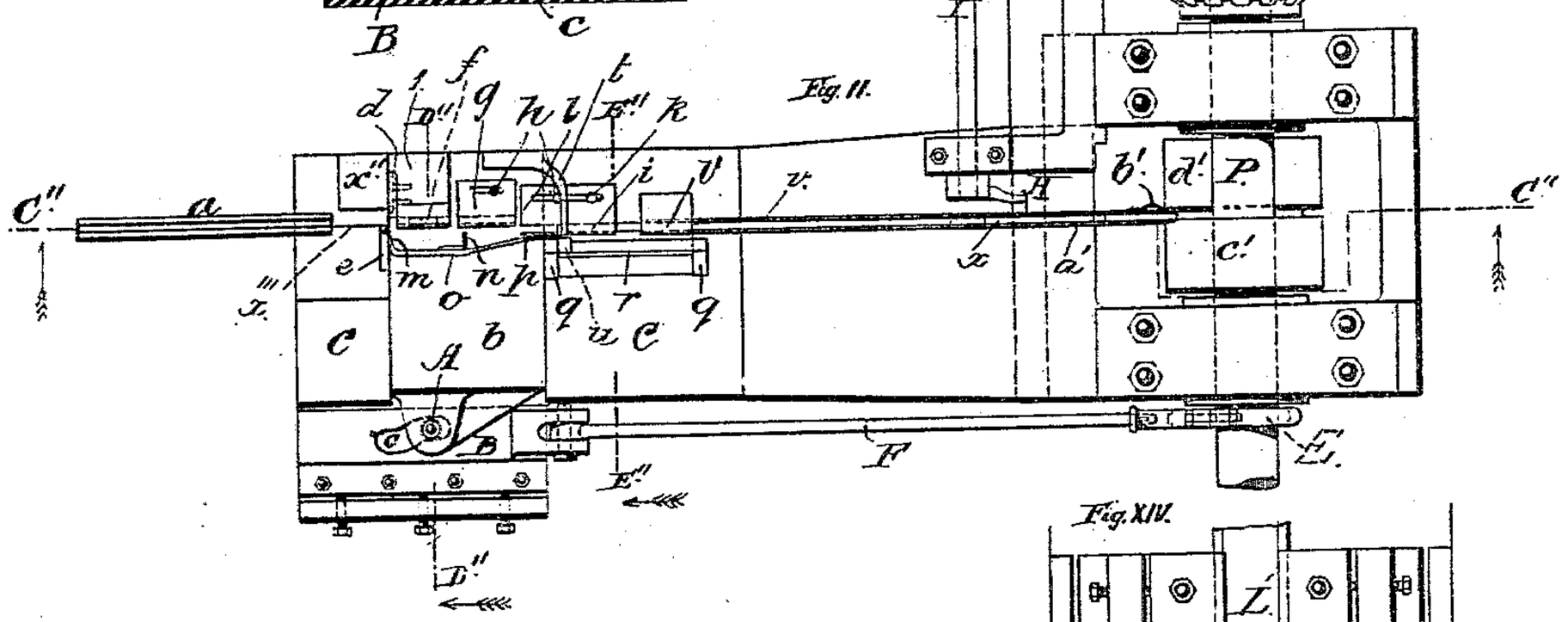


Fig. XIV.

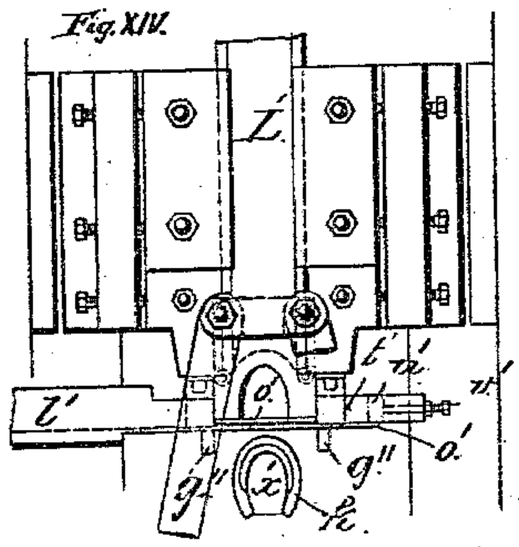
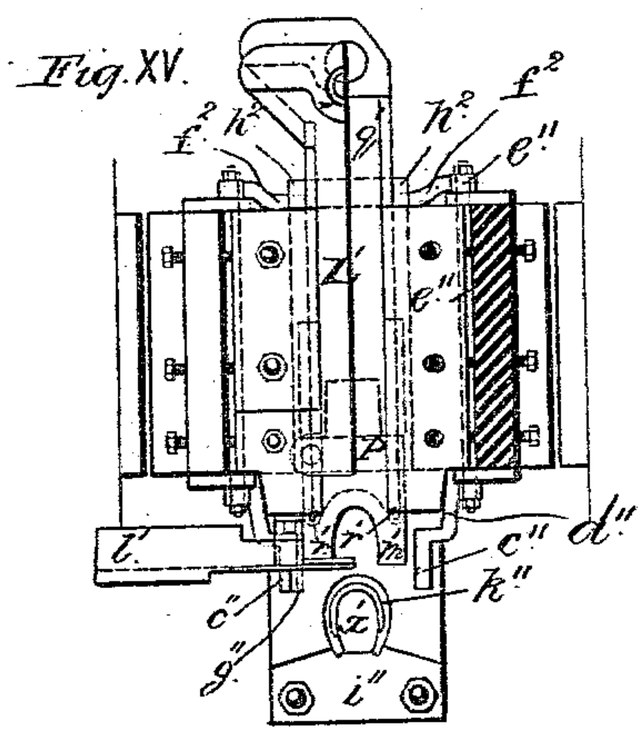


Fig. XV.



Witnesses:
Philip Hammond
C. J. Hedrick

Carl Robert Wedelin
by A. Pollok
his attorney.

(No Model.)

