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A. J. LANGELIER.

MULTIPLE DRILL.

No. 552,379. Patented Dec. 31, 1895.

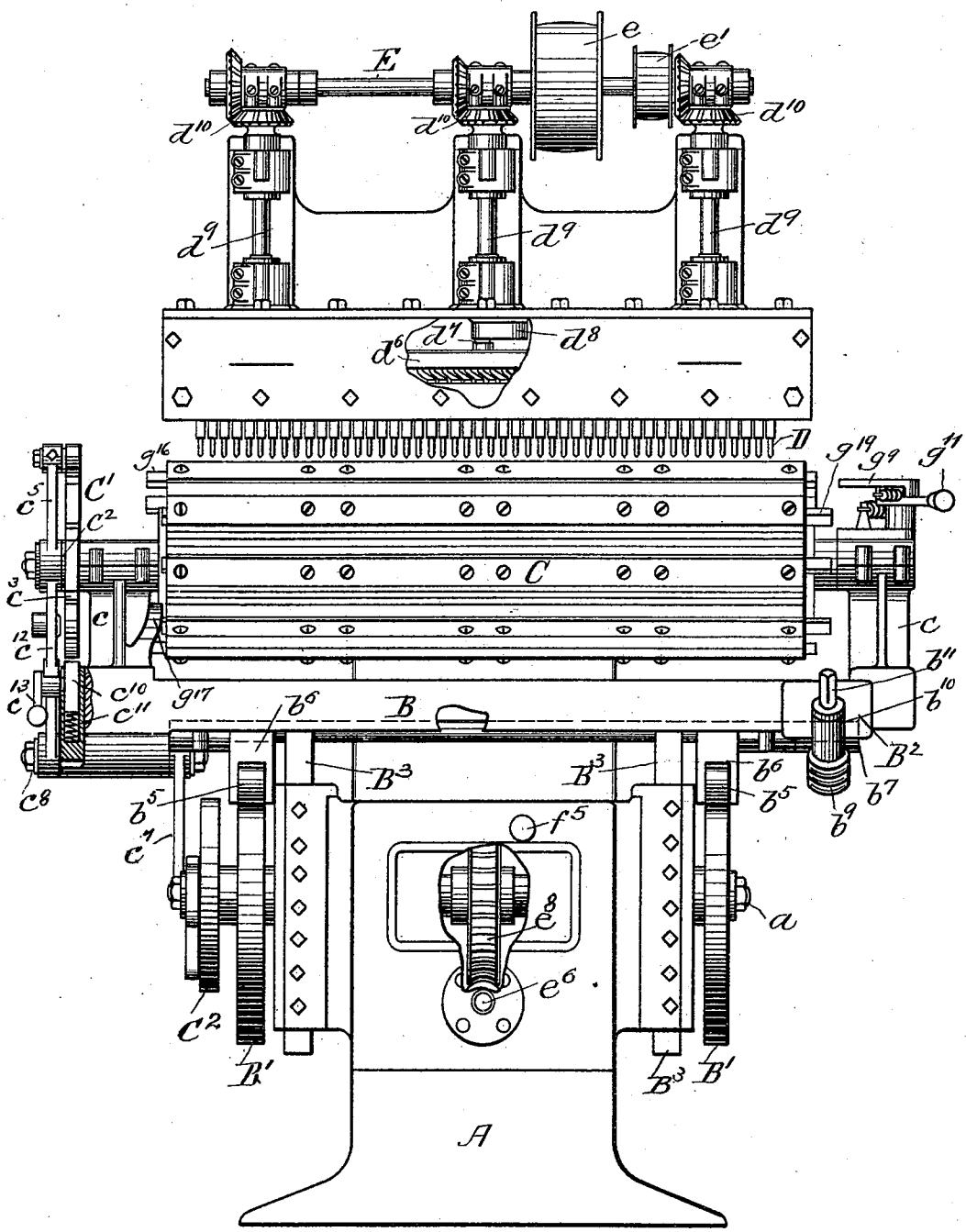

Fig. 1.

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MULTIPLE DRILL.

