

(No Model.)

2 Sheets—Sheet 1.

C. H. FIELD & C. H. FIELD, Jr.
ENGRAVING MACHINE.

No. 461,745.

Patented Oct. 20, 1891.

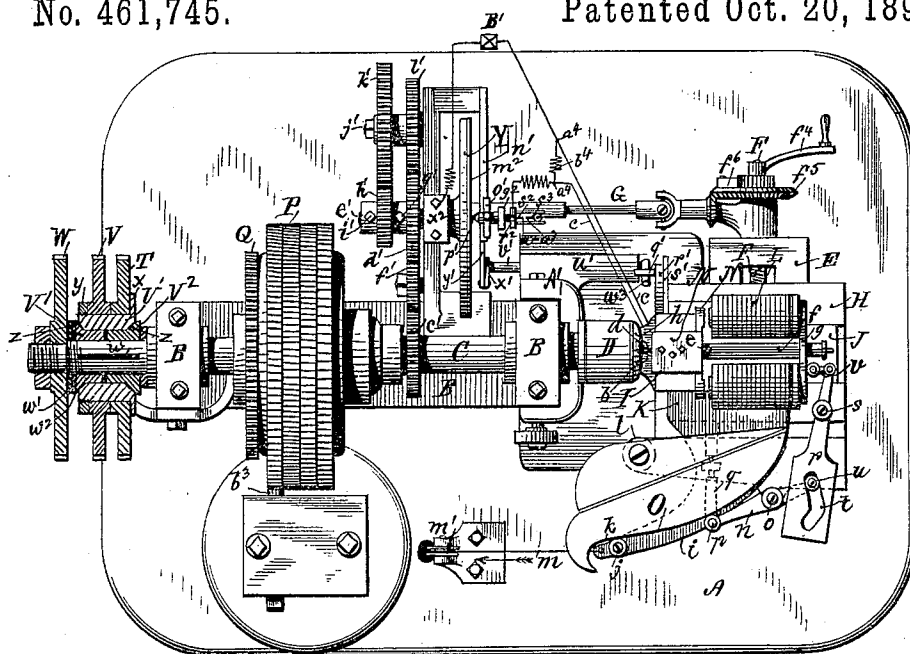


Fig. 1.

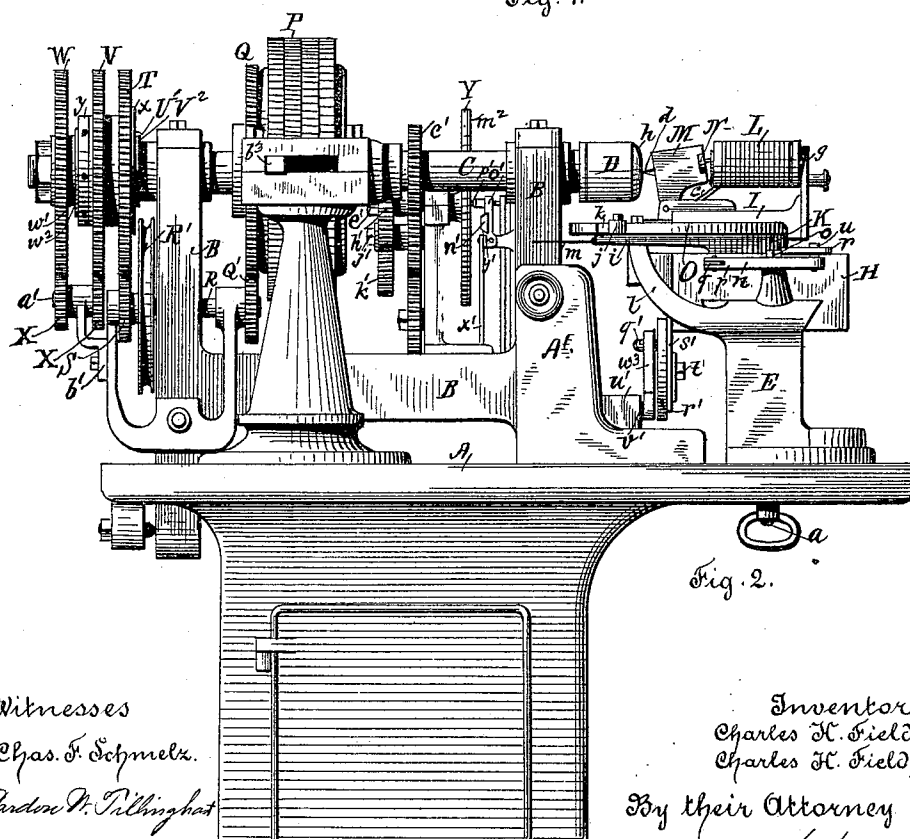


Fig. 2.

