(No Model.) 4 Sheets—Sheet 1.

S. F. COHIN.

BORING MACHINE.

No. 326,202. Patented Sept. 15, 1885.

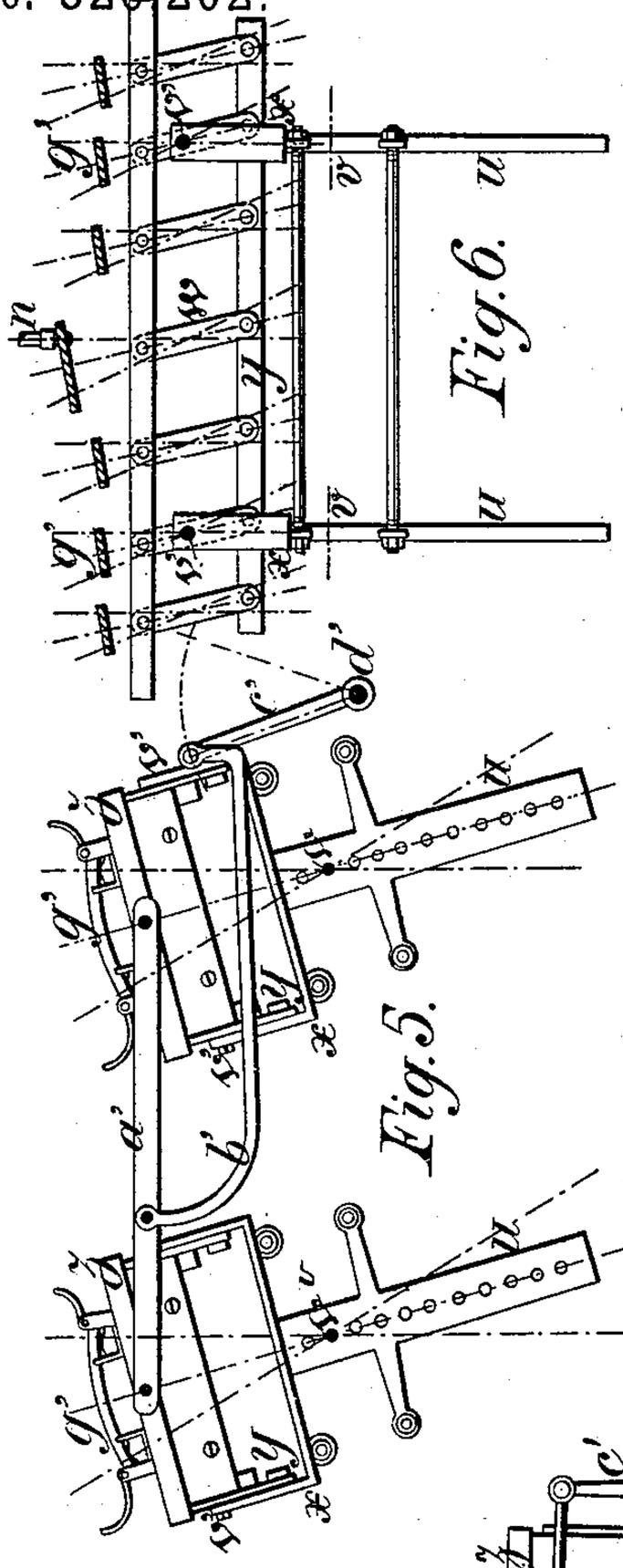


Fig. 5.

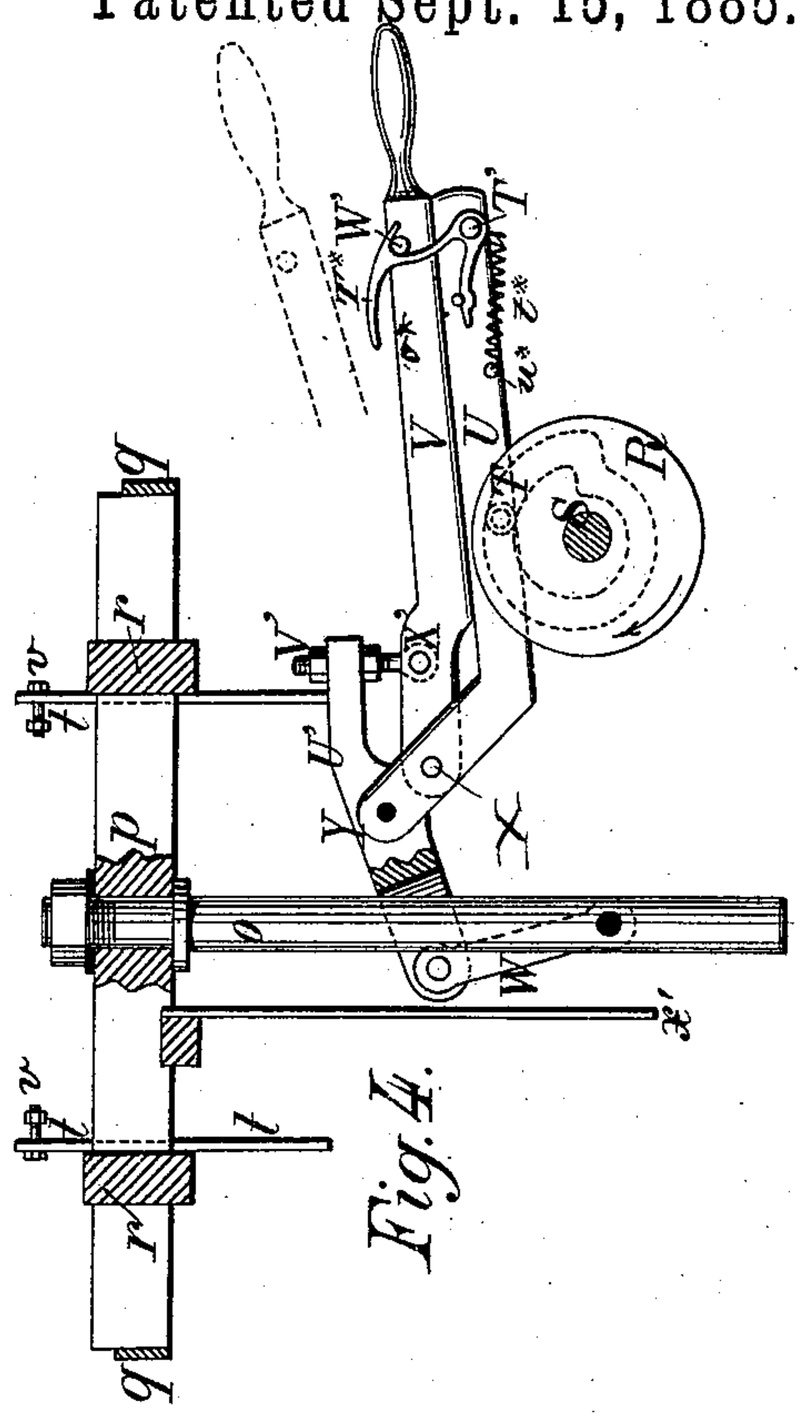


Fig. 4.