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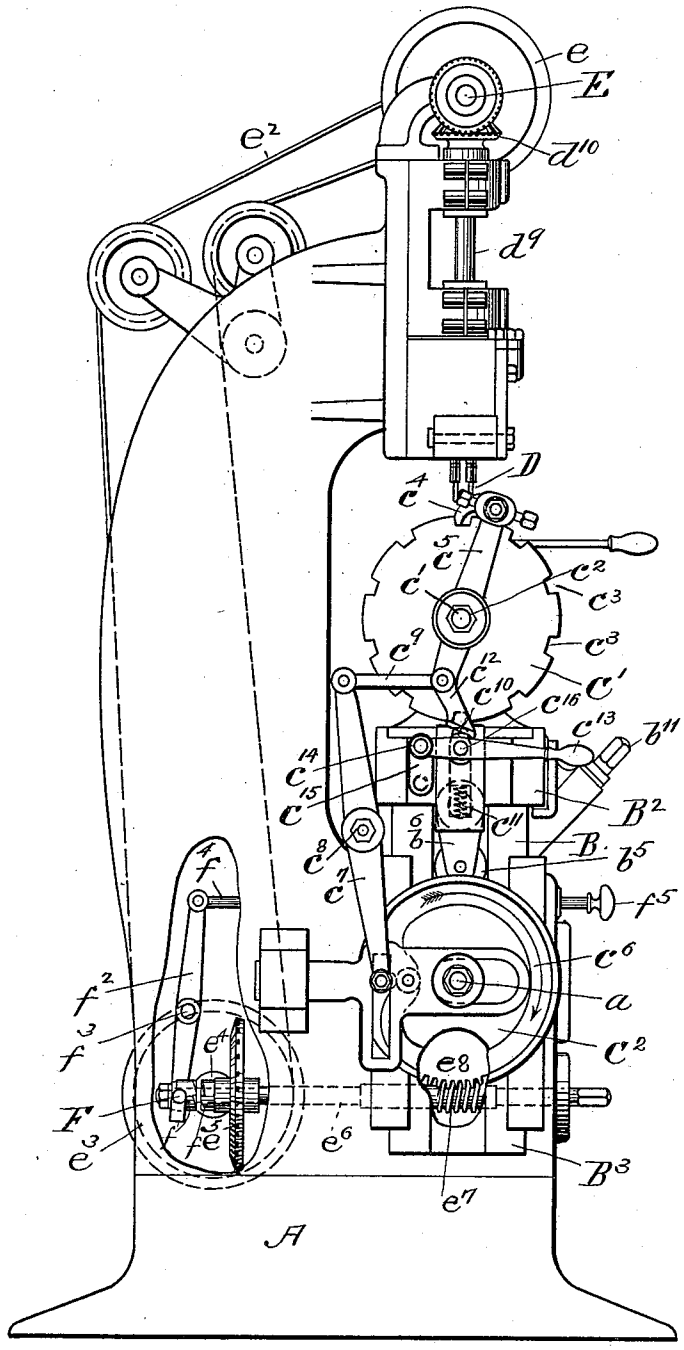

FIG 2

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MULTIPLE DRILL.

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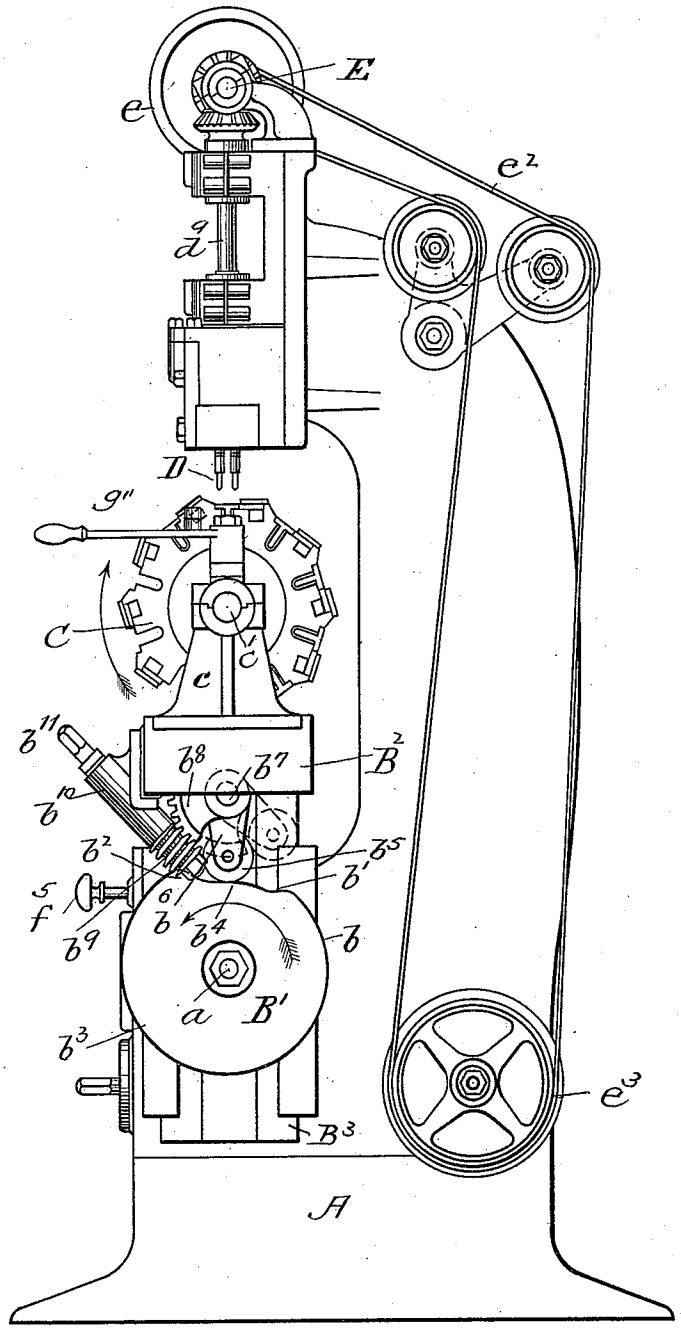

Fig. 3.