Witnesses

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(No Model.)

2 Sheets—Sheet 2.

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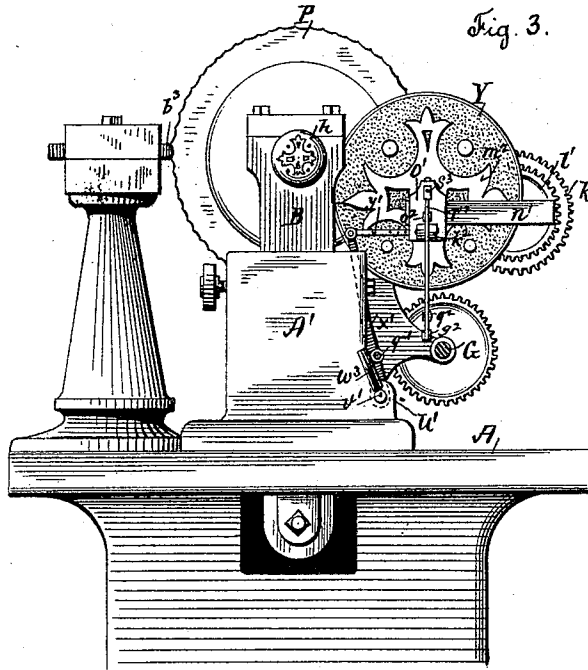


Fig. 3.

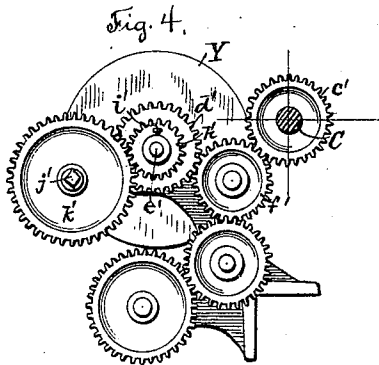


Fig. 4.

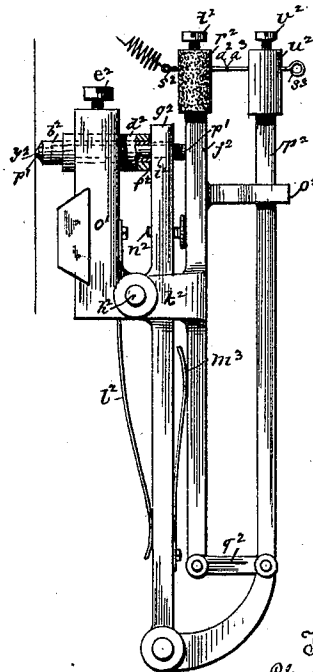


Fig. 5.

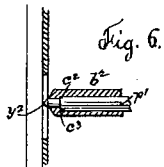


Fig. 6.

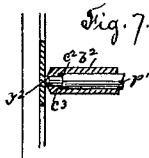


Fig. 7.

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UNITED STATES PATENT OFFICE.

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ENGRAVING-MACHINE.

SPECIFICATION forming part of Letters Patent No. 461,745, dated October 20, 1891.

Application filed November 19, 1890. Serial No. 371,958. (No model.)

To all whom it may concern:

Be it known that we, CHARLES H. FIELD and CHARLES H. FIELD, Jr., citizens of the United States, and residents of Providence, in the State of Rhode Island, have invented a new and useful Improvement in Engraving-Machines, of which the following is a specification.