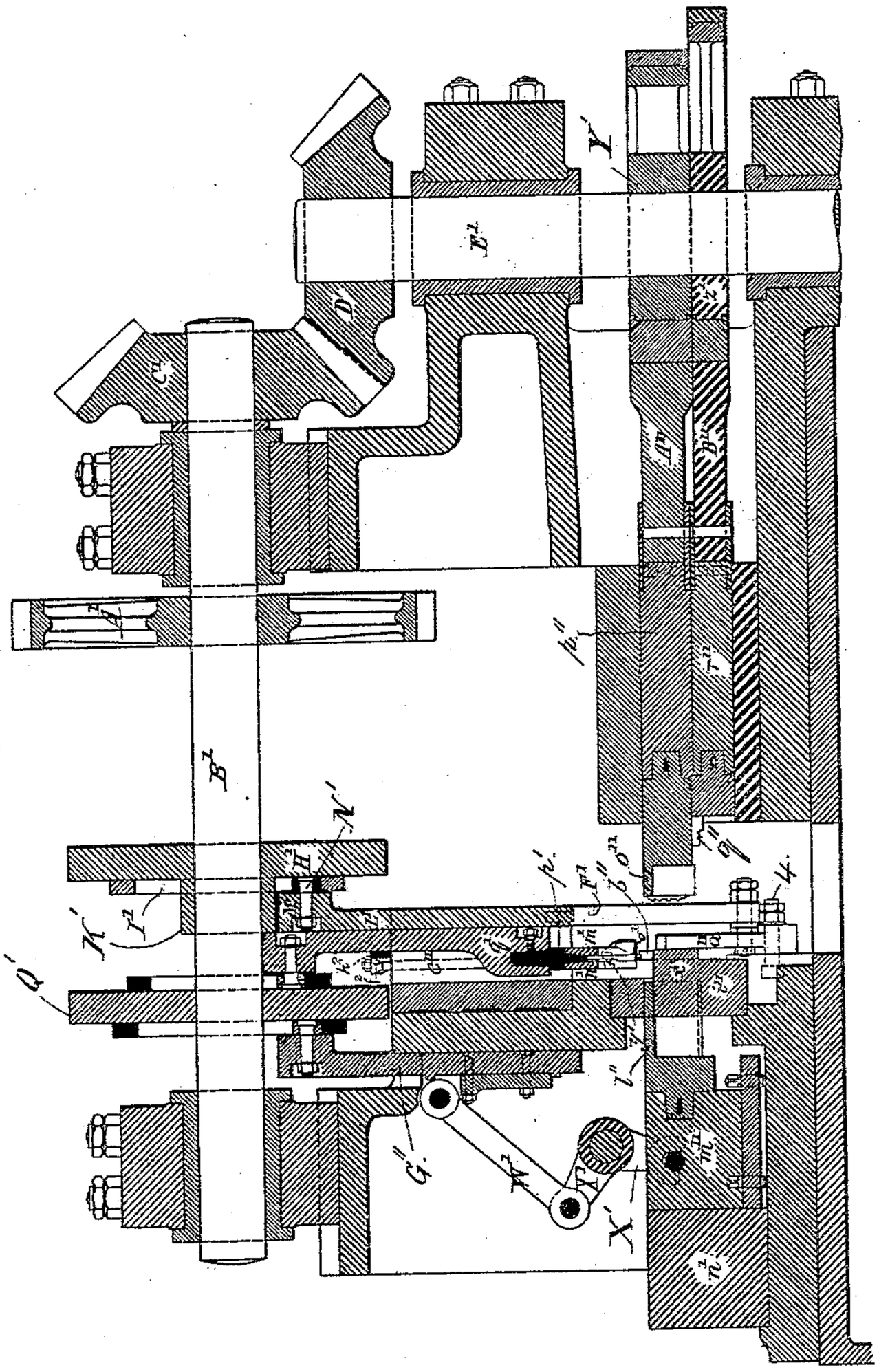
5 Sheets—Sheet 3.

C. R. WEDELIN.

HORSESHOE MACHINE.

No. 318,838. Patented May 26, 1885.

Fig. V.



Witnesses:
Philip Hanna
C. J. Hedrick

Carl Robert Wedelin
by A. Pollok
his attorney

(No Model.)

5 Sheets—Sheet 4.

C. R. WEDELIN.

HORSESHOE MACHINE.

No. 318,838. Patented May 26, 1885.

