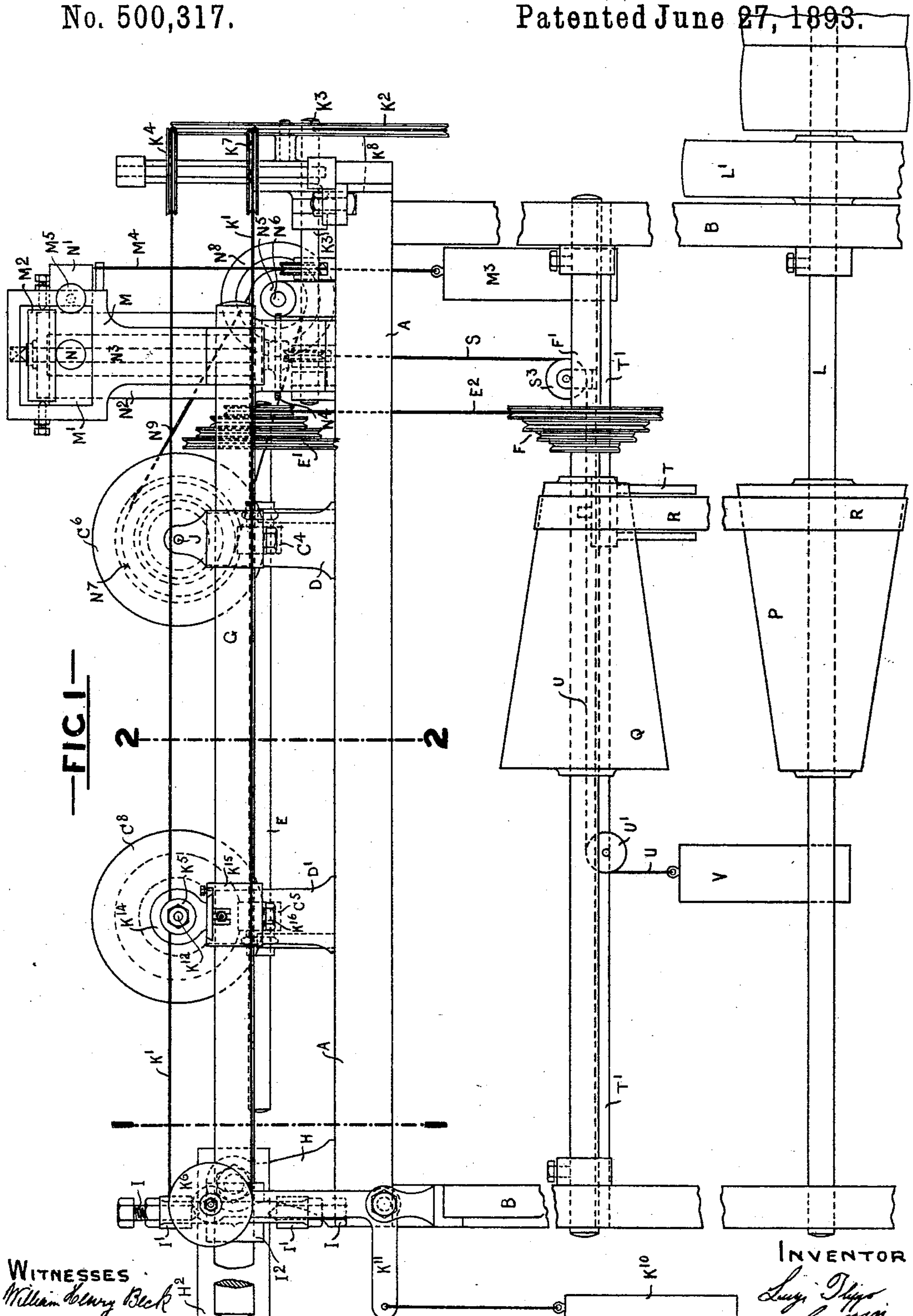
(No Model.) 4 Sheets—Sheet 1.

L. F. CAMPI.

MACHINE FOR ENGRAVING OR SINKING DIES, MATRICES, OR OTHER OBJECTS.