Our invention relates to that class of engraving-machines in which an electro-magnet is employed to operate the graver in connection with a pattern and a tracer, the movement of which over the pattern serves to make and break the electric circuit at proper intervals; and it is a well-known fact that when a sufficient amount of electric current is employed to properly control the action of the graver a very deleterious spark will be produced at the instant of the separation of the contact-points, the same being especially deleterious when the contact is made and broken at the surface of the pattern, and to practically reduce the said spark to a minimum constitutes one of the objects of our invention; and heretofore in engraving-machines in which a cam is used to regulate the angular position of the graver to the curved form of the article to be engraved the support for the cam has been made separate and independent from the supporting-standard of the traversing block for the graver-carriage, thus necessitating an adjustment of the said support independently of the adjustment of the position of the standard or frame which supports the said traversing block, thereby requiring extra time and care in making the proper adjustment of the separate parts; and our invention consists in the employment of a short-circuit resistance-wire with the coils of the electro-magnet which operates the graver, whereby the spark will be greatly lessened at the breaking of the electric circuit at the contact-points.

It also consists in the combination, with the graver and the graver-carriage, of the traversing block which supports the graver-carriage and a guiding-cam attached to the adjustable standard which supports the traversing block.

It also consists in the improved construction and arrangement of the tracer, which serves to transmit the required movement from the pattern to the levers which operate the contact-points.

It also consists in the combination, with the pattern, of a train of gearing whereby the pattern will be caused to revolve with a greater number of revolutions than the article to be engraved.

It also consists in the improved construction of the gear mechanism for operating the rosette pattern-wheel; and it also consists in improved devices for transmitting a simultaneous traversing movement to the tracer and the graver.

Figure 1 represents a plan view of an engraving-machine embodying our improvements. Fig. 2 represents a side elevation of the same. Fig. 3 represents an end view with the carriage-supporting standard removed. Fig. 4 is a detail view showing the train of gears which serves to rotate the pattern. Fig. 5 represents a side elevation of the multiplying levers which serve to operate the contact-points. Figs. 6 and 7 are detail views showing the construction of the tracer.

In the accompanying drawings, A represents the table of the machine; B, the vibrating frame; C, the work-shaft or spindle, which is provided with means for holding the chuck D, on the end of which the metal-plate *h* to be engraved or ornamented is secured.

The graver-carriage standard is shown at E and is secured to the bed of the machine by means of a slot in its base and a clamping-screw *a*, which occupies a curved slot in the bed-plate, thus providing for the adjustability of the standard with relation to the end of the work-spindle.

The traversing screw is shown at F, provided with a hand-crank *f*⁴, a gear *f*⁵, and a spring-pawl *f*⁶, and is connected with the driving gearing mounted on the frame B by means of a shaft G, having universal joints, so that the screw F may be revolved regardless of the particular position of the adjustable standard E. The spring-pawl *f*⁶ admits of the disconnection of the driving gearing

from the screw, which can then be revolved by its hand-crank, as set forth in Letters Patent of the United States No. 192,247.

H represents the traversing block dovetailed to the standard E and connected with the traversing screw.

I represents the graver-carriage, which is secured to the traversing block H by means of the dovetailed slide J, to which the supporting-plate K is pivoted at its forward end, the dovetailed slide J being fitted into a recess in the traversing block, so that the said slide will move to and fro in a line at right angles to the axis of the traversing screw. The pivot *b*, which connects the slide J and the supporting-plate K, is preferably made hollow, so that the electric wire *c*, which forms a circuit around the arms of the electro-magnet L, may pass through the cavity of the said pivot. To the forward end of the supporting-plate K is pivoted the tool-post M, which serves to hold the graver *d*, the said tool-post being operated in a forward direction to bring the graver in contact with the plate *h* for engraving the same by means of a spiral spring *e*, held in a cylindrical case *f*, attached to the standard *g*, which forms a connecting portion of the electro-magnet L and is attached to the supporting-plate K. The pivoted tool-post M is provided with the armature N, which, in connection with the electro-magnet L, serves to draw the graver back from the plate *h* against the opposing action of the spring *e* by means of which the graver is held against the said plate to perform its work. One edge of the supporting-plate K is provided with a projecting arm *i*, provided at its outer end with a roller *j*, which rides against the curved edge *k* of the cam O, the said cam being supported in a horizontal position by means of the arm *l*, which projects from the standard E, and the roller *j* is held against the edge of the cam O by means of the cord *m*, which passes over the pulley *m'* and is provided with a weight, which is not shown in the drawings. The cam O being thus held in a fixed position relatively to the standard E, the movement of the traversing block H, by means of the screw F, will cause the pivotal movement of the supporting-plate K, which movement is required to maintain the proper direction of the graver from every part of the curved surface of the plate *h*, the general adjustment of the cam O being effected by the adjustment of the standard E upon the table A.