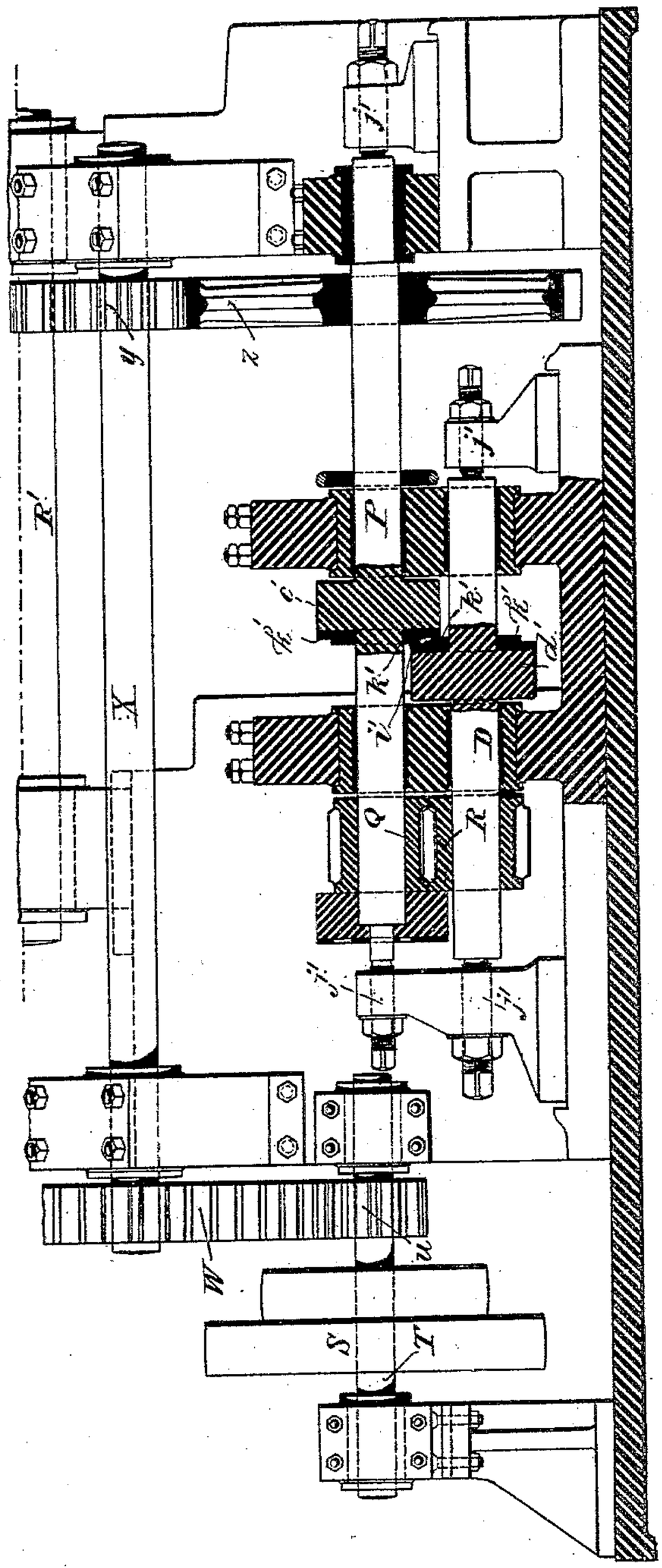


Fig. VI.

Witnesses:

Philip Hanna

C. J. Hedrick

Carl Robert Wedelin

by A. Pollok

his attorney

(No Model.) 5 Sheets—Sheet 5.

C. R. WEDELIN.

HORSESHOE MACHINE.

No. 318,838. Patented May 26, 1885.

Fig. VII.

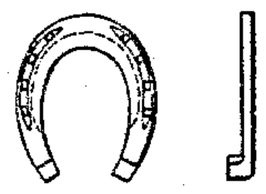


Fig. VIII.

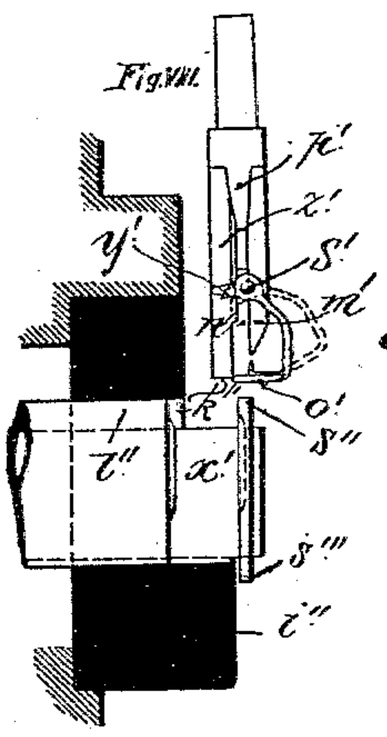


Fig. IX.

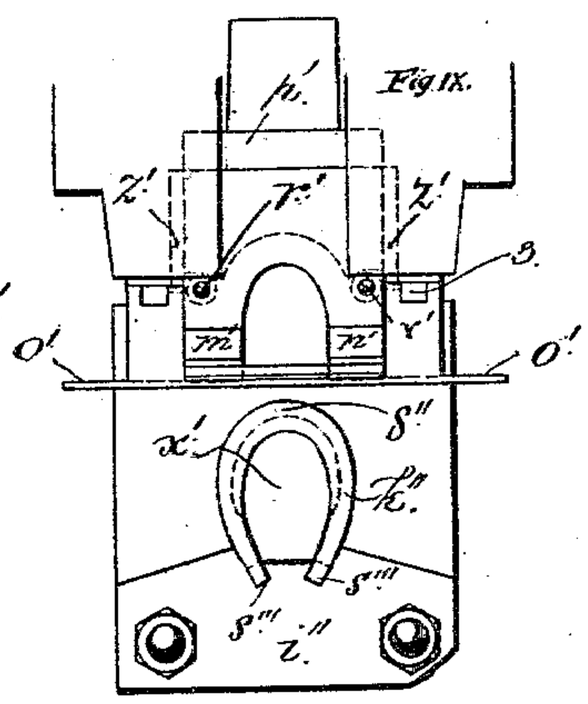


Fig. X.

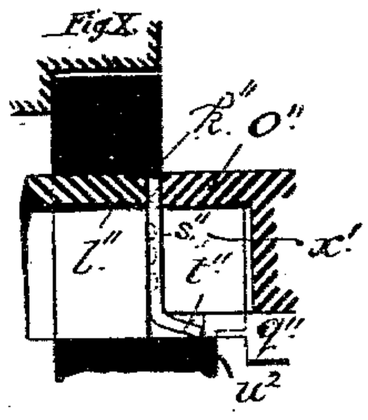


Fig. XI.

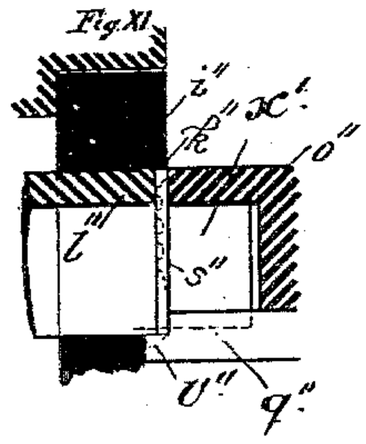


Fig. XII.

Fig. XIII.

Witnesses:
Philip Mauro
C. J. Hedrick

Carl Robert Wedelin
by A. Pollok
his attorney

UNITED STATES PATENT OFFICE.

CARL ROBERT WEDELIN, OF GOTHENBURG, SWEDEN.

HORSESHOE-MACHINE.

SPECIFICATION forming part of Letters Patent No. 318,838, dated May 26, 1885.

Application filed January 20, 1885. (No model.) Patented in England December 3, 1884, No. 15,913.