No. 500,317. Patented June ~~27, 1893.~~



WITNESSES
William Henry Beck
Stephen Edward Gunyon

INVENTOR
Luigi Filippo Campi

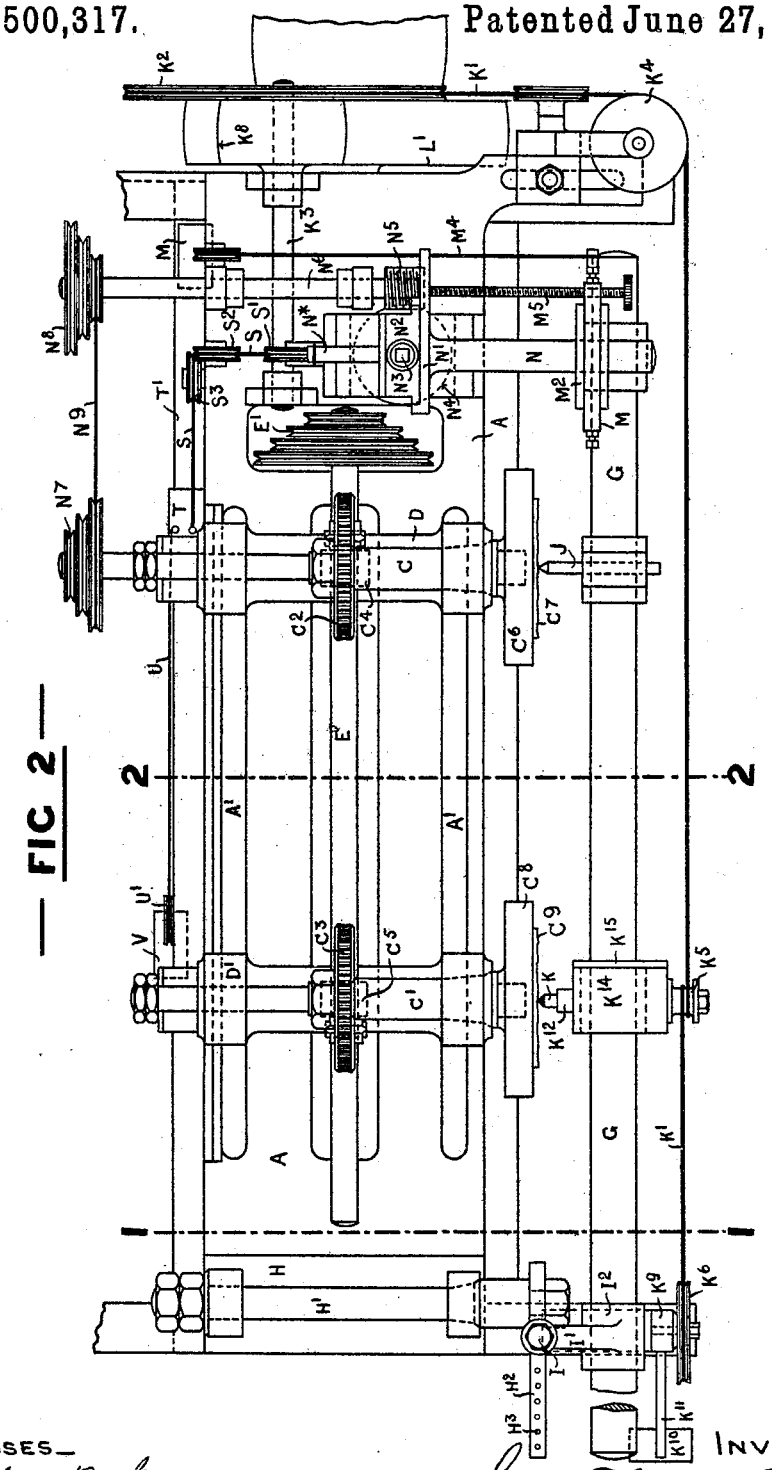
THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

(No Model.) 4 Sheets—Sheet 2.

L. F. CAMPI.

MACHINE FOR ENGRAVING OR SINKING DIES, MATRICES, OR OTHER OBJECTS.

No. 500,317. Patented June 27, 1893.



— FIG 2 —

WITNESSES—
William Henry Beck
Stephen Edward Gunyon.