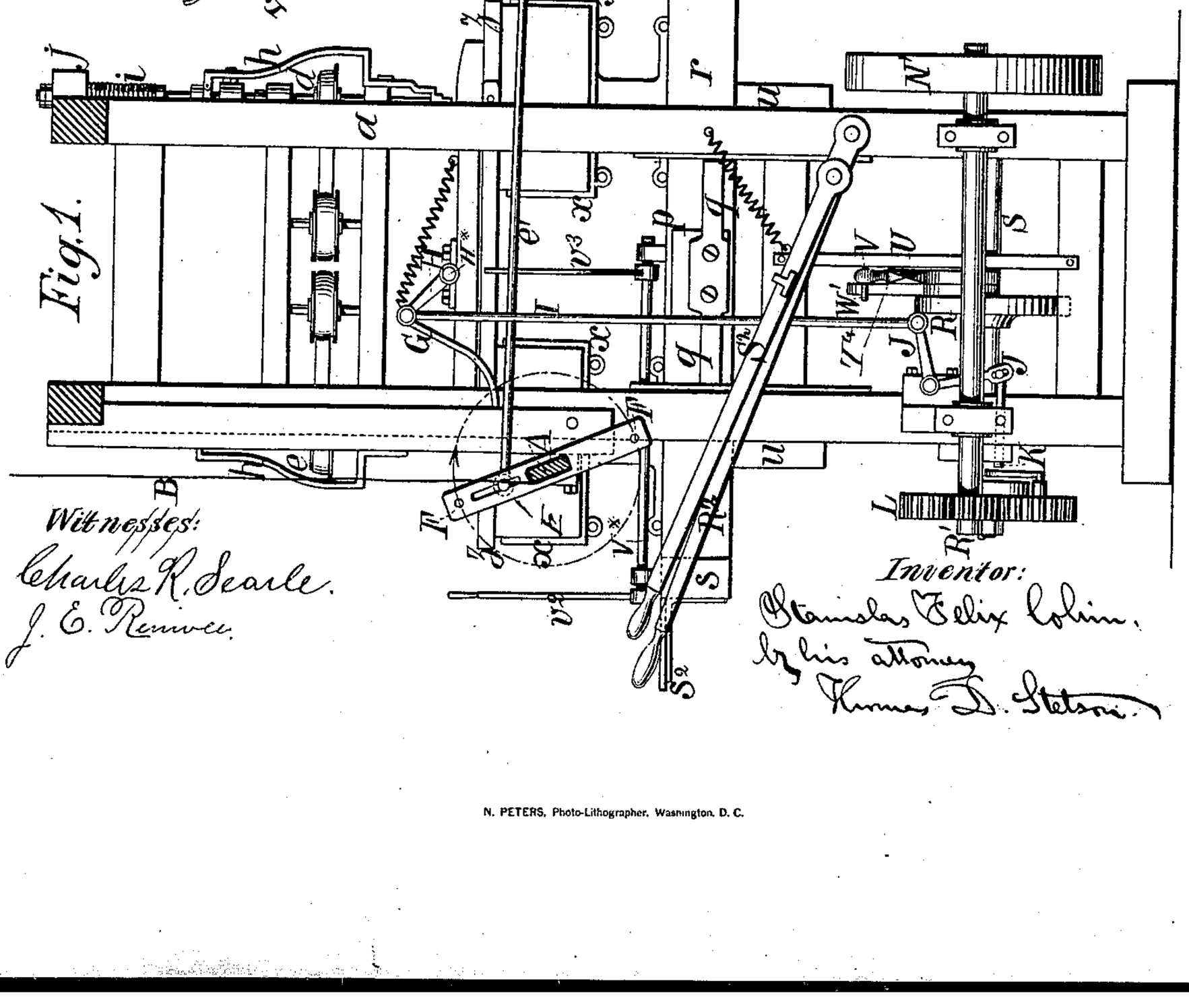


Fig. 1.

Witnesses:
Charles R. Searle.
J. E. Renwick.

Inventor:
Stanislas Felix Cohin.
by his attorney
Thomas D. Stetson.

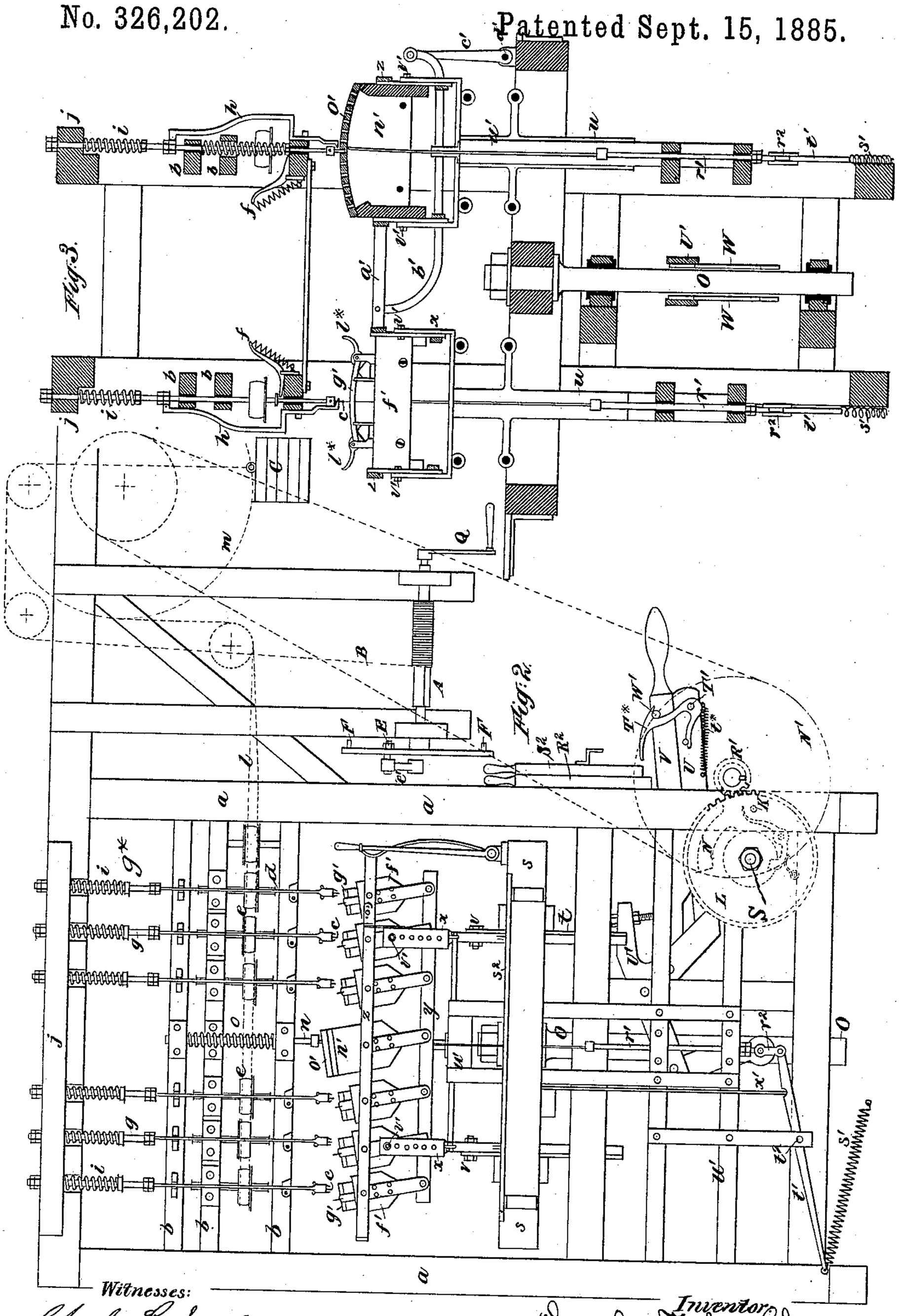
(No Model.)