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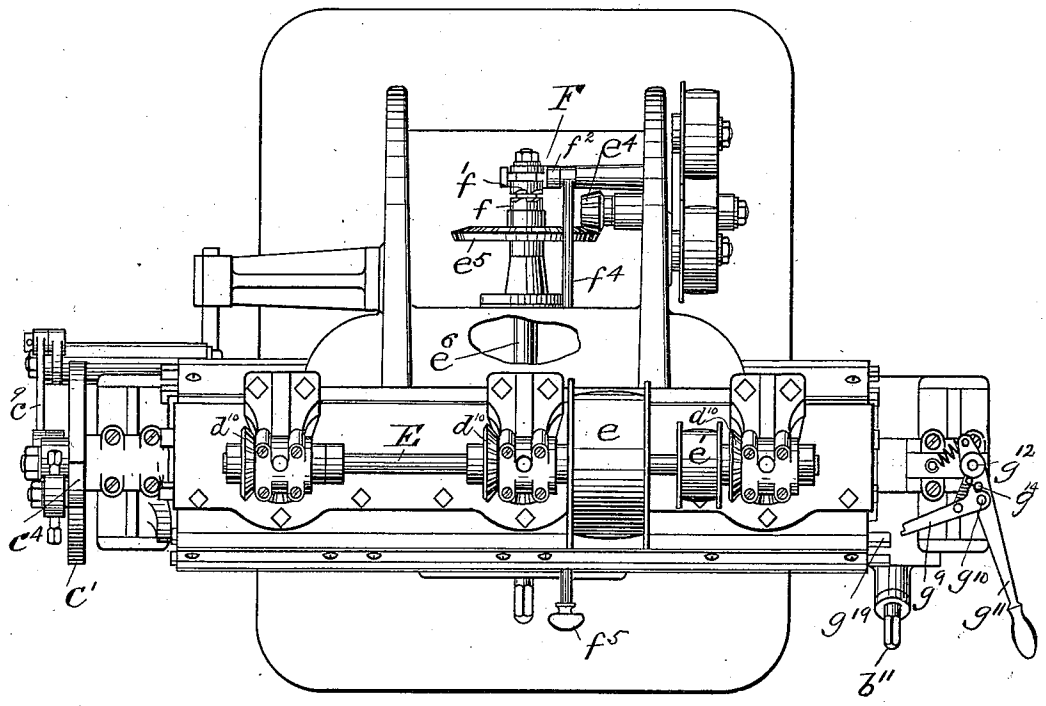

Fig. 4.

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No. 552,379. Patented Dec. 31, 1895.

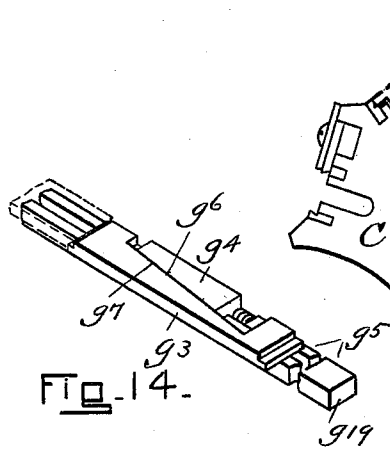

Fig. 14.

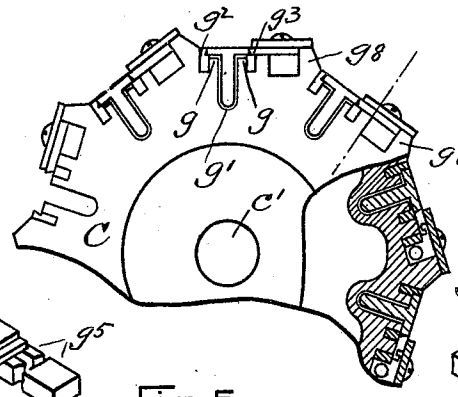

Fig. 5.

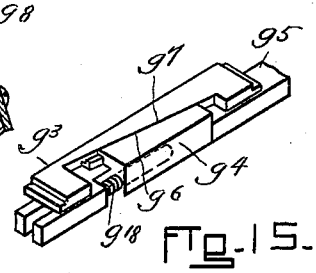

Fig. 15.

