(No Model.) 2 Sheets—Sheet 1.

H. SCHULZE-BERGE.

MACHINERY FOR DECORATING GLASSWARE.

No. 296,224. Patented Apr. 1, 1884.

FIG 1

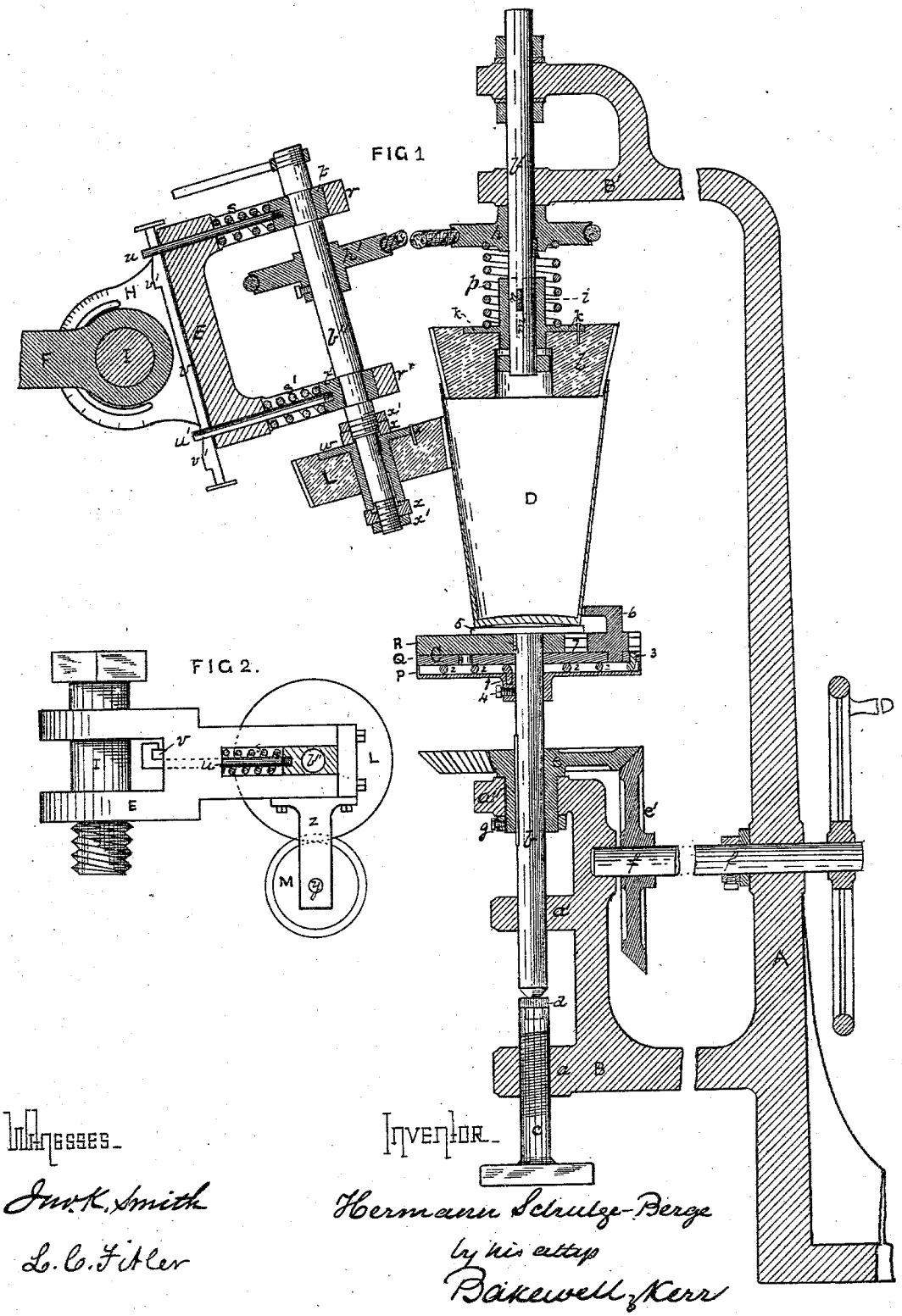


FIG 2.

Witnesses.

Jno. K. Smith

L. C. Fitler

Inventor.

Hermann Schulze-Berge

by his attys

Bakewell & Kerr

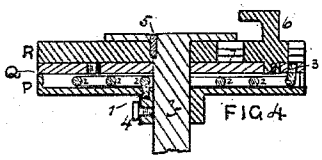
N. PETERS, Photo-Lithographer, Washington, D. C.