4 Sheets—Sheet 2.

S. F. COHIN.

BORING MACHINE.

No. 326,202. Patented Sept. 15, 1885.



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Inventor:
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(No Model.)

4 Sheets—Sheet 3.

S. F. COHIN.

BORING MACHINE.

No. 326,202. Patented Sept. 15, 1885.

Fig. 1.

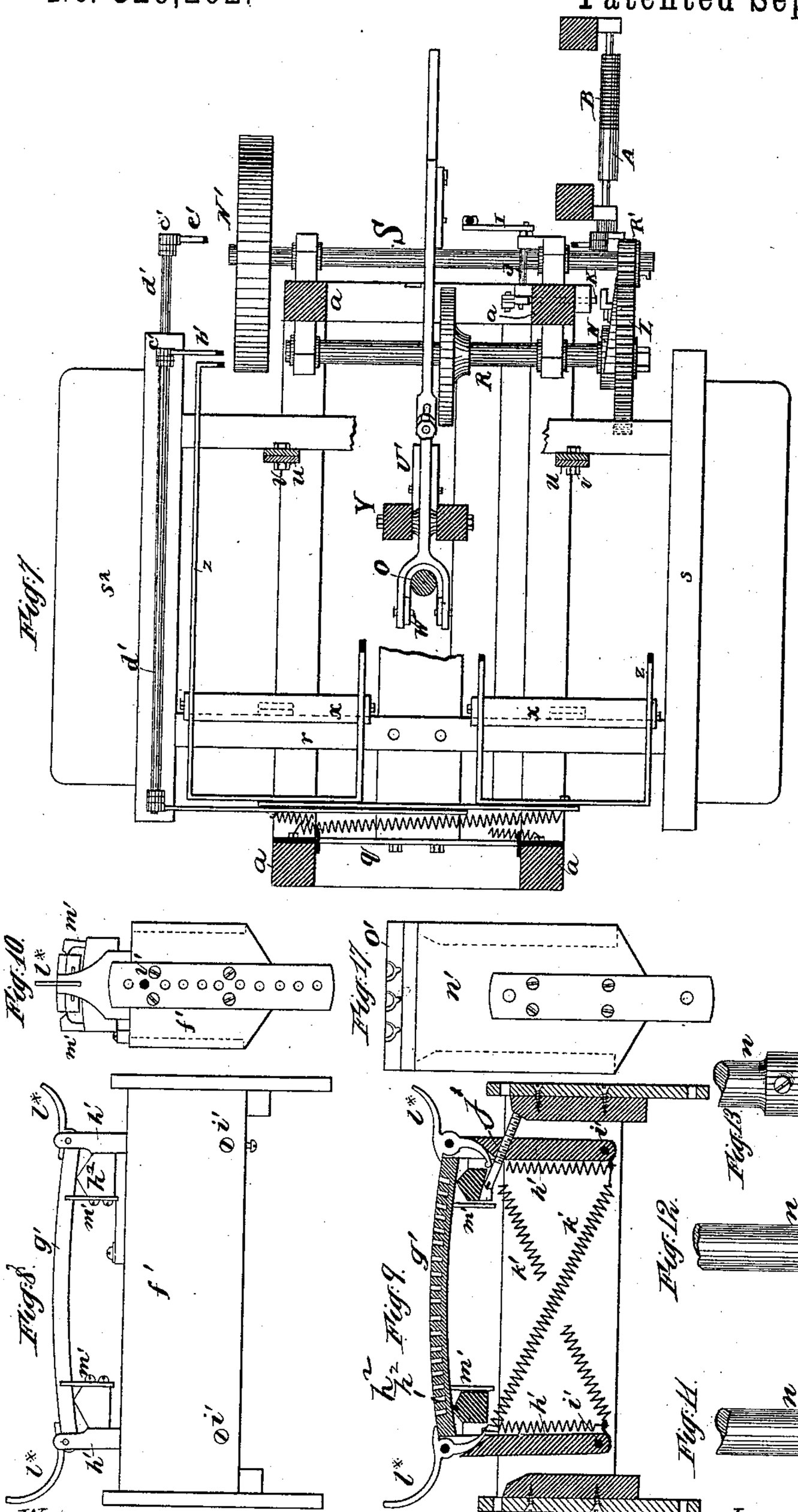


Fig. 16.

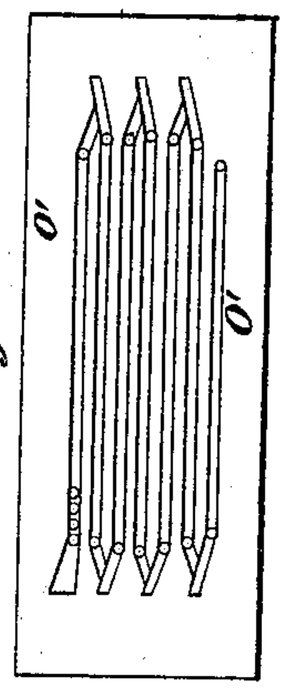


Fig. 15.

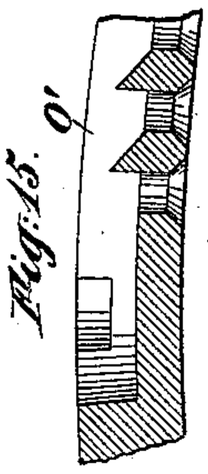


Fig. 14.

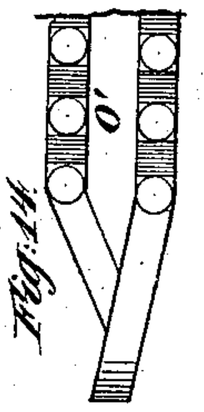


Fig. 10.

Fig. 11.

Fig. 8.

Fig. 9.

Fig. 13.

Fig. 12.