INVENTOR—
Luigi Filippo Campi

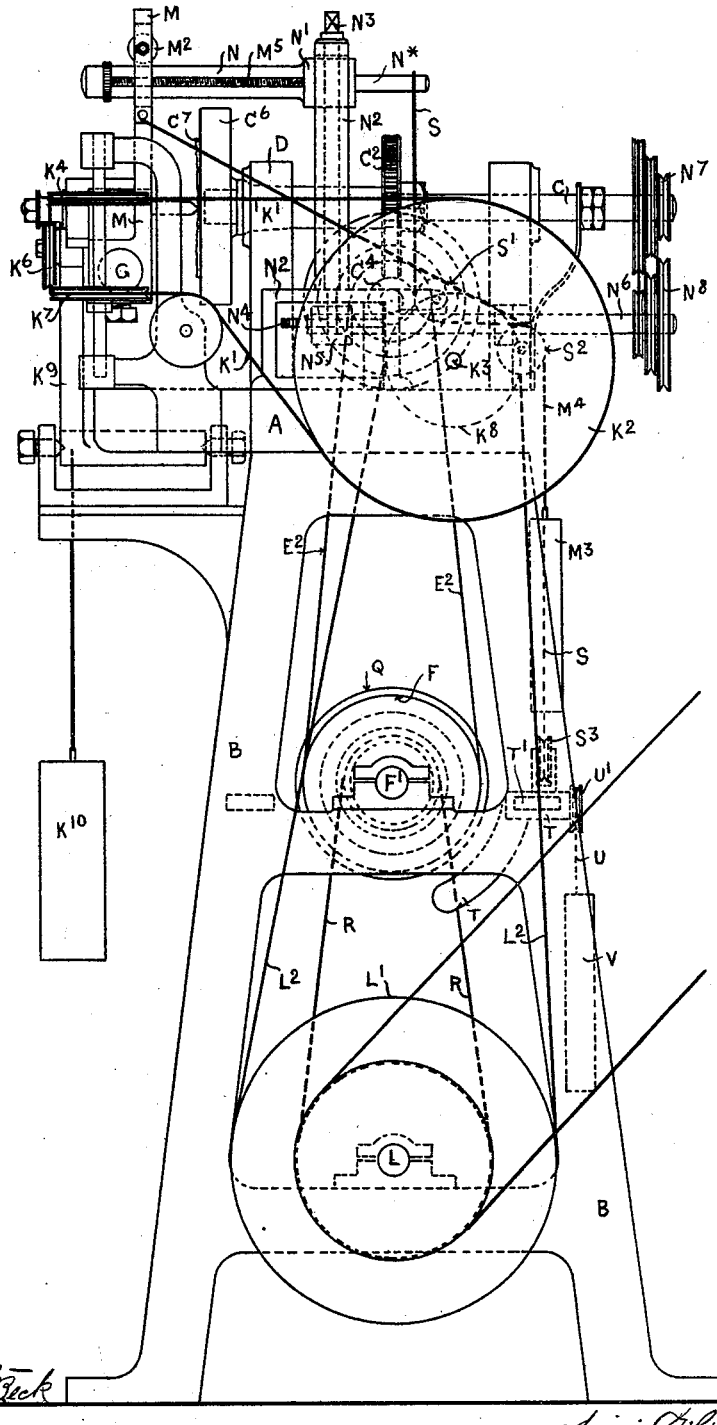
(No Model.) 4 Sheets—Sheet 3.

L. F. CAMPI.

MACHINE FOR ENGRAVING OR SINKING DIES, MATRICES, OR OTHER OBJECTS.

No. 500,317. Patented June 27, 1893.