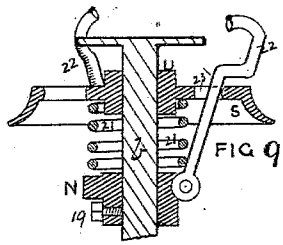
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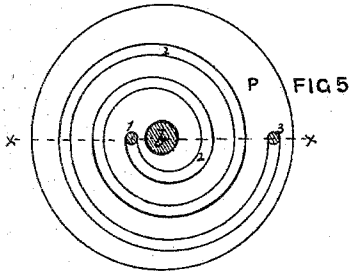
H. SCHULZE-BERGE.

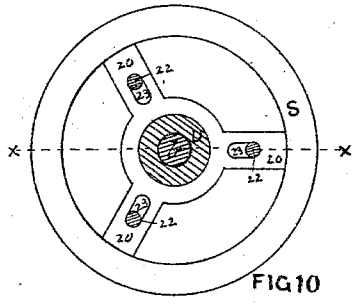
MACHINERY FOR DECORATING GLASSWARE.

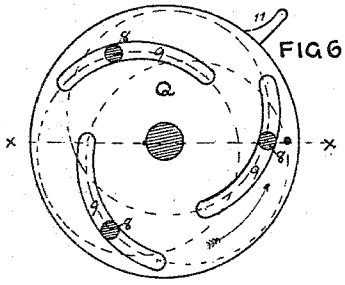
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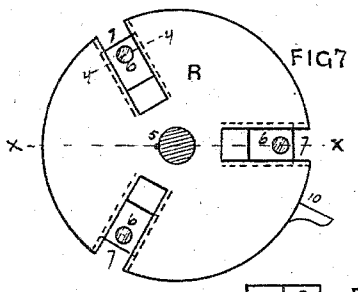


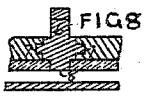


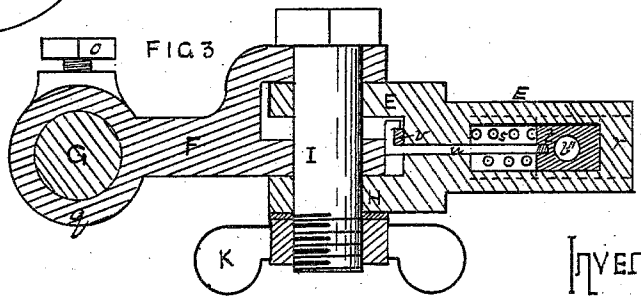












Witnesses.

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Baxewell & Kerr.

N. PETERS. Photo-Lithographer, Washington, D. C.

UNITED STATES PATENT OFFICE.

HERMANN SCHULZE-BERGE, OF PITTSBURG, PENNSYLVANIA, ASSIGNOR TO HIMSELF AND JESSE H. LIPPINCOTT, OF SAME PLACE.

MACHINERY FOR DECORATING GLASSWARE.

SPECIFICATION forming part of Letters Patent No. 296,224, dated April 1, 1884.

Application filed April 19, 1883. (No model.)

To all whom it may concern:

Be it known that I, HERMANN SCHULZE-BERGE, of Pittsburg, in the county of Allegheny and State of Pennsylvania, have invented a new and useful Improvement in Machinery for Decorating Glassware; and I do hereby declare the following to be a full, clear, and exact description thereof.

My machine is designed to print upon the surface of articles of glassware or china, which are circular in horizontal cross-section, any desired pattern or design. The design is printed with a resinous varnish or other semi-fluid substance of sufficient viscidity, and after the design has been so printed on the article to be decorated, and while the varnish is yet moist, finely-pulverized fusible metallic colors are dusted over the surface of the glass or china adhering to the sticky surface of the varnish. If the design is to be etched on the surface of the glass, instead of fusible colors, I dust onto the printed glass surface finely-pulverized fluoride of sodium or other alkaline fluoride; or, if preferred, the finely-pulverized fusible colors, or fluoride of sodium, are intimately mixed with the varnish or other suitable vehicle, and with this mixture as an ink I print the desired pattern or design on the surface of the glass or china to be decorated or etched. The article so prepared is then transferred to a suitable oven, where it is exposed to a sufficient degree of heat to fuse the metallic colors, or to produce a reaction between the fluorine of the fluoride and the silica of the glassware, and thus produce the effect of etching. This process of printing on the surface of glassware or china forms the subject of a separate application for Letters Patent filed simultaneously herewith, my present invention being confined to machinery for printing the desired pattern with varnish, or with varnish or other vehicle mixed with coloring matter, or with fluoride directly upon the surface of the glass or china.