To the standard E is attached the lever *n* by means of the screw *o*, the end *p* of the said lever being attached to the end of the traversing block H by means of the adjustable link *q*, and to the traversing block is attached the lever *r* by means of the screw *s*, the said lever being provided with the cam-slot *t*, which is adapted to receive the roller *u* at the outer end of the lever *n*, and the inner end of the lever *r* is connected to the slide J by means of the link *v*, and by means of the cam-

lever *r* a gradual forward movement and a corresponding backward movement will be imparted to the graver to provide for the curved surface of the plate *h* to be engraved.

The rosette pattern-wheel P is held loosely upon the spindle C between suitable collars, the said wheel P being rotated by means of the attached gear Q, which engages with the pinion Q' upon the end of the shaft R, upon which is placed the driving-pulley R' and the driving-pinion S, which engages with the gear T, the said gear being held upon the sleeve U, which is provided with a flange *x*, against which the side of the gear rests, and upon the sleeve U is also placed the removable gear V, which is held against the hub of the gear T to revolve with the same by means of the nut *y*. Upon the spindle C are placed the sleeves V' V'', which are caused to rotate with the spindle by means of the spline *w*, and are provided with the beveled surfaces *z*, which are adapted to engage with the corresponding beveled surfaces at the end of the cavity of the sleeve. The sleeve V' is arranged to slide upon the spindle, and is adapted to be set up to compensate for the wear of the bearing-sleeve U by means of the nuts *w'* and *w''*. Upon the rearward end of the spindle C is secured the removable gear W, which has either one more teeth, or one tooth less than the corresponding removable gear V, the gears V and W being connected to each other by means of the equal pinions X X, which are secured to a short shaft *a'* held in the adjustable bracket *b'*. The rosette pattern-wheel P will thus be driven at a slightly greater or less speed than that of the spindle C, so that in one revolution of the rosette pattern-wheel there will be either a gain or loss of one-half of a wave of the said pattern-wheel. For example, with a rosette pattern-wheel having one hundred waves upon its periphery the gears V and W must have either two hundred and two hundred and one or two hundred and one hundred and ninety-nine teeth, respectively.

To the spindle C is attached the gear *c'*, which is connected with the gear *d'* upon the shaft *e'* by means of the intermediate gear *f'*, the said gear *d'* being made of the same diameter as the gear *c'* in order that when the gear *d'* is tightened upon the shaft *e'* by means of the set-screw *g'* the shaft *e'* will be driven at the same speed as the spindle C; but in order to drive the shaft *c'* at the rate of two, three, or four times the speed of the spindle C, as may be required, we provide upon the shaft *e'* a pinion *h'*, which may be tightened upon the shaft by means of the set-screw *i'*, while the gear *d'* is allowed to run loose, and upon the fixed stud *j'* are loosely placed the gears *k'* and *l'*, which are connected to each other, the gear *k'* being made to engage with the pinion *h'*, while the gear *l'* will engage with the loose gear *d'*, the gears shown in the drawings being adapted to cause the revolution of the shaft *e'* twice as fast as the spindle

C. Upon the end of the shaft e' is secured the pattern-plate Y, which is provided with the pattern m^2 , the said pattern being made of sheet metal cut out in the proper form, and soldered or otherwise secured to the face of the pattern-plate, so that the electric current can be made to pass through the said pattern to or from the contact-points.

Upon a slide n' , arranged in front of the pattern-plate Y, is placed the insulated sliding holder o' , which carries the tracer p' and the contact mechanism, and the said holder is caused to traverse upon the slide n' in timely relation to the traversing movement of the graver-carriage I, by means of the roller-covered pin q' held in the circular disk r' , which is secured to the downward-extending arm s' by means of the clamping-screw t' , the said arm being secured to the traversing block H, so as to move therewith, and by turning the disk r' upon the clamping-screw t' the position of the roller-covered pin q' can be properly adjusted.