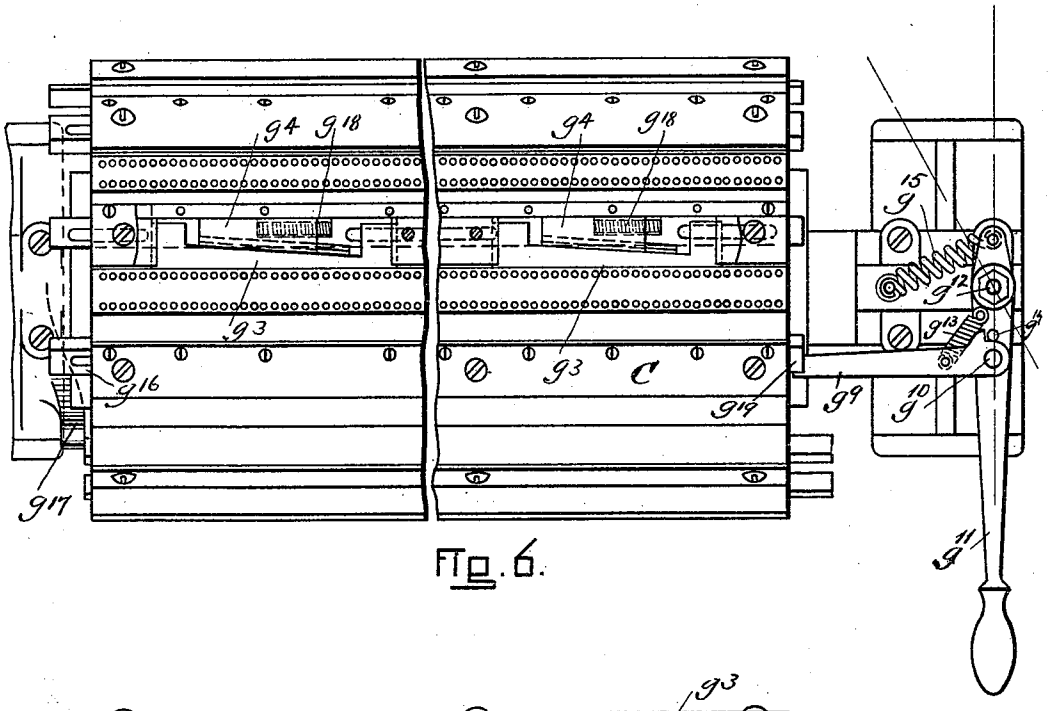

Fig. 6.

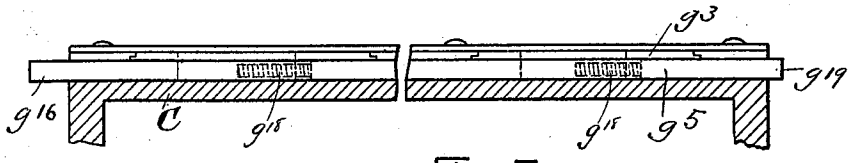

Fig. 7

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No. 552,379. Patented Dec. 31, 1895.

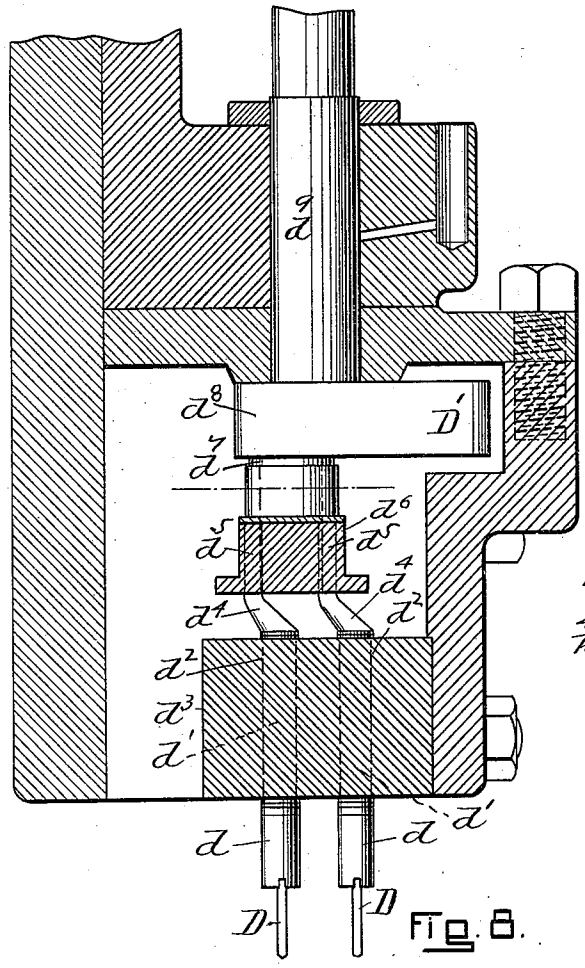

Fig. 8.

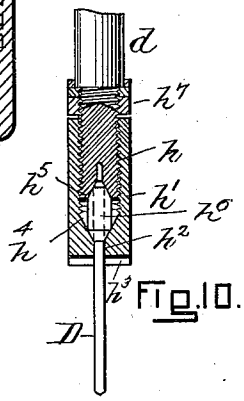

Fig. 10.