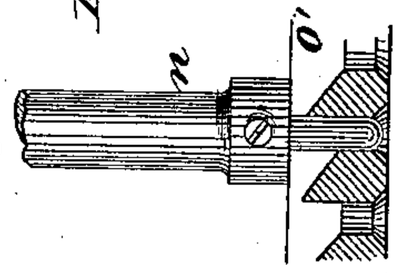
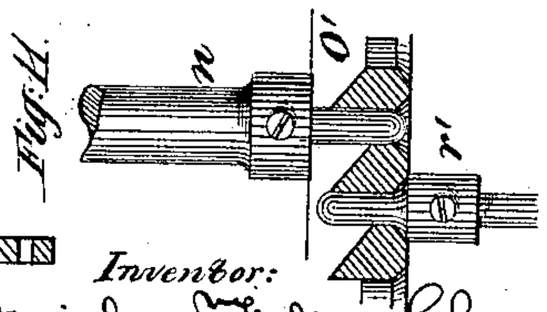


Fig. 17.



Witnesses:
Charles R. Searle.
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Inventor:
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by his attorney Thomas D. Stetson.

(No Model.) 4 Sheets—Sheet 4

S. F. COHIN.

BORING MACHINE.

No. 326,202. Patented Sept. 15, 1885.

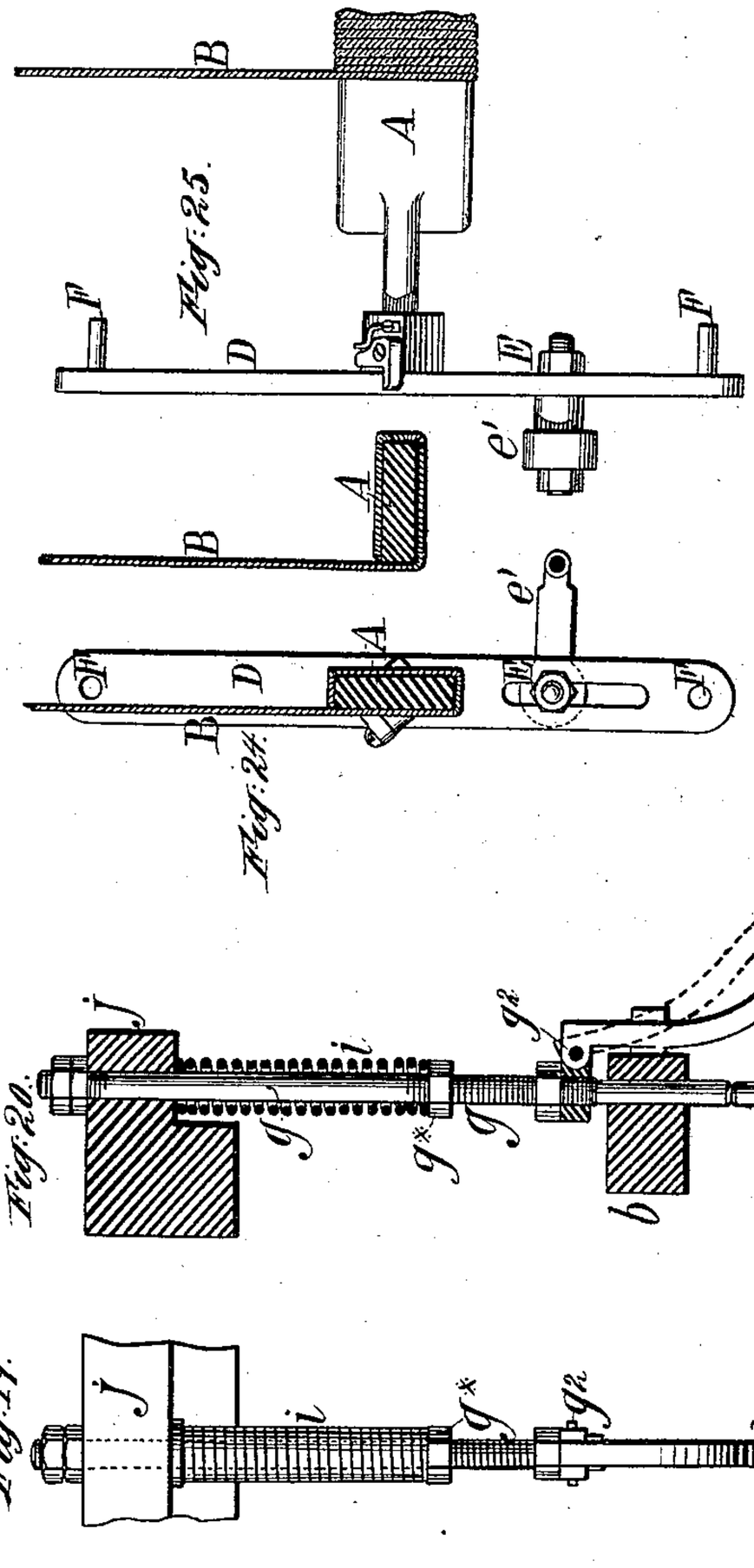

Fig: 25.

Fig: 24.

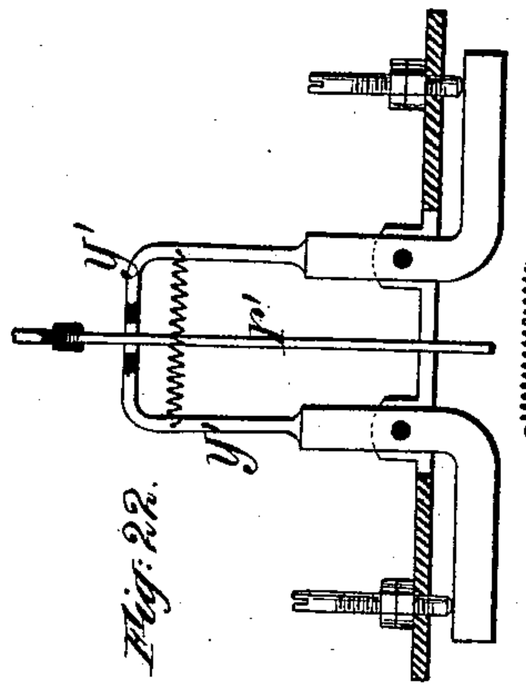

Fig: 22.

Fig: 23.