To all whom it may concern:

Be it known that I, CARL ROBERT WEDELIN, engineer, a subject of the King of Sweden, and residing at 53 Södra Hamngatan, Gothenburg, in the Kingdom of Sweden, have invented certain Improvements in Machinery for the Manufacture of Horseshoes, (for which I have applied for a patent in Great Britain, No. 15,913, dated December 3, 1884,) of which the following is a specification.

The object of my invention is to manufacture horseshoes or the like from hot bar iron or steel so that the metal is entirely finished into the perfect shoe form without requiring reheating or the necessity for removal from one machine to another.

I construct a machine adapted to receive (preferably direct from the rolls) into a spout or guide made for the purpose a bar of hot iron of suitable section for the manufacture of horseshoes. This spout is continued into a further spout formed in different parts sliding one on another, so as to present at different times different lengths of spout, according to whether the parts are in line or otherwise; and it is also provided in some of its parts with knives or cutters, so as that when the requisite length of the hot bar is automatically measured by the relative position of the parts of this spout it shall be automatically cut off by the sliding of one part of the spout out of line with the other part or parts. I provide also a pressing arrangement, whereby any "rag" formed by the cutting of the bar, as described, may be pressed back into the bar, and any bend in the bar be straightened. I prefer to arrange the spouts in an inclined position, so that the bar may pass into the required position by gravity. In continuance of this spout I provide an arrangement of any convenient form, whereby any piece of iron entering the machine which is too short for the formation of such a shoe as the machine is adapted to make may be rejected—that is to say, for instance, the last piece of any bar not exactly divisible into the requisite lengths. The lengths of bar as cut and pressed pass into a second spout or channel (also preferably inclined downward) one by one, when each length of bar is retained by a suitable device—such, for example, as a spring—until a pair of rollers, hereinafter referred to, is in a position to receive it, at which time a pressing-piece is caused by suitable gearing to press against the end of the length of bar with such force as to overcome the resistance of the retaining device, and, following the length of bar for a short distance, it enters it into the grasp of the rollers.

For the purpose of forming the blank so as to give a varying section to the different parts I produce a tight groove or pass, to which I can apply very heavy pressure, but with no tendency to lock the machine, and yet with no room for "fin," as follows: I roll the iron between two rollers which touch each other at one corner of each, so that the tightness of the groove or pass is due to the pressure of faces on the end of one roller against faces on the end of the other roller, which faces I make each in one plane throughout and exactly at right angles to the axis of revolution of the rollers, and I arrange that by end-pressure the faces are kept absolutely touching. I find that with this arrangement of rollers I can arrange the section in all parts, so that the length of bar on emerging from the nip of the rollers shall not follow either roller, but shall come out as a straight or approximately straight bar. The piece of hot iron thus thickened in parts in one direction and reduced in another direction, as may be desired, is passed into a channel or spout, (preferably inclined downward,) whence it passes on a removable bottom into a position between two cheeks and underneath two small pressing-rollers and over a mandrel of the shape which it is desired to give to the inside of the shoe. It is there held by a spring or other convenient retaining device until, by the movement of the parts of the machine described as being above it, it is laid on the mandrel and sufficiently supported by the cheeks and rollers last referred to, when the spring or other holding arrangement is removed. It is, by the continued movement of these parts of the machine and the pressure on the mandrel, pressed up between the cheeks into a part which it more nearly fits, and when it begins to bend it enters a part which it accurately fits, and is there firmly held, so as to prevent the warping which would be apt to occur in the part of the bar forming the toe of the shoe if it were unsupported. By the continued movement of this

part of the machine the rollers (which I prefer to use so as to reduce friction) produce the first bending of the bar in the direction required. I do not, however, effect the entire bending of the shoe by means of this pressure, which would be attended by inconvenience; but after the shoe is bent slightly by that described pressure I apply other direct pressure from each side, and so arrange the sequence of movements in the machine as that the supporting-cheeks before described are pulled off the bent iron while it is still firmly held upon the mandrel by the direct side pressure I have described. Thus I overcome any tendency which might exist for the sticking of the iron in the channel in which it was bent, or the distortion of the shoe on its withdrawal from it.

While the shoe is on the mandrel, and after the pressing-pieces by which it was formed are withdrawn, I cause a die to advance having on its face projections for nail-holes and for what is called the "crease," or either of them, and which die presses the hot iron against a matrix or face bearing projections and recesses, as required, which matrix or face is within a recess smaller than the whole length of the shoe. If heels are to be formed on the shoe by this means, the requisite counterpart is formed or preserved, and at the same time, if required, the heels of the shoe are also bent. I complete the heel end by the pressure of another die following that last described, and in a direction parallel to it, and if extra pieces be required on the toes of the shoe I may use a third die. When the dies are withdrawn, the hind face (or what I have called the "matrix") is caused to slide forward on the mandrel on which the shoe was formed, pushing the shoe before it, which then drops off into a receptacle provided for it; and it will of course be understood that each part of the machine having performed its function is returned automatically to its first position, and that while one part of the machine is performing one function on one piece of hot iron another part is performing another function upon another piece of iron, and so on.

In order that the said invention may be fully understood, I shall now proceed more particularly to describe the same, and for that purpose shall refer to the several figures on the annexed sheets of drawings, the same letters of reference indicating corresponding parts in all the figures.

Figure I is a transverse vertical section taken on the line C″ of Fig. II, looking in the direction of the arrow adjacent to the section-line. Fig. II is a plan of a part of the machine. Fig. III is a section taken on the line D″ of Fig. II. Fig. IV is a section taken on the line E″ of Fig. II. Fig. V is a section taken on the line F″ of Fig. I. Fig. VI is a section taken on the line G″ of Fig. I. Fig. VII shows a horseshoe with calks as made by the machine. Figs. VIII, IX, X are enlarged details of the mechanism for bending the rolled lengths into horseshoe form, and making the lateral formations therein and thereon in making shoes with calks. Fig. XI is an enlarged detail of a modification, showing the arrangement when making shoes without calks. Fig. XII is an elevation and transverse section of a strip or blank cut from the bar before being submitted to the action of the rollers in the machine, and Fig. XIII shows an elevation of the said strip or blank after it has been acted upon by the said rollers, but before it is bent into the horseshoe form. The section at the left hand is taken on the line 1 1, and the section on the right hand is taken on the line 2 2. Figs. XIV, XV are details of the mechanism for bending the strips or blanks into the horseshoe form.