Fig. 12.

Fig. 13.

Fig. 11.

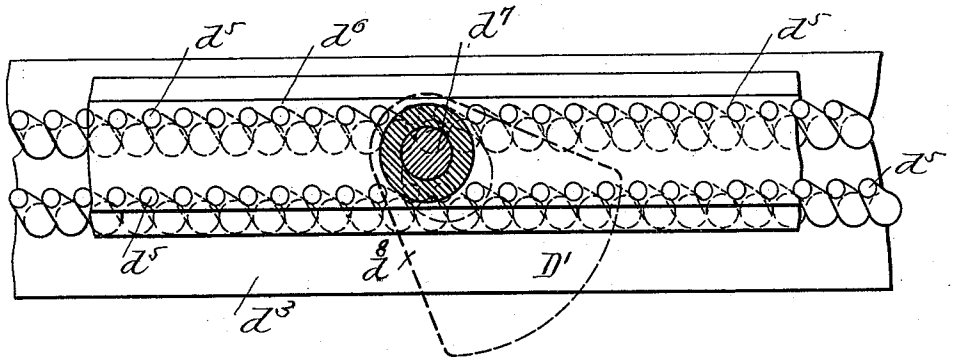

Fig. 9.

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UNITED STATES PATENT OFFICE.

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MULTIPLE DRILL.

SPECIFICATION forming part of Letters Patent No. 552,379, dated December 31, 1895.

Application filed September 19, 1894. Serial No. 523,453. (No model.)

To all whom it may concern:

Be it known that I, ANTOINE J. LANGELIER, a citizen of the United States, residing at Providence, in the county of Providence and State of Rhode Island, have invented a new and useful Improvement in Multiple Drills, 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.

It is often necessary to drill simultaneously in parallel lines or otherwise a large number of holes; and my invention relates to means whereby this may be accomplished. It is represented in the drawings as applied to a mechanism for drilling holes in the edges of flats used in carding-engines, such holes being necessary for the securing of the wire clothing to the face of the flat by means of clips or attaching devices having shanks which extend through the clothing and the holes.

The invention as so embodied comprises, among other instrumentalities, these: two lines of drill-stocks which are parallel and means for simultaneously rotating them and a flat-carrier having a feed movement toward and from the drills and which has also means for holding a number of flats, whereby completed flats may be removed and new ones placed in position while the operation of drilling is progressing.

It further comprises means for automatically disengaging the finished flats from the feeding bed or device and for automatically moving the feeding bed or device after the completion of the drilling operation to move the drilled flat out of position and an undrilled one automatically into position.

It further relates to means for clamping the flats to the bed and for unclamping them.

It further relates to means for feeding the bed to or from the drills by hand as may sometimes be necessary, because of the breaking of a drill.

It further relates to various details of construction and organization, all of which will hereinafter be more fully explained.

In the drawings, Figure 1 is a view principally in front elevation of a machine having the features of my invention. Fig. 2 is a view in left-side elevation thereof. Fig. 3 is a view in right-side elevation thereof. Fig. 4 is a view in plan. Fig. 5 is a view enlarged, partly in elevation and partly in section, of the flat-bed. Fig. 6 is a plan view thereof and of the mechanism for operating the flat-clamps, also enlarged. Fig. 7 is a view in horizontal section upon the dotted line of Fig. 5. Fig. 8 is a view in vertical section enlarged to show the devices for operating the drill-stocks. Fig. 9 is a view in horizontal section upon the dotted line of Fig. 8 and in plan of parts below said line. Fig. 10 is a view enlarged of a drill stock or head and drill representing the construction of the stock. Figs. 11, 12, and 13 are detail views of the drill-stock. Figs. 14 and 15 are views in perspective of parts of the flat-clamps.

The machine has a frame A which provides bearings for the cam-shaft *a* and slideways or guides for the slide B which carries or supports the rotary flat-bed C. The upper part of the frame supports the drills D and carries the mechanism for operating them. This mechanism is actuated from the main shaft E of the machine which is mounted at the top of the frame and has the driving-pulley *e* and a driven pulley *e'* which, by means of the belt e^2, the lower pulley e^3, bevel-pinion e^4, bevel-pinion e^5, shaft e^6, worm e^7, (see Fig. 2), and a worm-wheel e^8, revolves the cam-shaft *a*.