FIG. 3



WITNESSES—
William Henry Beck
Stephen Edward Gunyon

INVENTOR
Luigi Filippo Campi

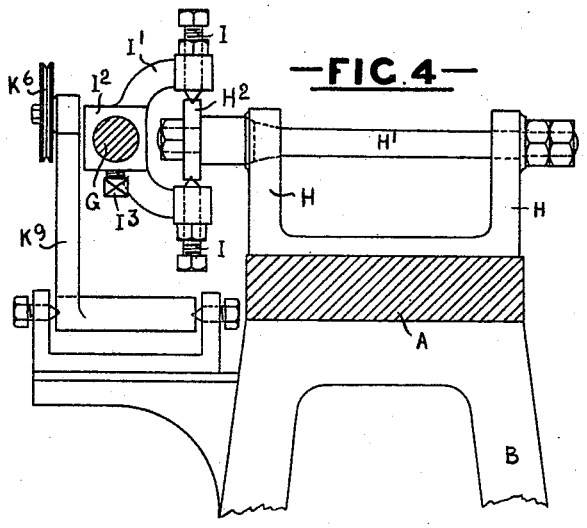
(No Model.) 4 Sheets—Sheet 4.

L. F. CAMPI.

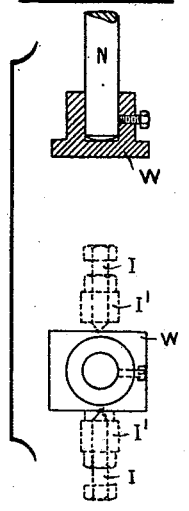
MACHINE FOR ENGRAVING OR SINKING DIES, MATRICES, OR OTHER OBJECTS.

No. 500,317. Patented June 27, 1893.

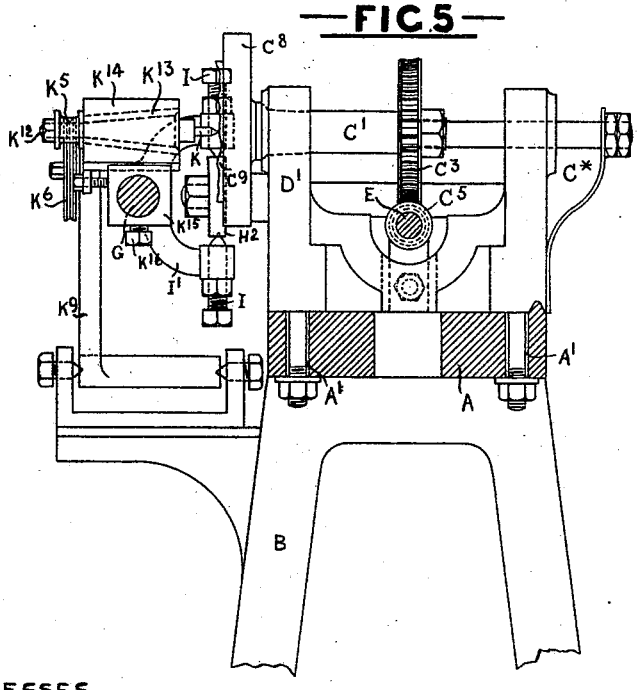
—FIG. 4—



—FIG. 6—



—FIG. 5—



WITNESSES—
William Henry Beck
Stephen Edward Gunnyon

INVENTOR—
Luigi Filippo Campi

UNITED STATES PATENT OFFICE.

LUIGI FILIPPO CAMPI, OF BIRMINGHAM, ENGLAND.

MACHINE FOR ENGRAVING OR SINKING DIES, MATRICES, OR OTHER OBJECTS.

SPECIFICATION forming part of Letters Patent No. 500,317, dated June 27, 1893.

Application filed August 15, 1892. Serial No. 443,152. (No model.) Patented in England May 21, 1891, No. 8,684.

To all whom it may concern:

Be it known that I, LUIGI FILIPPO CAMPI, engineer, a subject of the King of Italy, residing at Moor Street, Birmingham, in the county of Warwick and Kingdom of Great Britain, have invented certain new or Improved Machinery for Engraving or Sinking Dies and Matrices and other Objects in Relief or Intaglio, (for which I have received Letters Patent in England, No. 8,684, dated May 21, 1891,) of which the following is a specification.

This invention relates to new or improved machinery for engraving or sinking dies and matrices and other objects in relief or intaglio, in which the cutting or engraving tool is caused to follow a path which is defined by the movements of a pointer or tracer which is kept in contact with the surface of a templet, pattern or model while the latter is passed in front thereof, and the arrangements are such that the object engraved or sunk may be made the same size as, less than, or larger than, the templet, pattern or model from which it is copied and either right handed or left handed as may be required. And in order that the said invention may be fully understood I will now proceed to describe the same with the aid of the accompanying two sheets of drawings in which—

Figure 1 is a front elevation; Fig. 2 a plan and Fig. 3 an end elevation of a machine constructed in accordance with the said invention. Figs. 4 and 5 are sectional elevations taken on the lines 1—1 and 2—2 respectively of Figs. 1 and 2, and Fig. 6 shows detail views of certain parts.