The bar from which the shoes are to be made is preferably taken direct from the rolling-mill while still hot, and is caused to enter a straight spout or guide, *a*, Figs. I, II, which may be advantageously lined with a non-conducting material, such as fire-clay, charcoal-dust, or the equivalent. For the purpose of so introducing the bar, the last rollers in the rolling-mill may be situated at the upper end of the spout or guide *a*, so that the bar is pushed into the spout by the rolling-mill. If the locality or other conditions will not admit such an arrangement, then the spout or guide *a* can be made movable, so that it is placed before the last track of the rolling-mill, and there receives the hot bar, and the said spout or guide is afterward moved to the position relatively with the machine shown in the drawings.

b, Figs. I, II, III, is a slider which is moved backward and forward in the undercut recess in the bed *c* in a direction across or transversely to the spout or guide *a*. The slider *b* is provided with a knife, *d*, bolted to the block 1, and the bed *c* is provided with a fixed counterpart, *e*, of the knife. By this arrangement the cutting of the bar into lengths suited each for the formation of a horseshoe is effected. On the slider *b* is firmly fixed a spout or guide, *f*, formed of a plate fastened to the block 1, and having the outer edge bent down, and also another spout or guide, *g*, of similar construction, which can be adjusted and fixed lengthwise by means of the slot and screw *h*. The bed *c* is also provided with a spout or guide, *i*, formed of a plate fastened on the block or raised part 2, Figs. II and IV, by screws *k* passing through a slot, so that it (the guide) can be adjusted longitudinally. The drawings show the slider *b* at one end of its movement when the spouts or guides *f* and *g* jointly make a continuation of the spout or guide *a*. In consequence of the inclination at which the spouts are placed, the hot bar which is introduced into the spout *a* slides down by gravity until the lower end of the said bar is checked by the end *l* of the plate which forms the spout or guide *i*. This end acts as a stop at the lower end of the spouts or guides *a f g*, so that the bar cannot slide farther down when the parts are in the position shown. By the trans-

verse movement of the slider *b* the knife *d*, in connection with the counterpart *e*, cuts off that piece of the hot bar which is between the said counterpart and the stop *l*, which piece is of suitable length to form a horseshoe-blank. By the movement of the slider *b* the spouts or guides *f g* are brought in line with the spout or guide *i*, and the blank passes down from the spouts or guides *f g* and into the spout or guide *i*.

m and *n*, Fig. II, are two projections on the bar *o*, which is fixed to the bed by the spring *p*, so that the projections move in approximately the arc of a circle described from the point where the spring is fixed. When the blank is cut off, the knife *d* presses the blank against the projection *m*, so that the blank is held or clamped in virtue of the tension of spring *p* between the knife *d* and the projection *m* during the continued motion of the slider *b*, and thus is prevented from sliding down into the spout or guide *i* until the other projection, *n*, is struck by the spout or guide *g*, and the bar *o* is thereby forced back so as to withdraw the projection *m* from its bearing on the upper end of the blank and allow said blank to slide down into the spout or guide *i*.

q q are two lugs or supports fixed on the bed *c*, and *r* is a bent plate movable round the center pin, *s*, carried by the said lugs or supports *q q*.

t is a bent arm, which is fixed to the slider *b*.

When the slider *b* is in the position shown in the drawings, the bent plate *r* is situated in the position shown by the full lines in Fig. IV; but when the said slider moves forward in order to effect the cutting of the bar, then the arm *t* presses against the upper projection, *u*, on the bent plate *r*, so that the plate *r* is thereby moved into the position shown by the dotted lines in Fig. IV. In this position the lower part of the bent plate *r* forms the bottom of the lower portion of the spout or guide *i*, and also the bottom of the upper portion of the spout or guide *v*. It is when the parts are in this position that the projection *m* leaves its hold of the upper end of the cut-off blank, which then slides down into the spouts or guides *i* and *v* onto the bottom formed by the lower part of the bent plate *r*, and thence through the continuance of the spout and guide *v* toward the other parts of the machine. When the slider *b* has returned to the position shown in the drawings, the bent plate *r* is pressed back to the position shown in the drawings in full lines, which may be effected by a spring fixed to the said plate, and by this means the bottom of the lower part of the spout or guide *i* and the upper part of the spout or guide which was formed by the said bent plate is withdrawn. Previous to this the blank has slid off the plate *r* into the spout *v*. The return of the slider *b* also removes the knife *d* from below the end of the bar in the spout *a* and allows it to slide down until it is stopped by the stop *l*. A new blank is cut off at the next movement of the slider *b*, and the already-described operations are repeated, and so on at each stroke of the slider.

x'' is a swage attached to the slider *b* so that it reciprocates with it, and when the knife *d* casts off a blank the lower end of the next blank is straightened by the said piece *x''* pressing it against the opposite side of the shoulder *x'''* on the bed *c*.

I may here state that when, by the movements of the parts described, the iron bar has been cut up into blanks, which have slid down through the spout into the other parts of the machine, it may happen that the last piece of the bar is too short for making a horseshoe. In such a case the upper end of the said last piece of the bar does not reach up to the projection *m*, so that the said projection *m* is not able to bear upon and retain the upper end of the said piece of the bar and thus keep it until the bent plate *r* has been brought into position to form the bottom of the spouts, as aforesaid, and consequently the said piece of bar slides at once through the spout, and, as there is no bottom to support it, it falls to the ground or into a receptacle placed to receive the short pieces. Thus any pieces too short to make a shoe are never passed into the other parts of the machine, and damage to the machine is prevented. If shorter or longer horseshoe-blanks be required, the stop *l* is moved up or down, and is fixed in position by the screws *k*.