The drills D are in two lines. These lines may be any desired distance apart and the drills of each line may be placed as closely together as may be desired. The drill heads or stocks *d* are attached to the lower ends of the crank-shafts *d'*. (See Figs. 8, 9, and 10.) These crank-shafts have bearings in vertical holes d^2 formed in the block d^3 which is bolted or fastened in place and the cranks d^4 have their crank-pins d^5 entering holes in the plate d^6 which receives all the crank-pins and which is moved in a circular path by means of crank-pins d^7 connecting it with the crank-disks d^8. There are three of these disks d^8 and crank-pin connections d^7 with the plate or block d^6, and the plate or bar d^6 thus has a movement imparted to it much like that of the connecting-rod between the two cranks of a pair of locomotive driving-wheels, and this plate or bar communicates a rotatory movement to as many

drill heads or stocks as it may be desired to operate and upon any desired line or arrangement by means of the crank connections.

The shafts d^9 for rotating the crank-disks d^8 have suitable bearings, (see Figs. 1, 8, and 9,) and are connected with the main shaft E at their upper ends (see Fig. 1) by means of the bevel-gearing d^{10}.

As in this machine the drills are unprovided with feed movements, they may be kept running continuously, and I have so represented them. When the flats are automatically fed to the drills, the flat feed device may also be run continuously; but as it is often desirable or even necessary to stop the automatic action of the flat feed, I have interposed between the pulley e^3 and the shaft e^6 a stop-motion F. (See Figs. 2 and 4.) This stop-motion is of ordinary construction and is obtained by mounting the bevel-gear e^5 to rotate freely upon the shaft e^6 and providing its hub with a clutch member f which is engaged by the sliding member f' of the clutch when desired, and which is fast to the shaft to rotate with it, the member being moved upon the shaft by the lever f^2 pivoted at f^3 engaging the clutch member f' in the usual way and operated by a rod f^4, the end f^5 of which extends to the front of the machine.

The flat-bed C is provided with movements toward and from the drills D by means of the cams B′. These cams are represented in Figs. 1 and 3 and are at the ends of the shaft a. They are shaped upon their peripheries b to impart to the bed C, first, a relatively quick movement by the sections b'. This advances the flat from its lowest position quickly to a position which brings its upper surface substantially in contact with the points of the drills, and from the sections b' to the beginning of the sections b^2, embracing more than two-thirds of the periphery of the cams. The cams are constructed to give the bed C a slow upward feeding movement, and when the sections b^2 are reached the drilling is completed and the bed is then allowed to rapidly drop by the sections b^2 to the rest b^4 which is between the sections b^2 and b'.

The slide B is in two parts—namely, the upper part or head B^2, which directly supports the brackets c, which carry the bed C, and the section B^3, which enters the guideway and which is of sufficient length to provide, with the guiding sections or plates of the frame, great stiffness and length of bearing. The connection between the slide and the cams is obtained by cam-rolls b^5, which rest upon the peripheries of the cams and which are carried by hangers b^6, attached to each other and to the slide B, near the head B^2, by a shaft b^7. This construction is employed in order that the rolls may be moved out of operative relation with the cams when the bed is upon the feed-sections b^3 of the cams, in order that the bed and slide may be dropped to remove the work from the drills while the cams are stationary or without requiring that the cams continue revolution until the dropping-points b^2 are reached. These rolls are represented in Fig. 3 in full lines as in operative relation with the cams and by dotted lines in the same figure as moved out of operative relation therewith. This is not the point in the cams where this movement could be used, but is taken as affording a convenient means for representing the action of the devices. To move the rolls, the shaft b^7 is provided with a sector b^8, (see Fig. 3,) which is engaged by a worm b^9, the shaft of which is supported by a bracket b^{10} and the upper end of which b^{11} is formed to receive a turning-wrench.

The feed-roll C is of the length of the flats, and it has a shaft c', which has bearings in the brackets c. It preferably is made in one casting and shaped upon its surface as will be hereinafter explained. The end c^2 of its shaft carries a notched turning-wheel C′, with the notches c^3 of which a feed-pawl c^4 carried at the upper end of the lever c^5 engages. This lever is pivoted upon the shaft and it is adapted to be moved by hand or automatically as may be desired. It is moved automatically by means of the cam C^2 upon the left end of the shaft a, (see Figs. 1 and 2,) the cam having a groove c^6, which is shaped to impart a feed movement to the lever c^5 at the desired time—namely, immediately after the sections b^2 of the feed-cams have passed from under the slide-rolls b^5—and the connection between this cam and the lever c^5 is represented as obtained by the lever c^7, which has at its lower end a cam-roll to enter the cam-groove, is pivoted at c^8 and connected at its upper end with the lever c^5 by means of the link c^9. The feed-pawl is thus actuated to rotate the bed C the distance between two notches, and it is not returned to its original position to engage the next feed-notch in order until the cam C^2 has made very nearly a full revolution and until the drilling is completed and the bed C has fallen, when it is returned by the cam. At the end of the feeding movement of the pawl c^4 the bed C is locked in position by means of a locking-bolt c^{10}, carried by the slide and forced upward by the spring c^{11}, the upper end of the bolt entering one of the notches c^3, and during the backward movement of the feed-pawl c^4 this latch is disengaged from its notch by the connection c^{12} between the lower end of the pawl-lever c^5 and the bolt-slide, which, as the lever is moved backward, presses the slide downward sufficiently to disengage the latch from the notch, and upon its reverse movement it holds the latch depressed until the notch has been turned sufficiently to bring it out of line with the latch and the edge of the notch-disk in line with it, when it will ride upon such edge until it comes in line with the next notch and automatically enters it. This latch may be disengaged from its notch by hand by means of the lever c^{13}, which is pivoted at c^{14} to a link c^{15}, and is pivoted at c^{16} to the latch-slide. (See Fig. 2.)