In the accompanying drawings, forming part of this specification, Figure 1 is a vertical section of my machine. Figs. 2 to 8 are details of parts of the machine shown in Fig. 1. Figs. 9 and 10 show a further modification of the chuck.

In the several figures like letters refer to similar parts.

My machine consists of two principal parts, one of which holds and rotates the article to be printed on, the other carries a revolving printing-roller which prints the impression on the articles of glass or china ware, the printing-roller receiving a positive rotary motion from the other portion of the machine. These two principal parts of the machine may be attached to the same bed-plate or not, as may be preferred; but if not they should both be so firmly fixed as to operate together substantially as one machine.

In the drawings, A is the frame of the lathe, or that part of the machine which holds and rotates the article which is to receive the impression. It has two projecting brackets, B and B′, the latter being at the upper end of the frame. The lower bracket has three arms, *a a′ a″*, the arms *a′ a″* serving as bearings for the vertical spindle *b*, and the lower arm, *a*, having screwed into it, on the same axial line as the spindle *b*, a screw, *c*, the upper extremity of which carries the step *d*, which supports the lower extremity of the spindle *b*.

To the spindle *b* is keyed, above the upper arm, *a″*, a horizontal bevel cog-wheel, *e*, into which another bevel cog-wheel, *e′*, gears, which is secured to a horizontal shaft, *f*, by means of a feather or spline, to which shaft motion is communicated by hand or power.

At the upper end of the spindle *b* is fastened a chuck, C, which carries the article of glass D, (which in the drawings is a tumbler,) which it holds securely in a vertical position in the manner hereinafter described. The chuck C, and with it the article which it carries, is adjusted to the proper position vertically by means of the screw *c*, as the spindle is capable of sliding up and down in the arm *a′* and in the hub of the bevel-wheel *e*, the bevel-wheel *e* being prevented from rising by a collar held by a key or screw, *g*. The upper bracket, B′, carries a spindle, *b′*, which is in the same vertical axial line as the lower spindle, *b*.

To spindle *b′* is keyed a pulley, *h*. Around the spindle *b′*, at its lower end, is a sleeve, *i*, which has a flange, *k*, to which is secured a

plug, *l*. A slot, *m*, in the sleeve *i* allows a pin, *n*, which projects from the spindle *b'*, to enter it. At the lower end of the slot *m* is an enlargement, forming with the pin *n* a bayonet-joint, so that when the sleeve and plug are raised by hand on the spindle *b'* the plug can be held in that position by turning it slightly on its axis. A spiral spring, *p*, surrounds the sleeve *i* and spindle *b'*, between the pulley *h* and flange *k* of the plug, and presses the plug *l* downward. The plug *l* is covered with a band of soft rubber, and, being inserted into the top of the tumbler, holds it firmly in a vertical position on the chuck C. The size and shape of the plug *l* will depend on the article of china or glass ware to be operated on, and as the plug can be readily detached from the flange *k* of the spindle *b'* a plug of any desired shape or size may be used.

I have described the spindle *b* and *b'* of my machine as being vertical; but if preferred the frame may be so constructed that these spindles shall be horizontal, the position ordinarily used in lathes; also, the power for communicating rotary motion to the spindles may be applied either to the spindle *b*, as in the drawings, or to the spindle *b'*.

The frame E of the printing machinery is connected by a short link, F, to a standard, G. The link F has an eye, *q*, at one end, which surrounds the vertical cylindrical bolt or standard G, (see Fig. 3,) rigidly connected with the bed-plate of the machine, thus forming a joint which enables the frame E to be adjusted horizontally. The other end of the link F is forked and receives a lug, H, of the frame E, to which it is jointed by a bolt, I. The axis of the bolt I is horizontal, while that of the standard G is vertical, which permits of the frame E being adjusted both vertically and horizontally. A screw-nut, K, on the hinge-bolt I and a screw, *o*, on the eye *q*, serve to clamp the joints and hold the frame E rigidly in any position in which it may be set. The outer edge of the lug H on the frame E may be graduated, (see Fig. 1,) so that when the printing-wheel is once adjusted to the angle of the article to be printed on it may afterward be set to that angle by turning the frame E in its joint at I until the edge of the link F coincides with the proper mark on the graduated arc.