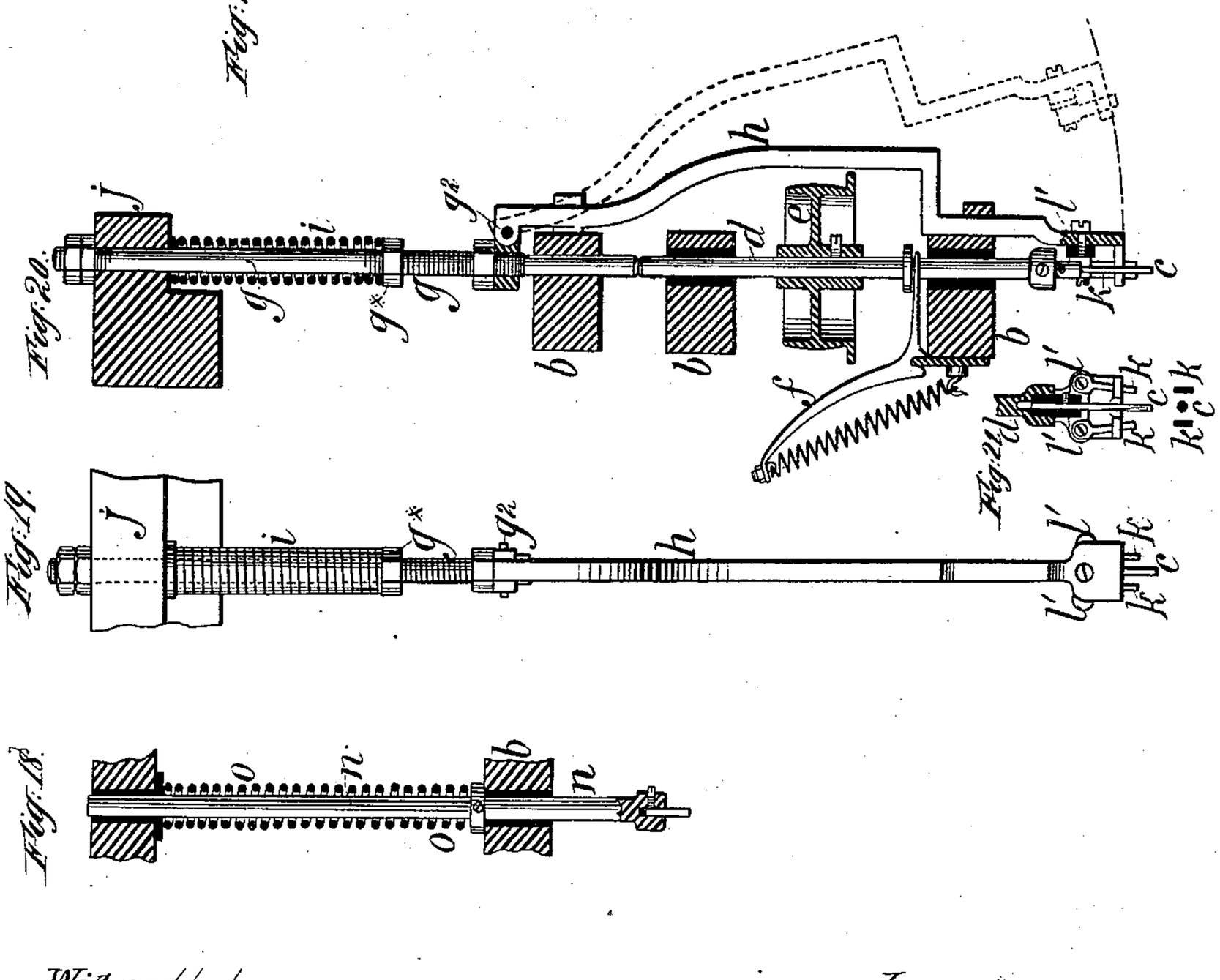

Fig: 20.

Fig: 21.

Fig: 19.

Fig: 18.

Witnesses:
Charles R. Searle.
J. E. Renwee.

Inventor:
Stanislas Felix Cohin
by his attorney
Thomas D. Stetson

UNITED STATES PATENT OFFICE.

STANISLAS FELIX COHIN, OF VILLAINES-LA-GANOIS, ASSIGNOR TO ROQUET & COHIN, OF ROUEN, FRANCE.

BORING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 326,202, dated September 15, 1885.

Application filed June 23, 1884. (No model.) Patented in England May 8, 1884, No. 7,432.

To all whom it may concern:

Be it known that I, STANISLAS FELIX COHIN, of Villaines-la-Ganois, Sarne, France, have invented certain new and useful Improvements in Boring-Machines, intended more particularly for boring the wood portions of brushes, brooms, and analogous articles of whatever name which require holes to be bored in divergent lines.

I have devised means whereby a considerable number of the pieces of wood or analogous material may be treated at a single operation. I gage the depth of the several holes very exactly.

In what I esteem the best form of the invention the boring-bits are grouped in two sets—one on each side of the machine. In the middle of each group is mounted a model or pattern in metal or other hard and durable material, in which are counterparts of the holes which it is desired to produce in the wood. These metallic patterns and the several pieces of wood which are to be treated are mounted on a table or carriage which is arranged to be raised into contact with the boring-bits and with the dummy which I term a "guide-pin," which acts on the metallic model. Means are provided for automatically raising and lowering this table with its contents at short intervals, also for automatically changing the position of the several patterns and correspondingly changing the position of the several pieces of wood after each operation.

The wood is presented to the boring-bits by oscillating frames which are hinged so as to allow the inclination of the holes as required. Each pattern is held or set free, as desired, by a guide-pin, which, after each perforation, permits the necessary change of place. When one row of holes has been bored in each piece of wood, all are simultaneously changed, so as to commence another row.

The holes situated along the center of each piece of wood may be without inclination. Those on each side are inclined more and more, those at each edge being inclined the most. The degrees of inclination may be varied within wide limits by changing the centers on which the boxes or carrying devices oscillate. The devices which thus confine the wood and the pattern or model, and change the positions of these as the work proceeds, are peculiarly mounted on the vertically-moving carriage and operated by a cam. I provide for detaching the carriage from the control of the cam and moving it by hand, when desired.

A weight acting through the medium of a cord wound on a windlass exerts a gentle but sufficient force through the medium of a crank and a link or connecting-rod rocking the patterns and series of connected pieces of wood alternately in one direction and the other. Each pattern is peculiarly grooved, and receives in its groove a pin which is capable only of an endwise movement, sinking alternately into holes in the groove, and being thrust out of the holes by a device which standing below is received in the holes in the pattern as the pattern and its connections sink at each movement. Each of these flexible pins, of which there are two, lifts the corresponding guide-pin out of the hole, and for a moment the pattern and the connected parts are free to yield to the rocking force received from the weight and cord. Thus conditioned the patterns and their connected pieces of wood each move one step until the corresponding guide-pin sinks into the next hole and locks the parts. As the patterns and their connections rise, they present the several pieces of wood in the proper new positions to the actions of the several boring-bits, and the new holes are produced. This is repeated at each operation.

What I term the "flexible pins" are sufficiently rigid to stand in the correct positions to be readily received in the holes in the patterns, but they are sufficiently elastic to be easily deflected laterally when the patterns and their connections yield to the force of the weight and move to shift into the new position.

After the patterns and their connections have traversed their entire length under the guide-pins, and thus have presented the several pieces of wood to the boring-bits in the right positions to produce one complete row of holes, the motion is reversed, effecting a traverse to the same extent in the opposite di-

rection. The grooves are so formed that by the presence of the guide-pins therein the pattern will not go back in the same path, but will shift over a little alternately sufficiently to produce a new row of holes on the return.