Underneath the spout or guide *v* is a rod or pusher, *x*, which has a reciprocating movement along the spout or guide *a'*, situated under the spout or guide *v*, the lower end of the said pusher *x* moving between the points *y* and *z*, Fig. I.

b', Fig. II, is a spring (shown as a leaf-spring) fixed to the side of the lower end of the spout or guide *a'*, so as to press upon the blank and obstruct its passage out of the spout *a'*. As each blank leaves the spouts or guides *f* and *g* and slides down in the spout or guide *v*, as above described, it falls into the spout or guide *a'* in front of the end of the pusher *x*. When the said pusher is in its highest position, with its end at the point *y*, the blank passes down the spout *a'* until the lower end of the said blank bears against the spring *b'*, whereupon the said blank is arrested by the said spring; but immediately after this the pusher *x* on its downward movement presses against the upper end of the blank and pushes it past the spring *b'* and down between the rollers *c'* and *d'*. The roller *c'* is mounted on the shaft P and overlaps the roller *d'*, which is mounted on the shaft D. The operating portions of the rollers *c' d'* are their contiguous ends, not their peripheries. The rollers *c'* and *d'* then make a revolution, and the pusher *x* and the slide *b* make a stroke at the same time, their operating mechanism being so connected together or timed that each time the rollers make a revolution a blank falls from the spouts *f* and *g* exactly in time to be forced to the grip of the rollers by the pusher *x*.

The office of the rollers *c' d'* is to shape the blank, Fig. XII, to the form it is to have before bending—that is to say, of the requisite thickness and thinness and difference in breadth at different parts—for example, as shown in Fig. XIII. To effect this the pass by which the shaping of the blank is effected is made on the ends or adjacent faces of the overlapping rollers, as shown by Fig. VI, so that the rolling into shape is performed partly by the pressure of revolution of the rollers and partly by the lengthwise pressure of the ends of the rollers against each other. Figs. I and VI show how both the rollers are to be shaped in order to give the horseshoe-blank the shape shown in Fig. XIII. It is to be understood that I do not limit myself to this shape, as the blanks may have any other desired or suitable shape given to them by correspondingly varying the shape of the groove between the ends of the rollers, as already mentioned. The blanks are always fed by the pusher *x* to a certain point, *e'* and *f'*, on the rollers, so that the blanks are caught by the rollers and carried between them and partly round them in the said groove formed between them to the points *g'* and *h'*, the remaining portion of the periphery of the rollers being idle.

The advantage of making the pass between the rollers in the position shown instead of between the peripheries of superposed rollers, as is usual, is that the pass by my improved arrangement is fully closed during the entire rolling process, as shown in Fig. VI, so that no fins are formed on the blanks; and, further, by making the side of the pass inclined, as shown at *i'*, Fig. VI, the rollers allow the blank to slip immediately it leaves the groove, so that the blank leaves the rollers in a straight course. If the pass were made in the periphery of the rollers, as usual, the blank would follow the movement of one of the rollers, and would be curved instead of issuing in a straight line. In order to give the necessary pressure of the ends of the rollers against the blank when rolling, the roller-shafts are pressed upon by screws *j'*, Fig. VI. As shown by the drawings, the pass is made in rings *k' k'*, Fig. VI, fixed by screws to the rollers, so that they can be renewed easily when worn or when a different section or side of shoe is to be made.

When the blank leaves the rollers, it slides down an inclined guide, *l'*, Fig. I, which guide has fixed sides and bottom, to and between the cheeks *m'* and *n'* and under the plate or filling *p'*, which is carried by a reciprocating slide, *q'*, and to which said cheeks are fastened, one on either side thereof. The plate or filling *p'* is on its lower side concaved to correspond with the shape which the shoe is to have at the toe or mid part, as shown by the dotted line in Fig. IX, and on each side of this concave portion a roller, *r'*, Fig. IX, is mounted.

The movable bottom *o'*, which supports the blank when it leaves the slide *l'*, is a bent plate, supported and turning upon pins *s'* in lugs 3 on a fixed part of the machine, so that the said plate forms the bottom to the space between the cheeks *m' n'* when the plate is in the position shown in full lines, Fig. VIII. The motion of the blank is arrested by the stop *u'*.

When the cheeks and filling-piece move downward, the projections *z'*, on either side of the cheek *n'*, press against an arm, *y'*, on the bent plate *o'*, so that the said plate is moved to the position shown by the dotted lines in Fig. VIII, and is retained there until the cheek *n'* has returned to its highest position again—*i. e.*, that shown on the drawings. When the plate *o'* is in the position shown by dotted lines, Fig. VIII, then, of course, the space between the cheeks *m' n'* has no bottom.

Beyond—that is, to the right in Fig. I—the cheeks *m' n'* is a short guide, *t'*, having fixed sides. The bottom of this spout consists of a part of the above-described bent plate *o'*.

In the lower part of the guide *t'* is a square movable piece or stop, *u'*, which can be moved backward and forward by the adjusting-screw *v'*.

x', Figs. I, V, VIII, IX, X, XI, is a mandrel or anvil, the outside of which is of a form corresponding to the shape of the inner side of the shoe to be made. It is fastened to or made in one piece with the block or former *i''*, which is fixed on the machine-frame.

When slide *q'*, together with the cheeks *m' n'* and filling-piece *p'*, moves downward, the blank, which now rests between the cheeks *m' n'*, accompanies the said cheeks in their descent until the middle of the said blank touches the upper part of the mandrel or anvil *x'*, and it is then by the further descent of the said slide and cheeks bent over the said mandrel or anvil by the rollers *r' r'*. During this bending the blank is pressed between the cheeks *m' n'* and between the rollers *r' r'* until it bears against the filling-piece *p'*, so that the toe of the shoe receives its proper shape from the interior surface of the said filling-piece, and, being confined on all sides, cannot be distorted. After this bending the levers *a''*, which are pivoted at 4 to the machine-frame, Figs. I and V, are brought by turning on their centers to bear one from each side against the ends of the blank to force them against the mandrel or anvil *x'*, and finish the shaping of the shoe into the curved form. The steel bearing-pieces *b''*, fixed to the said levers, form the adjustable and removable bearing-surfaces of the said levers *a''*.