The frame E has two arms, *r r'*, which are slotted, so as to receive the sliding bearings *t t'* of the shaft *b''*. Each of these bearings *t t'* is pressed outward toward the end of the arms *r r'* by a spiral spring, *s s'*, each of which surrounds and is kept in place by a rod, *u u'*, each of which is screwed into or otherwise attached to one of the bearings *t t'*. The rods *u u'* are for the purpose of withdrawing the printing-wheel L (which is attached by a feather to the spindle *b''*) from contact with the article D to be printed on. The rods *u u'* pass through the frame E and project at its rear. Each has a hook at its projecting end, which engages a slide, *v*, which rests against the back end of the frame E, as shown in Fig. 1. Two inclines, *v' v'*, on the slide *v*, serve to draw back the rods *u u'* and the bearings attached thereto, when the slide *v* is pushed in one direction, and allow the bearings to advance, when the slide is moved in the other direction.

A pulley, *h'*, is keyed to the spindle *b''*, corresponding to the pulley *h* on the spindle *b'*. These pulleys are grooved, and a crossed belt is passed around them, so that the pulley *h'* on spindle *b''* of the printing-wheel L and the pulley *h* on the spindle *b* of the chuck shall revolve in opposite directions, as if geared together, so as to secure the exact uniform revolution of the two spindles and the accurate registration of the pattern. If the pulleys *h h'* are of exactly the same diameter, they will perform a complete revolution in precisely the same time, so that the printing-wheel L will revolve once for every revolution of the tumbler D or other article placed on the chuck, thus securing the completion of the pattern printed on the tumbler, and this although the diameter of the printing-roller and of the article to receive the impression may not be precisely the same. This feature of my invention, however, forms the subject of a separate application for Letters Patent No. 117,133, filed January 11, 1884, and therefore needs not to be more particularly referred to here.

If desired, the printing-wheel may be of considerably different diameter from that of the article to be printed on, in which case the pulleys *h* and *h'* should bear a corresponding relative diameter to each other. The shaft *b''* projects below the frame E, and the printing-wheel L is placed on the projecting end of the shaft, being fastened by screws to a flanged sleeve, *w*, which fits onto the shaft *b''*, and is fastened to the shaft *b''* by keys.

In order that the position of the printing-roller L on the shaft *b''* may be adjusted lengthwise of the shaft *b''*, jam-nuts *x x'* are screwed onto the shaft *b''* above and below the printing-roller L. The printing-roller L is a block of wood, which is either of cylindrical shape or of the shape of the frustum of a cone, according to the shape of the article to be printed on, whether cylindrical or tapering. If the surface to be printed on is convex, the side of the printing-roller should be correspondingly concave. The pattern or design is formed in relief of some suitable material having more or less elasticity, such as leather or soft vulcanized rubber, or glue dissolved in water and mixed with bichromate of potash in such proportions that the glue when cold will be of the desired consistency and insoluble in water.

The semi-fluid substance with which the printing is to be effected, whether varnish or a mixture containing pulverized alkaline fluoride or fusible metallic colors, is applied to the printing-roller by means of an inking-roller made of printer's-roller composition, gelatine, or other suitable material, and may be

applied by hand or an inking-roller, *m*, (shown in Fig. 2,) supported by a shaft, *y*, attached to arms *z*, projecting horizontally from the frame E.

As above stated, the article D, to receive the impression from the printing-roller L, is placed upon a chuck, C, affixed to the upper end of the spindle *b*. This chuck is an important feature of my machine, as it would be impossible to produce a good impression on the article D by means of the revolving printing-roller unless the article D were accurately centered and held firmly in such position—that is to say, with its axis in the same vertical line as the axes of the spindles *b* and *b'*. It is also important that the chuck should be capable of acting with rapidity and of centering the article automatically as soon as it is placed within it. I shall therefore proceed to describe this part of my machine in detail.

Fig. 4 is a vertical cross-section of the chuck, showing its construction and connection with the spindle *b*. The chuck-frame consists of three parallel circular plates, P, Q, and R. (Shown detached in Figs. 5, 6, and 7, respectively.) Fig. 4 is a cross-section through the plates P, R, and R, on the dotted lines *x x* in Figs. 5, 6, and 7. The lowest plate, P, may, however, be dispensed with, as hereinafter described.

To the plate P, Fig. 5, is fastened at 1 the inner end of a coiled spring, 2. At a point near to the spindle *b* the outer end of the coiled spring is turned upward and attached to the eccentric plate Q at a point, 3, near to its circumference. (See Figs. 4 and 5.) By attaching the inner end of the coiled spring 2 directly to the spindle or to a collar attached thereto, the plate P may be dispensed with; but it is advantageous as affording protection to the spring. The spindle *b* passes through a central hole in each of these three plates, the middle plate, Q, turning upon the spindle *b*, while the plates R and P are rigidly attached to it, the plate P by the set-screw 4 and the plate R by the key 5, so that they revolve with the spindle. The top plate, R, has three gripping-jaws, 6, (one of which is shown in Fig. 4,) which slide in recessed grooves 7 in the plate R, as shown in Fig. 8, and are situate at equal distances apart around the plate R.