The force of the weight transmitted through the crank is nearly uniform in all positions. If the barrel of the windlass on which the cord is wound were cylindrical, the force would be in excess at the moment when the crank is nearly at the extreme of its motion, or what is sometimes termed the "dead-center." I avoid this by making the windlass flat, and arranging it so that the cord which is being unwound therefrom has little leverage at each period when the crank is near its dead-center.

The several mechanical devices by which all the movements are effected will be fully set forth below by the aid of the accompanying drawings. Such parts as are not fully represented and described will be understood as formed and connected in any ordinary or suitable manner, so as to perform the functions required.

The apparatus may be considered as formed of two principal parts or series of parts, of which one is moved with an ascending and descending motion, and as the parts rock or otherwise move thereon their motion is compounded of such rocking motion combined with the ascending and descending motion. The parts not so rising and sinking comprise, first, the fixed frame-work, the revolving shafts which carry the boring-bits, and the guides and pulleys and impelling means therefor; second, the regulators hinged and connected to the boring-arbors, which perform important functions in determining exactly the depth of the several holes; third, the guide-pins which act on the patterns in concert with the flexible pins to cause the correct movements of the patterns and the several connected pieces of wood, and to arrest the movements thereof at the proper time, and hold them stationary during the period of the boring; fourth, the provisions for exerting a gentle force by the weight tending to rock the patterns and the several pieces of wood; fifth, the bearings on which the vertically-moving parts are supported and guided, and the devices by which the proper strong rising and sinking motion is imparted.

The other or moving system is mounted in the central and lower portion of the machine, and comprises, first, a vertically-moving table on which the several other important parts are mounted; I term this the "carriage;" second, the rocking frames which support the boxes; third, the frames or boxes which are mounted within the last named and support the patterns, and the several pieces of wood and their connections adapted to compel the patterns and the several pieces of wood to move simultaneously.

The accompanying drawings represent what I consider the best means of carrying out the invention.

Figure 1 is an end elevation of the entire machine; Fig. 2, a corresponding side elevation, and Fig. 3 a vertical transverse section. The section on the right-hand side is in the center of the machine, and cuts through the pattern-box and pattern. The section on the left side is out of the center, and cuts through two of the boxes which support the wood to be treated. Fig. 4 is a section through the carriage and its operating parts detached. Fig. 5 represents the two primary rocking frames and the provisions for imparting the rocking motion thereto. This shows, also, mounted in the primary frames, the rocking boxes which contain the several pieces of wood and which are capable of rocking in the direction at right angles to the rocking of the primary frames. Fig. 6 is a view at right angles to Fig. 5. Fig. 7 is a horizontal section. A portion of the right-hand side is in a plane below the table. The remainder is in a plane above the table or carriage, but the rocking boxes and their contents are omitted. Fig. 8 is an elevation of one of the rocking boxes with its piece of wood mounted therein. Fig. 9 is a corresponding vertical section. Fig. 10 is an end view corresponding to Fig. 8. Figs. 11, 12, and 13 are vertical sections on a large scale, showing the lower end of the guide-pin, the upper end of the flexible pin, and a portion of the pattern as they stand related to each other at different periods. Fig. 14 is a plan view of a portion of two of the grooves in the pattern. Fig. 15 is a vertical section corresponding to Fig. 14. Fig. 16 is a plan view of the whole pattern. Fig. 17 is an end view of the box carrying a pattern. Fig. 18 is an elevation of the guide-pin with the section through its bearings and its depressing-spring. Fig. 19 is an elevation of one of the regulators and its connections. Fig. 20 is a view of the same at right angles. This view also represents the corresponding boring-arbor and its actuating means. Fig. 21 is a view of the lower portion thereof at right angles to that in Fig. 20. The boring-arbor is shown in section. Fig. 22 is an elevation of a portion of the upper end of the flexible pin with the elastic support therefor. Fig. 23 is a plan view of the parts shown in the upper portion of Fig. 22. Fig. 24 gives two sections of the flat windlass with the rope being unwound therefrom by the force of a weight. (Not shown.) Fig. 25 is an elevation of said windlass and its connections.

Similar letters of reference indicate like parts in all the figures where they occur.

I have shown the frame as of wood. The four principal uprights are marked *a*, certain other portions being designated *b*, *u'*, and *j*.

Fig. 2 shows in dotted lines a large pulley, *m*, turned by a steam-engine or other power, (not represented,) which gives motion through one or more belts, *l*, to a series of pulleys, *e*, on upright shafts *d*. (See Figs. 1 and 20.) There are twelve of these shafts *d*, each carrying a suitable boring-bit, *c*, adapted to si-

multaneously bore a hole in the several pieces of wood which shall be raised from below in the required positions.

O is a stout vertical slide, to which is fixed a strong horizontal framing or table, *p*, *r*, *q*, *s*, s^2, and *t*. These parts taken together constitute the carriage. (See Figs. 1, 2, 3, and 4.) Provisions are made (see Fig. 7) for guiding this table and preventing its turning around. There are four uprights *t*, arranged in pairs, (see Figs. 2 and 4,) each of which carries a pivot-pin, *v*. (See Figs. 2, 3, 4, and 7.) On each is mounted a rocking piece, *u*. (Shown in upright position in Figs. 1, 2, and 3, and in inclined position in Fig. 5.) These are connected in pairs. (See Fig. 6.) The upper end of each is forked, as indicated by *x*. (See Figs. 1, 3, and 5.) The supporting pivot-pins *v'*, Figs. 5 and 6, form pivots on which rock two of a series of seven transverse or secondary connected rocking boxes, which perform the important functions of holding and presenting the pieces of wood *g'* and a single central pattern, O'. The boxes are connected below the pivots *v'* by longitudinal pieces *y*, and above the pivots by yokes *z*. The end yokes of the two sets are connected together, the one set with the other, by links *a'*. These links *a'* are connected by crooked links *b'* to arms *c'*, which extend upward from a single horizontal shaft, *d'*, (see Figs. 1, 3, and 5,) which receives a rocking motion from a link, *e'*, connected to a crank-pin, E, which receives a gentle but sufficient turning force from a suspended weight, C, operating a cord, B, which, passing over suitable pulleys, is wound on a windlass, A. (See Figs. 12, 24, and 25.) This gives a tendency to a regular to-and-fro or oscillating motion of the entire series of boxes *f'*.

The boxes are capable of being rocked in both directions. They may rock by the inclination of the rocking pieces *u* on their cutters or pivots *v*, in the direction to the right and left in Figs. 1, 3, 5, 8, 9, 11, 12, 13, 14, 15, and 16; and while these pieces *u* are either upright or inclined in either direction, the boxes may be rocked by any slight force in the direction at right angles thereto, which is to the right and left in Figs. 2, 6, 10, and 17. The rocking in both directions is effected step by step. The rocking due directly to the forked pieces *u* shifts the several pieces of wood longitudinally to produce the several holes in a row. The rocking of the boxes *f'* in their supporting-forks is induced by the groove in the face of the pattern. These grooves, as shown in Fig. 16, are parallel throughout the effective portions of their lengths, with inclined connections at the ends.