On a suitable table or bed A, mounted on standards B, are arranged two spindles or shafts C C′ adapted to revolve in bearings in the headstocks D D′ which can be adjusted to any desired position on the said table or bed A and secured thereto by means of bolts passing through slots A′ in the said table or bed. These spindles or shafts C C′ are usually placed parallel to each other, as shown, at distances apart dependent upon the proportion that the size of the object to be engraved bears to that of the templet, pattern, or model from which it is to be copied. These spindles or shafts are caused to rotate slowly in the same or opposite directions by means of worm wheels C^2 C^3 fixed thereon and driven by worms C^4 C^5 on the shaft E which revolves in bearings in the headstocks D D′ and carries at one end the speed pulley E′ which is driven by the band E^2 from the speed pulley F on the countershaft F′. The worm C^5 is adapted to slide longitudinally on the shaft E to enable it to adjust itself to the position of the headstock D′ on the table A, but is caused to turn with the said shaft by means of a feather taking into a groove formed longitudinally in the said shaft. If preferred however the aforesaid spindles or shafts may be driven by spur or bevel gearing or otherwise. On the end of one of these spindles is mounted in a suitable chuck C^6 the templet, pattern, or model C^7 which it is desired to copy, and on the end of the other of these spindles is mounted also in a suitable chuck C^8 the piece of material C^9 which is to be engraved or sunk in imitation of the aforesaid templet, pattern, or model C^7. Opposite the pattern and piece of material to be operated upon, is placed a bar or arm G, one end of which is furnished with a kind of universal joint which allows of the said bar or arm being moved round such joint as a fulcrum in vertical and horizontal planes. In the machine illustrated in the drawings this universal joint is constructed as follows:—

H is a kind of headstock fixed adjustably on the table or bed A.

H′ is a spindle adapted to turn in bearings in the headstock H.

H^2 is an arm formed with or secured rigidly to the front end of the spindle H′. The upper and lower edges of this arm H^2 are provided with several holes or recesses H^3 into either pair of which the points of the fulcrum screws I of the fork I′ may be adjusted. The fork I′ can be fixed in any desired position on the bar or arm G by means of the boss I^2 and set screw I^3. On this bar or arm G are secured adjustably, first, a pointer or tracer J the front end of which comes opposite the pattern C^7 mounted on the spindle C so that it can be pressed against the surface of the said pattern as it revolves slowly in front of it, secondly, a revolving cutting tool K which comes opposite the piece C^9 intended to be operated upon, and which is mounted on the other spindle C′ so that as the pointer or tracer J follows the projections and hollows of the patterns C^7 so the cutting tool K acts

correspondingly upon the piece C^9 which is intended to be a copy of the pattern.

The revolving cutting tool K may be driven by a band or cord K′ which passes round the pulley K^2 on the shaft K^3, then round the guide pulley K^4, round the pulley K^5 of the cutter K, round the tightening pulley K^6, thence round guide pulley K^7 and back to pulley K^2. Motion is communicated to the shaft K^8 and pulley K^2 from the main driving shaft L of the machine by the pulleys K^8, L′ and strap L^2.

The tightening pulley K^6 is mounted on an arm K^9 turning between centers as shown and drawn constantly toward the left hand in Figs. 1 and 2 by the weight K^{10} acting on the arm K^{11} whereby the band or cord K′ is kept sufficiently tight. The cutting tool K is mounted in the end of a spindle K^{12} revolving in any suitable bearing K^{13}—preferably composed of hard material such as glass for example. The spindle K^{12} carrying the cutting tool is preferably formed with a conical journal as shown somewhat like those employed for lathe spindles and this journal may be kept against its conical bearing by spring pressure. The spindle K^{12} and bearing K^{13} may be contained in a case K^{14} secured adjustably to the carriage K^{15} clamped to the bar or arm G by the set screw K^{16}. The other end of the bar or arm G carrying the pointer or tracer and the cutting tool is guided and supported by devices, which while allowing free movement to the said bar or arm in a horizontal direction so as to enable the pointer or tracer to follow all the irregularities of the surface of the pattern as the latter revolves in front of it, only allow the said bar or arm to descend automatically to a certain slight extent for each revolution of the spindles carrying the pattern and the piece to be operated upon. These devices are of the following character:—