The bed C when arranged to rotate preferably is shaped as represented in Figs. 5 and 6—that is, it has the rests g for the flat back and upon which the flat is clamped, the recess g' into which the flat-rib extends and the side plates g^2 g^3 which engage and clamp the flat at its side edges. The plate g^2 is fixed and preferably somewhat undercut and the edge of the flat is forced against this edge by the opposite plate g^3 which may also be undercut and which is movable toward and from the plate g^2 and against the edge of the flat. This clamping-plate g^3 is moved outward against the edge of the flat by means of wedges g^4 carried by a sliding bar g^5 and arranged to bear by their inclined surfaces g^6 against the inclines g^7 of the plate g^3. A movement of the wedges g^4 in one direction will consequently move the slide-plate g^3 outward or against the edge of the flat and will hold it locked in that position, the back of the wedges bearing against the abutments g^8. A movement of the slide-bar g^5 in the reverse direction will release the wedges g^4 and permit the slide-plate to be moved away or back from the edge of the flat. The movement of the wedges to clamp the plate is effected by means of the push-bar g^9 which is pivoted at g^{10} to the lever g^{11} which in turn is pivoted at g^{12}. A spring g^{13} holds the pivoted push-bar g^9 against the stop g^{14} carried by the lever and permits its pushing end to hold its position while the angle between the lever and the push-bar varies because of the movement of the lever, and the spring g^{15} serves to return the lever g^{11} and push-bar to their normal positions and to hold them so returned.

The wedge-bar g^5 is longer than the cylinder and when it is pushed laterally to lock the flat in place, its end g^{16} projects from the left end of the cylinder and remains so until the bed has been turned sufficiently to bring the said end in line with a stationary inclined releasing cam or surface g^{17}, (see Fig. 6,) upon which the end rides and by which it is pushed back to its original position and the flat thereby released.

The springs g^{18} serve to hold the bar in its normal or released position and this releasing of the bar g causes its end g^{19} to be moved outward upon the right end of the cylinder. (See Fig. 6.) The cylinder-bed represented in the drawings has a relatively large number of flat-holders and there is of course a clamp and releasing-bar for each.

Any suitable head-stock for holding the drills may be used upon the drill crank-shafts d' and I have represented as a desirable type of holder one which involves forming upon the end of each crank-shaft a screw-thread h upon which is screwed a holder h', said holder having a central hole h^2 through which the drill extends, means h^3 by which it may be turned, a conical cavity h^4 which faces a conical cavity h^5 in the end of the crank-shaft and between which a split sleeve or bushing h^6 surrounding the inner end of the drill is confined and clamped.

The cone-surfaces cause the drill to be centered and the sleeve to be clamped sufficiently to bite the drill and hold it in place.

A check-nut h^7 may be used to lock the holder h' to the shaft.

The operation of the device is as follows: The flat to be drilled is placed in one of the flat-holders of the bed C, preferably the one next the drilling position. The operator then moves the lever or handle g^{11} laterally or to the left, pushes in the wedge-bar g^5 and thereby clamps or locks the flat in place. It will be understood that the drills are constantly turning and that the bed C has vertical movements imparted to it, and after the completion of the drilling of a previously-placed flat, the bed C is rotated to bring the next or undrilled flat into position and while the bed is in its lowest position. This may be done automatically and continuously, in which case the operating-cams B' are constantly rotated or by means of the push-rod f^5 the cylinder may be started and stopped when desired. However operated, it is turned until the undrilled flat is brought into position under the drills when it becomes stationary and is then caused to feed the flat toward the drills and to remove the flat from the drills, as above explained, the drills forming simultaneously all the holes required in the flat, of which usually there is a large number.

Of course the cylinder may be rotated entirely by hand, if desired. The first movement of the bed or cylinder toward the drills is rapid; but as the points of the drills are reached, the movement becomes slower until it is that of an ordinary feed and this movement continues until the drilling operation is completed, when the bed recedes to its former position. Every time that the bed is turned to move into position an undrilled flat a clamping-bar g^5 is moved to release a previously-drilled flat, the said releasing action taking place when the holder is in inverted position, preferably in front of the center of the bed.

It will be noted that the drill-shafts have their crank-arms inclined to the crank-pins. This permits in their rotation each crank-pin to pass over the shaft or arm of the next crank-pin in order and the placing of the drill-shafts very closely together.