In a bearing u' at the base of the standard A' is held the rock-shaft v' , one end of which is provided with the roller-covered arm w^3 , which engages with the roller-covered pin q' , and the other end of the said shaft v' is provided with the upwardly-extending arm x' , which is pivoted to a link y' , connected to the holder o' , the angular movement of the said arm x' serving to impart the required traversing movement to the tracing-point, the roller-covered arm w^3 being held in contact with the side of the roller-covered pin q' by means of a suitably-arranged spring or weight (not shown in the drawings,) the said spring or weight being of sufficient strength to cause the backward movement of the holder o' with the backward movement of the pin q' .

The tracer p' is provided with a conical point y^2 , which passes over the surface of the pattern-plate and pattern, and the movement of which over the elevations of the pattern, and the vacant openings in the same, will serve to make and break the electric circuit at the contact-points $a^2 a^3$, which are operated by a system of compound levers, as follows: Over the tracer p' is placed the loose supporting-sleeve b^2 , the end of which is beveled to correspond with the conical inclination of the point of the tracer, the said tracer being provided with the shoulder c^2 , which is adapted to be engaged by the shoulder c^3 in the cavity of the sleeve b^2 , as shown in Figs. 6 and 7, and the said sleeve is arranged loosely in the adjustable shell d^2 , which is securely held by means of the screw e^2 , the end f^2 of the said shell serving to form a stop for the upper end of the lever g^2 , which is pivoted to the holder o' at the pivot-pin h^2 , the said lever being provided with a perforation i^2 to allow the outer end of the tracer p' to press against the upper end of the lever j^2 , the said lever being provided with the ears k^2 , which are also pivoted to the pin h^2 . A spring l^2 is attached to the holder o'

and arranged to bear against the lower arm of the lever g^2 , and to the opposite side of the lower arm of the said lever is attached the spring m^3 , which bears against the lower arm of the lever j^2 , the pressure exerted by the spring l^2 being greater than that of the spring m^3 , and upon the upper arm of the lever g^2 is placed the stop-screw n^2 , the head of which serves to limit the movement of the upper arms of the levers g^2 and j^2 toward each other. The upper arm of the lever j^2 is provided with a forked guide o^2 , adapted to receive and guide the upper arm of the lever p^2 , which is pivoted to the lower arm of the lever g^2 and connected with the lower end of the lever j^2 by means of the pivoted link q^2 . The upper end of the lever j^2 is provided with a head r^2 of insulating material, having a transverse perforation to receive the contact-pin s^2 , which is held in proper adjustment by means of the clamping-screw v^2 . The electric-circuit wire c runs from the top of the standard x^2 , to which it is attached, to the electric generator B' , and thence to the coils of the electro-magnet, from which it passes to the contact-pin s^2 of the insulated head r^2 upon the lever j^2 , and from the point a^4 in one arm of the circuit-wire c to the point a^4 in the opposite arm at each side of the magnet is extended the short-circuit resistance-wire b^4 , which, by allowing a current to pass at the breaking of the circuit, will serve to greatly diminish the spark at the contact-points.

In operating the machine the back of a watch-case or a curved plate h may be attached to the chuck D at the forward end of the work-spindle C, and the proper adjustment of the graver-carriage standard E may be made by means of the clamping-screw a and the curved slot in the table A, through which the screw is made to pass, as set forth, and in this case, upon the proper movement of the traversing block H by means of the rotation of the traversing screw F, the action of the cam O upon the arm i will serve to guide the axis of the graver d in a direct line toward the presented surface of the curved plate h without requiring a separate adjustment of the cam O, as heretofore, and at whatever angle with the work-holding spindle C the standard E is set, the proper engagement will be made by the pin q' and arm w^3 , whereby the movement of the traversing block H and the graver d will be transmitted to the sliding holder o' and tracer p' , and by the adjustment of the pin q' by turning the holding-disk r' upon the clamping-screw t' the traverse of the tracer p' can be made to be either greater or less than that of the graver d , the pin q' being thus caused to engage with the arm w^3 at a greater or less distance from the rock-shaft v' , and the adjustable en-

gagement of the pin q' and arm w^3 for transmitting movement from the traversing block to the holder for the tracing-point constitutes an important feature of our invention, the same being capable of operation at any desired position of the standard E upon the table. Upon the rotation of the pattern m^2 and consequent engagement of the same with the point of the tracer, the points a^2a^3 of the contact-pins s^2 and s^3 will be moved in opposite directions to either make or break the circuit, as the case may be, the said contact-points being actuated in the opposite direction by means of the springs l^2 and m^3 , and we prefer to pass the electric current through the pattern and tracer, as by means of the electric-wire connections hereinbefore described.