M is an arm clamped on the bar or arm G and having at its upper end an opening M′ in which is mounted the friction roller M^2 revolving freely on center screws as shown. The end of the bar G is supported by the roller M^2 bearing on a pin N projecting from a slide N′ which can be moved up and down in guides on the standard N^2 by means of a screw N^3 taking into a nut in the said slide N′. The lower end of the screw N^3 carries a worm wheel N^4 into which gears the worm N^5 on the shaft N^6 which turns in bearings secured to the table A and is driven from the spindle C by the speed pulleys N^7 N^8 and cord N^9. A weight M^3 and cord M^4 draw the arm M and end of the bar G constantly toward the back of the machine; such action being limited and regulated however by the adjusting screw M^5 screwed through the arm M and having its end bearing against a part of the slide N′. By these arrangements the free end of the bar G is at liberty to move backward and forward horizontally as the pointer or tracer follows the elevations and depressions of the pattern and is allowed to gradually descend so as to carry the pointer or tracer and the cutting tool toward the circumference of the pattern and of the piece to be operated upon respectively.

It will now be understood that if the two spindles C C′ carrying the pattern C^7 and the piece to be operated upon C^9 respectively be caused to rotate, and the pointer or tracer J on the aforesaid bar or arm G is brought in contact with the pattern C^7, the cutting tool K on the said bar will act on the piece C^9 on which the copy is to be made and will cut it away to a depth proportionate to that of the corresponding part of the pattern.

In practice the operation of engraving or sinking may be commenced by placing the pointer or tracer J in the center of the pattern. Then at each revolution of the pattern C^7 and piece being operated upon C^9, the bar or arm G, with the pointer J and cutter K, is lowered slightly by means of the screw N^3 operated from the spindle C as above described so that the pointer or tracer passes in a spiral line over the surface of the pattern as the latter revolves and the cutting tool passes over a similar path on the piece being operated upon as the latter revolves.

It will be obvious that if preferred the screw N^3 may be moved intermittently instead of continuously by any suitable arrangement of mechanism such as a ratchet wheel and pawl for example whereby the tracer and cutting tool will follow a succession of circles on the pattern and copy instead of a spiral line. As however the circumference of the circles or spirals described becomes larger as the pointer and cutter are moved away from the centers of the pattern and copy respectively, it is necessary to reduce the speed of rotation of the spindles carrying the pattern and copy, so that the surface speed of the part of the copy passing in front of the tool shall not be too great, whatever part of the copy the tool may be operating upon. This may be effected by any suitable mechanism. For example, the said spindles or shafts may be driven as shown in the drawings by a pair of cone pulleys P Q the strap R of which is gradually shifted along from the larger to the smaller end of the driving cone P as the pointer J and cutting tool K are moved away from the center of the pattern and copy respectively. This shifting of the strap R is effected in the following manner:—

S is a cord connected at one end to a pin N* fixed to the back of the slide N′ and after passing under the guide pulley S′, over the guide pulley S^2 and under guide pulley S^3 is secured at the other end to the strap fork T which is adapted to slide on the bar T′ connecting the two standards B.

U is a cord connected at one end to the strap fork T and after passing over the guide pulley U′ has its other end connected to the weight V. As the slide N′ is carried down by the screw N^3 the cord S is relaxed and the

weight V draws the strap fork T to the left in Fig. 1 gradually traversing the strap R in the same direction whereby the speed of the countershaft F′ and consequently that of the worm shaft E and spindles C C′ are gradually reduced.