It will also be noted that there is placed upon each shaft d^9 a counterbalance D'.

The spring g^{18} being attached at one end to the flat-bed and at the other to the movable plate g^5 serves to return the latter to its place after it is disengaged.

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

1. The combination in a machine of the character specified, of the drills, a work hold-

ing bed, a cam, a cam roll and means for moving the cam roll out of connection with the cam so that the bed may be operated independently of the cam, as and for the purposes described.

2. The combination of the slide B, feed cam or cams B′, the roll or rolls b^5, the roll hanger or hangers b^6, the sector b^8, and the worm b^9 and its operating shaft, as and for the purposes described.

3. In a machine of the character specified, the combination of a series of drills, a rotary flat holding bed, means for rotating it automatically, with a support for the bed and means for automatically moving said support and its bed toward and from the drills, as and for the purposes described.

4. The combination of the drills D, the main shaft E, the cam shaft a, the slide B^2 and a work holding bed and one or more cams B′ to operate the slide with a clutch between the shaft E and the cam shaft a, whereby the drills may be constantly rotated without imparting movement to the cam shaft, as and for the purposes described.

5. The combination of the main shaft E, the drills D connected therewith substantially as specified, the cam shaft a, cams thereon, the slide B, bed C and the worm wheel e^8 upon the cam shaft, its operating worm e^7 upon the shaft e^6, the bevel gears e^4 e^5, the clutch F, the shaft carrying the bevel gear e^4, being operated by a belt from the shaft E, as and for the purposes described.

6. The combination of the main shaft E, the cam shaft a, the worm shaft e^6, the pulleys e, e', e^3, the bevel gears e^4, e^5, the worm e^8, and the drills D, the slide B, and the bed C, as and for the purposes described.

7. In a machine of the character specified, a flat holding and presenting cylinder having a series of clamps for holding the flats, comprising opposing wedges on the moving clamp plate and its operating bar, the said bar being moved lengthwise the cylinder in one direction to set the clamp and in the opposite direction to release the clamp.

8. In a machine of the kind specified, a flat holding and presenting device comprising a bed having a recess for receiving the flat rib and a surface upon which the back of the flat rests and a clamp movable against the edge of the flat to clamp it against a projection bearing against the other edge, as and for the purposes described.

9. In a machine of the kind specified, a flat holder having a projection or shoulder against which one edge of the flat is held, a movable clamping plate to bear against the other edge of the flat and a device for operating the clamp plate, adapted to have longitudinal movement imparted to it in one direction to close the clamp and in the opposite direction to open it, as and for the purposes described.

10. The combination of the flat or plate holder having the rest g, the side plate g^2, the movable plate g^3, its actuating bar g^5 and springs g^{18}, as and for the purposes described.

11. The combination of a bed having the rests g, the side plates g^2 g^3, one of which is movable in relation to the other, the operating bar g^5, the ends of which are longer than the plate g^3 and which is movable lengthwise said plate, whereby when the plate is locked, the end of said bar projects at one end thereof, and when unlocked, at the other end thereof, as and for the purposes described.

12. The combination of the bed C, the rests g, the clamp plates g^2 g^3, the operating bar g^5 and the push bar g^9, substantially as and for the purposes described.

13. The combination of the rests g, the clamp plates g^2 g^3, the sliding bar g^5, and the unclamping cam or projection g^{17}, as and for the purposes described.

14. The combination of a flat or plate holding and presenting device having a series of clamps, each having the rests g and clamping plates g^2 g^3 and an actuating bar g^5, with a push bar g^9 common to all the clamps and a releasing cam or surface g^7, as and for the purposes described.

15. In a machine of the character specified, the combination of the drills, the flat holding bed mounted upon a shaft and moved toward and from the drills, by cams, the turning disk attached to said shaft and the cam connected with said turning disk to cause the bed to be turned a portion of a revolution when in its lowest position, as and for the purposes described.

16. The combination in a machine of the character specified, of the drills, the rotary bed moved toward and from the drills, by cams, the flat holding clamps carried by said bed and automatic means for rotating said bed while in its lowest position and for locking it after its rotation, as and for the purposes described.

17. The combination of the constantly rotating drills, a slide, and cams for moving and feeding it constructed as specified, a bed mounted upon said slide carrying a number of flat holding clamps, a clamp setter, an automatic clamp releaser, means for automatically turning the bed when in its lowest position and for locking it after it has been so turned, as and for the purposes described.

18. The combination in a machine of the character specified of the slide B, the turning disk C′, the locking bolt c^{10} carried by the slide B to engage notches in the turning disk, the lever c^5, having the arm c^{12} to force the bolt c^{10} out of engagement with the notches, and the spring c^{11} to force the bolt back into position, as and for the purposes described.

ANTOINE J. LANGELIER.

In presence of—
SOCRATES SCHOLFIELD,
A. T. LANGELIER.