It is intended that the beveled end of the tracer-supporting sleeve b^2 shall touch at the highest surface of the pattern, and in case of inequalities in such surface the said sleeve will operate to move the contact-points backward together, so that under all circumstances the distance through which the contact-points are caused to separate from each other will be the same, and by our improvement a very quick movement for making and breaking the circuit will be attained, which will insure the highest grade of work.

In making what is known as "barleycorn engraving" the work-spindle C is made to have a slight vibratory movement by the rotation of the rosette pattern-wheel P against the fixed guide-rest b^3 , and the arrangement of the removable gears V and W with the rosette pattern-wheel P upon the same spindle C constitutes an economical construction and a desirable improvement.

We claim as our invention—

1. In an engraving-machine, the combination, with the graver and an electro-magnet which is adapted to operate the graver, of a short-circuit resistance-wire arranged to connect the wire of the electric circuit in advance of the coils of the magnet, whereby the tendency to throw off a spark at the contact-points upon the breaking of the circuit will be diminished, substantially as described.

2. In an engraving-machine, the combination, with the graver, the graver-carriage, and the traversing block, of the adjustable standard supporting the traversing block and provided with a cam which is adapted to guide the direction of the graver relatively to the curved surface of the plate to be engraved, substantially as described.

3. In an engraving-machine, the combination, with the pattern, of the sliding tracer, the electric contact-points, and operative connection from the sliding tracer to the contact-points, whereby the mechanical action of the pattern upon the tracer will be imparted to the contact-points, substantially as described.

4. In an engraving-machine, the combination, with a pattern and a tracer arranged in electric circuit with the pattern, of the con-

tact-points and supporting-levers which are actuated to move simultaneously in opposite directions by the mechanical action of the pattern upon the tracer, substantially as described.

5. The combination, with the electro-magnet, the contact-points adapted to make and break the electric circuit, of a pattern and tracer, and suitable connection for imparting a simultaneous opposite movement to the contact-points, as set forth.

6. In an engraving-machine, the combination, with the pattern, the tracer, and the tracer-supporting sleeve, of the contact-points and supporting-levers, which are actuated to move simultaneously in opposite directions by the mechanical action of the pattern upon the tracer, and are actuated to move together in the same direction by the mechanical action of the pattern upon the tracer-supporting sleeve, substantially as described.

7. In an engraving-machine, the combination, with the pattern and the sliding tracer, of the lever which carries one of the contact-points for making and breaking the circuit and is operated by the movement of the tracer, and the lever which is linked to the said tracer-operated lever and carries the opposite contact-point, substantially as described.

8. In an engraving-machine, the combination, with the pattern and the sliding tracer, of the lever which carries one of the contact-points and is operated by the movement of the tracer, the tracer-sleeve, the lever which is operated by the movement of the tracer-sleeve, the stop for limiting the movement of the tracer-sleeve toward the pattern, and the lever which is jointed to the said sleeve-operated lever and linked to the said tracer-operated lever and carries the opposite contact-point for making and breaking the electric circuit, substantially as described.

9. In an engraving-machine, the combination, with the work-holding spindle, of the revolving pattern which is geared to rotate at a different rate of speed from that of the work-holding spindle, the tracer arranged in electric circuit with the pattern, means, substantially as described, for making and breaking the electric circuit by the mechanical action of the pattern upon the tracer, the graver, the electro-magnet for operating the graver, and means for causing the simultaneous traversing movement of the graver and the tracer, substantially as described.

10. In an engraving-machine, the combination, with the work-holding spindle, of the rosette pattern-wheel loosely held upon the spindle, the loose sleeve provided with the gears, one of which is removable, the removable gear attached to the work-spindle and having one more or one less number of teeth than the removable gear of the sleeve, means for connectedly driving the rosette pattern-wheel and the gears upon the sleeve, and

means for connectedly driving the removable gears of the sleeve and spindle, substantially as and for the purpose specified.

5 11. In an engraving-machine, the combination, with the traversing block and the adjustable projecting pin adapted to move with the traversing block, of the rock-shaft provided with a projecting arm which engages with the said projecting pin, the holder for

the tracer, and means for imparting movement from the rock-shaft to the holder, substantially as described.

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