In order to prevent the blank from dropping onto the anvil when the bottom *o'* is removed, instead of being carried down with the slide *q'*, retaining devices are provided on either side of the cheek *n'*. These devices consist each of a rod, *c''*, (see Fig. XV,) affixed by an arm, *d''*, to the lower end of a rod, *e''*, capable of a movement of partial rotation. To the upper end of each of the said rods *e''* is affixed an arm, f^2, on which a spring bears in such a way as to force the rod *c''* against the blank, which projects beyond the cheeks *m'* and *n'*. When the movable bottom *o'* is

turned to the side, as shown by the dotted lines in Fig. VIII, the said springs force the rods c'' c'' to press on the projecting ends of the blank and force it against the cheek m', so as to retain the said blank in position and prevent it from falling, and the said rods c'' c'' continue the pressure on the blank while the rollers r' r' are operating on the blank and until they begin forcing it over the mandrel or anvil x', the said rods c'' pressing the blank during the first part of the descent against the cheek m', and during the next part of the descent against the turned-down bars g'' g'', Fig. XIV, provided for the purpose, so that the blank is thereby kept in its position against the rollers r' r' till the bending round the mandrel or anvil has commenced. When the blank has in this manner been bent round the mandrel or anvil x', the rollers r' r', cheeks m' n', and slide q' return to their former position—*i. e.*, that shown in the drawings—the levers a'' a'' continuing during this movement still to exert such pressure upon the sides of the shoe as to counteract any tendency which may exist for lifting the shoe from the mandrel. When this object is accomplished, the levers a'' a'' also return to their former position, and the parts are then ready to receive and afterward operate upon another blank from the rollers c' and d'. The blank, which has been bent meantime, remains on the mandrel or anvil x', as shown at S'', Figs. VIII and IX, and when the slide q' arrives at its highest position the wedge-shaped pieces h^2, Figs. V and XV, formed thereon, press against the arms f^2 and return the rods c'' to their normal position, so that they do not hinder the next blank from sliding down the guide. At this time the projections z' on each side of the cheek n' have ceased to bear on the small arm y' on the movable bottom o', and a spring moves this bottom back to the position shown in full lines in Fig. VIII. The stop u' is adjusted by the screw v' so that the middle of the blank is caused to take up its position just over the middle of the mandrel or anvil x', so as to insure that one-half of the blank comes on each side of the said mandrel or anvil x'.

i'', Figs. I, V, VIII, IX, is a former, through which a hole, k'', is made, of the same shape as the shoe. In this hole is placed a bottom swage, l'', Figs. V, VIII, which has its end shaped to correspond to the upper side and top bail of the shoe being formed. The said swage l'' is attached to the slide m'', Fig. V, and reciprocates with it. Before the commencement of the swaging of the shoe the swage l'' and slide m'' rest against the fixed piece n'.

o'' is a swage which is attached to the slide p'' and reciprocates with it. The said swage o'' is provided with crease-pieces and punches to make the grooves and punch, or partially punch, the nail-holes in the shoe; and the rest of the said swage—that is to say, the bottom of its face—is shaped to correspond to the shape of the under side of the shoes being made.

q'', Figs. V and X, is another swage, attached to the slide r'' and reciprocating with it. This swage q'' consists of two projecting square rods of the same shape as the ends of the calks of the shoe. Only one of these rods is shown on the drawings, as the other is cut away by the line of section.

When shoes with calks are being made, the blanks are cut off such a length that after the shoe has been bent around the mandrel or anvil x' by the action of the rollers r' r' and levers a'' a'' the ends s''' of the blank project, and from these projecting ends the calks are bent up. The swage o'' approaches and pushes the bent shoe into the hole in the former i'', where the said shoe is swaged against the swage l'', and thus the necessary grooves and nail-holes are formed in the said shoe. At the same time the ends s''' of the shoe are bent up, as shown at t'' in Fig. X, by being forced against the fixed part u^2, Fig. X, on the lower side of the former i''. Just after the swage o'' has acted the swage q'' follows and squeezes or swages the bent shoe ends t'' so that the calks are thereby perfected. The swages o'' and q'' then retire and the swage l'' advances over the mandrel or anvil x' and forces the completely-formed shoe from off the said mandrel or anvil, the said shoe falling upon the floor or into a receptacle placed to receive it.

The machine thus cuts the bars into blanks and afterward acts upon all the blanks so cut, the said machine performing different functions upon different blanks as they pass through its several parts, and shoes are thus continuously produced from the bars fed into the entry spouts or guides of the machine.

The former i'', mandrel or anvil x'', swages l'' o'' q'', rollers r' r', and cheeks m' and n', with the middle piece, p', are easily substituted by similar parts of larger or smaller size to make larger or smaller shoes, as may be required. The section of the groove of the blank-forming rollers c' d' and of the subsequent receiving parts can of course be varied in accordance with the shape of the shoe to be made.

If shoes without calks are to be manufactured, the lengths of bar forming the blanks are cut off a little shorter, and the operating parts of the swage q'' are made so much longer that they squeeze the lower ends of the shoe, as shown in Fig. XI. There are also provided on these operating parts projecting pieces v'', which cut off and even the lower ends of the shoe. For this purpose the former i'' is altered, the projecting part u^2, Fig. X, for bending the calks being dispensed with, as also shown in Fig. XI.

If it be desired to form a special piece or pieces on the toe or curved part of the shoe, a special swage may be used, it being situated opposite to the toe or curved part of the shoe, and being operated in substantially the same way as that in which the swages o'' and q'' are

operated. If extra metal be required for the said special piece or pieces, the blanks are rolled by the blank-shaping rollers with the requisite extra amount of metal at the required parts.

I have described how the horseshoes are formed by the different parts of machine. I will now describe the most convenient means with which I am acquainted for imparting the necessary movements of the operating parts, premising that I do not necessarily limit myself to any particular mode of giving the said movements.

The slider *b* may conveniently be operated by the following means: On the said slider *b* is placed a roll, A, which engages in a curved slot, C, in a slider, B, Figs. II and III, which reciprocates transversely to the movement of slider *b*, and so imparts the necessary movement to the slider *b*. The slider is reciprocated from the upper roll or shaft, P, by the eccentric E, Fig. II, and eccentric-rod F.