The vertical slide O and its connected parts, including the several boxes *f'* and their contents, receive a sufficient vertical motion to effect the boring to the proper depth with a tendency to bore still deeper. This tendency is resisted by a special provision, mounted in connection with each boring-spindle *d*. There is a pin, *g*, mounted in fixed bearings above each arbor *d* and in line therewith. It is capable of only a vertical motion, and is urged down by the force of a gentle spring, *i*, which abuts against the fixed cross-piece *j* of the framing, and acts on a nut or adjustable collar, *g**, set on the pin *g*. (See Figs. 1, 2, 3, 19, and 20.) Each pin *g* carries, by means of a hinge, g^2, a lever, *h*, (see Figs. 19, and 20,) which extends down and partially embraces the boring-bit *c*. It carries two stops, *k*, hinged to the lever *h* at *l'*, (see Figs. 1, 2, 3, 19, 20, 21, and 21[a],) which bear against the wood and prevent its rising any higher or the bore to go deeper.

In the middle of each series of boring-arbors is a yielding pin, *n*, mounted in fixed bearings, so that it is capable only of an endwise motion up and down. (See Figs. 2 and 18.) The lower end is shown on a larger scale in Figs. 11, 12, and 13. Each pin *n* is urged downward by a gentle spring, *o*. Its lower end carries a smooth point, which when worn may be removed and exchanged. This point stands constantly in the groove in the pattern O', rising therewith during the rising of the slide O and its connected parts *p r s* s^2, which I will term, collectively, the "carriage," and sinking therewith when these parts sink. The spring *o* has a sufficiently long range to allow this amount of vertical motion. Each guide-pin *n* rises when the carriage rises, and descends, or tends to descend, by the force of its spring *o*, when the carriage descends.

I provide devices *r'*, which I term "flexible pins," which perform an important function in lifting by each acting from below against the end of the corresponding guide-pin *n*, and lifting it out of its hole in the pattern at or near the extreme lowest position of the carriage. When this occurs, the pattern O', and consequently the boxes *f'*, are free to yield to the gentle force exerted by the weight C, and being actuated by a gentle force received from the weight, all move a little, and the guide-pin, being pressed down by its spring *o*, acts on the inclined bottom of the groove to hasten the movement. But this is allowed to only a small extent, because as soon as the movement has presented the next hole in the pattern the pin *n* engages immediately therein and holds the pattern and all the boxes firmly in the new position. In this condition the carriage ascends and presents the pieces of wood to their several boring-bits, and a new hole is produced in each. The succeeding descent of the carriage withdraws the several pieces of wood from their several bits, and again, as the lowest point in the motion is reached, the flexible pin *r'* lifts the guide-pin *n* and shifts the parts along another step on the pattern O', Fig. 16. These operations are repeated, the pattern, and consequently the several pieces of wood, being properly shifted at each end of each row, so as, in returning, to produce the next row of holes. This proceeds until all the holes are bored, when the rising and sinking

motion of the carriage is temporarily stopped, an automatic stop-motion being employed, if desired, and the bored pieces of wood are removed and fresh pieces are inserted, after which the rising and sinking motion of the carriage and all the other proper motions are again resumed.

Fig. 11 shows the flexible pin r' remaining in the hole in the pattern which served for the previous operation, its movement to that extent out of its original line being allowed by the elasticity of itself and of its elastic guides y'. (See Figs. 22 and 23.) The guide-pin n stands engaged in the next hole properly and firmly holding the pattern and all the pieces of wood. Fig. 12 shows the position after the carriage has ascended and set the flexible pin r' free and after it has sprung again into its proper position in line with the pin n. Fig. 13 shows the same after the carriage has descended again, and the flexible pin r' has lifted the guide-pin n ready for a further step of the movement of the several parts.

The clamps which hold each piece of wood g' firmly in its proper box f' consist of a pair of arms, h', hinged to the box at their lower extremities, i', and carrying at their upper ends supports h^2, on which the wood g' may rest, catches l^*, each actuated by a spring, k', side clamps, m', and a regulating-screw, j'. (See Figs. 3, 5, 8, 9, and 10.)

V* is a shaft mounted in bearings on the carriage and having an actuating-arm, v^2, and a spring-arm, v^3. This latter arm presses against the series of boxes f' with gentle force whenever the hand is applied to the lever v^2. This may serve to aid in shifting the pattern O′ and its connections from one row to another, when from any cause the proper action due to the groove in the pattern shall be obstructed so as to need such assistance. (See Figs. 1 and 2. It is also useful in arranging all the boxes correctly at the commencement of each operation.

The windlass A is not round. It is flat, the direction of greatest diameter being in the plane of the crank-pin E. (See Figs. 1, 2, 24, and 25.) The force of the weight C in turning the windlass varies in consequence as the cord draws from an edge which is nearer to or farther from the axis of the windlass, being greatest at the middle of the movement of the boxes f', and least at each end when the motion is being reversed. The variation in the leverage of the cord B coincides almost exactly with the variation in the leverage of the crank-pin E. The action on the patterns O′ and their connections is practically uniform in all positions, being not appreciably greater or less at the end of each movement.

The required vertical movement of the carriage is produced automatically, but with provisions for conveniently disconnecting, to allow the several pieces of wood to be exchanged. These provisions are shown in Figs. 1, 2, 3, 4, and 7. A belt acting on the pulley N′ rotates a small gear-wheel, R′, on the same shaft, which, by engaging in a larger gear-wheel, L, gives through the shaft S a strong rotary motion to a wheel, R, having a cam-groove in its side, (see Fig. 4,) which engages with a roller, T, mounted on a pin in the side of the lever U. This lever turns on a center, Y, mounted in fixed supports. Links W, mounted one on each side of the vertical slide O, and pivoted thereto, connect to a forked lever, U′, which lever connects by a strong link, V′, to a pin, X′, on a lever, V, which is pivoted to the lever U at X. Near the outer end of V is a pin, W′, which receives a catch, T*, turning on a pin, T′, in the side of U, and actuated by a spring, t^*. A stop, w^*, in the side of U maintains this catch always in the proper position to engage.

When it is desired to disengage the carriage, the attendant turns the catch T*. The weight of the carriage will then lift the lever V, and hold it in the position shown in dotted lines in Fig. 4, while the lever U rises and sinks idly. When the several pieces of wood are all secured, and the carriage is again desired to work, the attendant presses down the lever V, and the catch T* engages strongly with the pin W′, compelling the lever V thenceforward to vibrate with the lever U, and give the corresponding rising and sinking motion to the carriage, which continues until all the holes are bored and the catch T* is detached.