In order to produce a left hand copy from a right hand pattern, or vice versa, the two spindles carrying the pattern and copy respectively, are caused to rotate in opposite directions by making the worm and worm wheel of one of the spindles C C′ right handed and those of the other spindle left handed. An intaglio copy can be made from a pattern in relief, or vice versa, by arranging the headstock H and fork I′, forming the universal joint or fulcrum of the bar or arm G, in a position between the spindles C C′. In order to produce a copy the same size as the pattern or model an apparatus similar to that indicated by the letters of reference N to N^9 inclusive may be substituted for the headstock H, a piece W, shown in Fig. 6, being secured on the end of the pin N of such apparatus for the fork I′ to take its bearing upon. By these means the entire bar or arm G is caused to descend parallel to itself in the same way as the outer end of such bar or arm is caused to descend in the arrangement above described, the said bar or arm being still free to oscillate horizontally on the fulcrum screws of the fork I′ to enable the tracer to follow the elevations and depressions of the pattern.

The size of the copy relative to that of the pattern can be varied to a certain extent by suitably adjusting the relative positions to each other of the spindles C C′ carrying the pattern and copy and of the position of the fulcrum of the bar or arm G carrying the pointer J and cutter K with reference to those two spindles. In the arrangements shown in the drawings the copy is produced smaller than the pattern. When it is desired to make the copy larger than the pattern the latter is mounted on the spindle C′ and the piece on which the copy is to be made on the spindle C.

When it is desired to adjust the fork I′ nearer to the spindle C′ than can be effected with the arm H^2 in the position shown in Figs. 1 and 2, the said arm may be reversed so as to project toward the said spindle C′ instead of away therefrom.

The spindles C C′ are preferably made with conical journals and bearings, the journals being pressed against their corresponding conical bearings by springs such as that shown at C* for example in Fig. 5 in order to prevent unsteady action of such spindles as they rotate.

The point of the tracer J should be made of hardened steel, diamond, ruby or other very hard material to prevent wear and tear as much as possible.

I claim—

1. In a machine for engraving or sinking, the combination with the spindles C C′ placed parallel to each other and caused to rotate at the same speed, in the same or in opposite directions, one of such spindles carrying the pattern or model and the other the piece of material on which the copy is to be produced, of the bar or arm G carrying the pointer or tracer J and the revolving cutting tool K, and adapted to pivot horizontally and vertically in front of the said revolving pattern or model and piece of material substantially as hereinbefore described and illustrated in the drawings.

2. In a machine for engraving or sinking the spindles C, C′, one carrying the pattern or model and the other the material to be operated upon, the devices for allowing the bar or arm G, with the pointer or tracer and the revolving cutting tool mounted thereon, to pivot horizontally and vertically, said devices consisting of the headstock H, the spindle H′, the arm H^2 having holes or recesses H^3 in its edges, the fork I′ having fulcrum screws taking into such holes and being secured on the bar G, all combined and arranged substantially as hereinbefore described.

3. In a machine for engraving or sinking the spindles C, C′, one carrying the pattern or model and the other the material to be operated upon, the devices for effecting the vertical pivoting movement of the bar or arm G with the pointer or tracer and the revolving cutting tool mounted thereon, said devices consisting of a friction roller M^2 mounted on the bar or arm G, a pin or stud N, slide N′, standard N^2, traversing screw N^3, worm wheel N^4, worm N^5 and shaft N^6 driven from the spindle C, all combined and arranged substantially as hereinbefore described.

4. The new or improved machinery for engraving or sinking, which consists of two spindles C, C′ caused to rotate at the same speed in the same or in opposite directions, one of such spindles carrying the pattern or model, and the other the piece of material on which the copy is to be produced; a bar or arm G on which are mounted a pointer or tracer and a revolving cutting tool; mechanism substantially as described for enabling the said bar or arm to turn in a horizontal plane in order to allow the pointer or tracer to follow the elevations and depressions of the pattern or model; and mechanism substantially as described for moving the said bar or arm vertically in order to traverse the pointer or tracer and the cutting tool across the faces of the said pattern or model and piece of material respectively as the said pattern or model and piece of material revolve, combined, arranged and operating substantially as hereinbefore described.

In testimony that I claim the foregoing as my invention I have signed my name in presence of two subscribing witnesses.

LUIGI FILIPPO CAMPI.

Witnesses:

WILLIAM HENRY BECK,
STEPHEN EDWARD GUNYON,
Both of 115 *Cannon Street, London.*