The feeding-rod or pusher *x*, Fig. I, may conveniently be operated by a rod, G, fastened at one end to the said pusher, the other end of the said rod G being attached to an arm, H, on one end of shaft I, Fig. II. On the other end of the said shaft I is placed another arm, K, which is attached to one end of the rod L, the other end of which rod L carries a roll, M, which works in a cam-groove, N, in the disk O in the end of the upper roller-shaft, P. The said cam-groove N is so shaped that when the roller-shaft revolves the groove N imparts a reciprocating motion to the rod L, the arms K and H, and the connecting-rod G, which latter gives the pusher *x* the required reciprocating movement at the proper times. The shafts P and D of the rollers *c' d'* are geared together by the equal pinions Q and R, Fig. VI, one on each shaft, so that the rollers *c' d'* have equal velocities.

The whole machine may be driven by any suitable motor, arranged to operate by any suitable gear upon one of the roller-shafts. In the arrangement shown in the drawings the gearing consists of a pulley, S, mounted on the shaft T, which carries a pinion, *u*, gearing with the wheel W, fixed upon a shaft, X, on which also is fixed a pinion, Y, which gears with the wheel Z on the upper roller-shaft, P, and thus gives the rollers their movement. The pinion Y also gears with the wheel A', Figs. I and V, on the shaft B' and gives the shaft its movement. The wheels Z and A' have the same number of teeth, so that the shaft B' makes the same number of revolutions as the rolling-shafts P and D.

The shaft B' imparts movement to the upright shaft E', Fig. V, by means of the bevel-wheels C' and D', which have the same number of teeth, and therefore the shaft E' makes the same number of revolutions as the shaft B', and as the rolling shafts P and D. On the shaft B' is fixed a cam-disk, H', Figs. I and V, in which is a cam-groove, I', and at the side of which is a cam-piece, K', Fig. I.

On the slide L' is arranged a rounded head, M', and a roll, N', which engages in the cam-groove I', and thereby has a reciprocating movement imparted to it. As the shaft B' revolves, the arm K' bears on the head M' of the slide L', and thereby depresses the said slide, the upward motion of which is obtained by groove I' operating on the roll N'. The slide L' imparts its upward and downward reciprocating motion to the lower bending-lever, *a''*, by the connecting-rods F'.

The slides *q'* and G'' receive their motions from the double cam-disk Q', Fig. V, by rolls carried by the said slides engaging in their respective cam-grooves.

The bottom swage, *l''*, and slide *m''* obtain their motion from the slide G'' by means of the connecting-rod W' and the bell-crank lever X', as clearly shown in Fig. V.

The slides *p''* and *r''*, carrying the swages *o''* and *q''*, obtain their motion from the eccentrics Y' and Z' on the shaft E', and the rods A'' and B''. If a third swage be used for shaping the toe of the shoe, as aforesaid, it may be operated in the same manner.

All the operating mechanism is so arranged and timed that the motions of the different parts of the machine are executed at the proper relative times during the operation of the machine.

The hereinbefore-described guides or spouts, which lead the bar and blanks from one part of the machine to another, may be of any suitable inclination to allow of the action of gravity.

Having now particularly described and ascertained the nature of my said invention and in what manner the same is to be performed, I declare that what I claim is—

1. In a horseshoe-machine, and in combination with the mechanism for shaping and bending the blanks, the inclined spouts or guides, arranged in advance of the bending mechanism, for conducting the bar and unbent blanks from one part of the machine to another by gravity, substantially as described.

2. In a horseshoe-machine, the combination, with the stationary guides or spouts, the movable guides or spouts, and the knives, of the bar *o*, provided with projections *m* and *n*, and the movable bottom *r*, substantially as described.

3. The combination, with the guide or spout for the entering bar, the slider, and the knives, one stationary and the other movable, of the piece for straightening the end of the bar, the said piece being carried by the slider and arranged opposite a shoulder on the bed, substantially as described.

4. The combination, with mechanism for bending the blanks into horseshoe form, of the overlapping pressing-rollers by which the blanks are shaped preparatory to bending, the said pressing-rollers having the pass between them formed in the adjacent faces or ends of the rollers, substantially as described.

5. In a horseshoe-machine, the rollers *r'*, the cheeks *m'* and *n'*, and the filling-piece *p'*, hav-

ing on the bottom the shape of the mid part of the shoe, in combination with the mandrel or anvil, the blank being confined by the cheeks while being bent upon the mandrel, to prevent distortion, substantially as described.

6. In a horseshoe-machine, the movable rods c'' and fixed rods g'' and the movable bottom o', in combination with the cheeks, filling-piece, and mandrel or anvil, substantially as described.

7. In a horseshoe-machine, the combination, with the mandrel or anvil, and the cheeks and filling-piece for carrying the blank down on said mandrel, of the levers which bend in or bear upon the lower parts of the shoe, said cheeks and levers being actuated as described, so that while the cheeks are being withdrawn after the blanks are bent the said levers still exert a pressure to retain the blanks on the mandrel or anvil, substantially as set forth.

8. In a horseshoe-machine, and in combination with the mandrel or anvil, the swages or pressing-tools, and co-operating parts for acting upon the blank on the mandrel, swages or pressing-tools comprising a swage for pressing upon the front part of the shoe to form the creases and nail holes or points, and a second or supplementary swage for pressing upon the shoe at the heels to form the calks, or to squeeze or shape the ends when calks are not to be made on the shoes, substantially as described.

9. The combination, with the mandrel and former, having a hole to receive the shoe, of the swage l'', forming the inner wall to said hole, and movable so as to dislodge the formed shoe from the mandrel or anvil, substantially as described.

10. The combination of the overlapping rollers, the guides or spouts, the anvil or mandrel, the cheeks and filling-pieces, the bending-levers, and the swages for acting upon the blanks on the anvil, substantially as described.

11. The overlapping pressing-rollers mounted upon parallel axes, and having a pass or groove of varying cross-section formed in the adjacent ends of said rollers, substantially as described.

In testimony whereof I have signed my name to this specification in the presence of two subscribing witnesses.

CARL ROBERT WEDELIN.

Witnesses:

EDWD. GEO. DAVIES,

CHAS. JAS. JONES,

Both of 47 Lincoln's Inn Fields, London, W. C.