I have shown means by which the flexible pins r' may be actuated by the rising and sinking of the carriage in the same direction as the carriage. Each is connected by links r^2, and a lever, t', turning on a fixed center, t^2, and subject to the force of a spring, s'. A rod, x', extending downward from the table of the carriage, acts on this lever at the point shown, and as the carriage rises and sinks gives a corresponding but greater rising and sinking motion to the flexible pin r'. The effect of this action is the same as just described, except that the thrusting of the flexible pin r' through the hole in the pattern to displace the guide-pin n, and allow the movement of the pattern and its connection for each step, is done by a positive motion of the flexible pin r' upward, and the action is effected when the carriage is near its highest position instead of near its lowest position. This may be preferable in some cases. It will be sufficient in most cases to simply hold each flexible pin stationary in the framing, and allow it to displace its guide-pin n by the descent of the carriage, and allow the movement of the pattern and its connections when they are near their lowest positions. This is preferable, because then the boring-bits are not in action, and the several pieces of wood are free to be easily shifted.

I make the box n', which holds the pattern O′, higher than the boxes f', which hold the pieces of wood. This gives more motion to the pattern than to the wood, and allows the boring for small brushes while employing a large pattern. The work can be better done

by a large plate with a large pin playing in large grooves and entering large holes in the pattern.

I can vary the action of the several parts by changing the positions of the centers. I produce many holes in the several parts, and can adjust the action by changing the center pins from one hole into another, as will be readily understood.

The shafts *d* and their adjuncts are arranged in two series, one on one face and another on the opposite face of the machine. The boxes presenting the wood to the two series of boring-bits are controlled by the two independent guide-pins *n*, one serving for one series and the other for the other.

It will be observed that the windlass A, by which the force of the weight C is communicated to the several patterns and the connected pieces of wood, and by the arresting of which all further action of the machine will be prevented, has two arms, D, each of which carries a pin, F. These are intended to automatically stop the machine when all the holes are bored. This is done by the aid of the nose-pawl G, (See Fig. 1,) which is hinged to an arm, H, turning on a suitable pin or rocking-shaft, H*, as shown. The link I connects this arm with a bell-crank, J, which controls a horizontally-moving bolt, K, which, when properly operated, sets free the toothed wheel L.

A click, P, allows the windlass A to be turned in the proper direction at intervals by the attendant, who operates through the crank Q to wind up the weight.

Modifications may be made in the forms and proportions without departing from the principles or sacrificing the advantages of the invention. I can provide other means than the hand-crank Q for winding up the weight C at intervals. I can provide other means than a weight for imparting the gentle force required to give the proper step-by-step motion to the patterns and to the connected pieces of wood when they are set free from the control of the guide-pins *n*. I can use the machine with only one pattern O′, and only one series of boring-arbors *d*. I can use a less number of boring-arbors controlled by each guide-pin.

Weighted levers may be used instead of springs to accomplish many of the other important functions of the machine.

Parts of the invention can be used without the whole. I can dispense with the shaft V*, carrying the handle or operating lever v^2 and the spring-arm v^3, the automatic control of the boxes being sufficient in all ordinary cases.

I claim as my invention—

1. In a pattern-boring machine, substantially as described, the series of boring-spindles *d* and their operating means *e l*, the vertical sliding frame O, for carrying the material up to the boring-bits, and the pivoted frames for holding the material, combined with the regulator-pins *g*, one arranged above and in line with each boring-spindle, and springs *i* for holding the pins *g* into contact with the boring-spindles, as and for the purposes set forth.

2. In combination with the horizontal rail *b* of the main frame, and the series of boring-spindles working loosely through said rail, the spring-levers *f*, pivoted on the frame and working under collars upon the spindles to support them, as shown, combined with the corresponding series of regulator-pins, *g*, the springs *i*, and the frames *h*, pivoted at g^2, as shown, and having pivoted fingers *k*, which engage the material to be bored and limit its motion, as herein set forth.

3. The frames *u*, carried by the slide O and pivoted at *v*, and the wood-holding boxes *f′*, yoked together and pivoted so as to rock in a direction at right angles to the motion of the frames *u*, combined with the corresponding boring-spindles, *d*, the pattern-holder *n′*, pivoted to the bar *y* and moving with the wood-holding boxes *f′*, and the guide-pin *n*, and spring *o*, arranged in the frame of the boring-spindles and parallel with said spindles, as and for the purposes set forth.

4. In combination with the pattern-holder *n′* and the wood-holding boxes *f′*, yoked together and pivoted at right angles to the pivots of their supporting-frames *u*, and with a pattern, O′, supported in the holder *n′*, and having a connected series of grooves, the guide-pin *n*, its spring *o*, slide O, and means, as described, for automatically operating said slide, as set forth.

5. The pattern O′, having connected series of grooves, and inclined surfaces between adjacent holes, as shown, the holder *n′* and boxes *f′*, pivoted to the bar *y* so as to move together, combined with the guide-pin *n*, and spring *o*, operating to hold said guide-pin to the pattern, as and for the purposes set forth.

6. The pattern O′, having grooves and inclines, as described, and the guide-pin *n*, held down by the constant force of the spring *o*, combined with the sliding carriage O, the flexible pins *r′*, operating loosely in the flexible frame *y′*, and operating through the pattern O′, all arranged and adapted to operate as and for the purposes set forth.

7. The sliding carriage O, the frames *u*, carried on said carriage on pivots *v*, and the boxes *f′*, pivoted in said frames so as to rock in a direction at right angles thereto, combined with the yokes *z* and bars *y* connecting the several boxes, the boring-spindles, the pattern, and guide-pin, as herein specified.

8. The frames *u*, pivoted at *v*, and having a series of holes so as to vary the adjustment, combined with the series of boxes *f′*, two of which are pivoted at *v′* in the frames *u*, the box *n′*, connected to the boxes *f*, and the boxes *f′* with each other in each set by the yoke *z* and bar *y* above and below the pivots, respectively, the bar *a′* connecting the different sets of frames *u*, the crank-pin E, and connections, as and for the purposes set forth.

9. In combination with the boxes *f′* and their connections, as described, the levers *h′*,

pivoted near the bottoms of said boxes at i', and carrying supports h^2, the wood-holding clamps l, the diagonal springs k', actuating the clamps, and side clamps, m', secured to the supports h^2, as and for the purposes set forth.

10. In combination with the rocking frames u x and link a', the flat windlass A, crank-pin E, cord B, and weight C, and connections e' d' c' b' with said link a', whereby a differential force is given as the cord is suspended from an edge nearer to or further from the axis of motion of the windlass, as set forth.

11. In combination with the sliding carriage O and its wood-holding boxes, as described, the cam-wheel R and its connections with the pulley N′, the roller T, mounted on the lever U, the links U′ W, connecting said lever with the slide O, the lever V, pivoted to the lever U, and the catch T* for locking the levers U and V together to throw the carriage and power into working connection, as set forth.

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

STANISLAS FELIX COHIN.

Witnesses:

ROBT. M. HOOPER,

EUG. DUBOIS.