Fig. 8 is a cross-section through one of the gripping-jaws 6 and plate R on the line *y y*, Fig. 7. Each gripping-jaw 6 has a round pin, 8, projecting from its under side (see Fig. 4) which enters a slot, 9, in the plate Q, situate immediately below it. The slots 9 in plate Q are in the shape of the arc of a circle, all the arcs having the same radius, but all eccentric to the axis of the plate Q, and so placed that in whatever position the plate Q may be situate relatively to the plate R the pins 8 of the jaws 6 will be equidistant from the center of plate Q, which is the axis of the spindle *b*. It is obvious, therefore, that if the plate Q be turned in the direction of the arrow on plate Q, Fig. 6, the three gripping-jaws 6 will be drawn inward toward the spindle, while if the plate Q is turned in the opposite direction the gripping-jaws 6 will be moved outward away from the spindle. The coiled spring 2, attached to plate *p* or spindle *b*, (see Fig. 5,) always exerts a pressure on the movable eccentric plate Q in the direction of the arrow on Fig. 6, and consequently draws the gripping-jaws together toward the center; and if any article is placed on the plate R the gripping-jaws will not only hold it by the pressure of the spring 2, but as the gripping-jaws are all operated by the same spring, they will press equally upon it, and will hold it exactly in center of the plate R.

In order to open the gripping-jaws conveniently, so as to receive an article to be held by them, a handle, 10, is made on the periphery of plate R, and a similar handle, 11, on the periphery of plate Q. When these handles are drawn together, the gripping-jaws 6 are retracted, and when the handles are released the coiled spring 2 causes the plate Q to rotate, and thus draws the jaws together.

A device is shown in Figs. 9 and 10 which is simpler in construction than the chuck already described, and for many articles will answer the purpose of holding and centering the article to receive the impression of the printing-roller.

Fig. 9 is a vertical section through *x x*, Fig. 10, of the upper part of the lathe-spindle *b* and of the centering device. A sleeve, N, is fastened to the spindle *b* by a set-screw, 19, a short distance below the head of the spindle *b*, which has a T-head to receive the tumbler D or other article to be operated on. A sliding collar, S, having a hub, U, which surrounds the spindle *b*, and radial arms 20, which connect the rim of the collar and its hub, slides up and down the spindle *b*, between the sleeve N and the T-head of the spindle, and is pressed upward by a coiled spring, 21.

To the sleeve N are pivoted three fingers, 22, each terminating at its upper end in a hook. Each of the fingers 22 passes upward through a slot, 23, in the radial arms 20, and the under side of each hook is sloping, so that when the hub U is forced upward by the coiled spring 21 the fingers 22 are pressed inward toward the spindle *b*, in which position they seize and hold firmly any article placed on the T-head of the spindle *b*.

An important and characteristic feature of the chucks described is that the jaws for holding the glass article are pressed against it by a spring or elastic pressure, and not rigidly, so that not only are slight irregularities of the article provided for, but danger of breakage by the holding device is obviated. Another characteristic is that all the jaws are actuated by one and the same spring, so that the action is uniform, and an accurate centering of the article is secured. If an independent spring were applied to each jaw, there would be

danger of the springs varying in power, or of one or other of them becoming clogged, and thereby prevent the centering of the article.

By the use of cylindrical rollers for printing on glass and china a much better impression can be obtained than by a direct vertical pressure by means of flat stamps, for the reason that a rolling contact of the printing device with the article to receive the impression allows of the free escape of air from between the two surfaces, which would otherwise separate into minute particles, leaving bare spots on the impression and producing an imperfect and mottled appearance.

In using my machine, two or more printing-rollers may be employed at the same time by the addition of two or more frames similar to E. This would enable several colors to be printed on the glass or china at the same time.

The lathe portion of the machine, which holds and revolves the article to be operated on, may be used, if desired, without the frame E and its attachments, and the design may be printed on the article of glass or china by means of a revolving printing-tool held against the article by hand; but the result will not be as good as by the use of my entire machine when properly adjusted.

Having thus described my improved machine, what I claim as my invention, and desire to secure by Letters Patent, is—

1. In machines for printing on glassware and similar articles, the combination of a lathe for holding and revolving the article to be printed on, with a revoluble shaft and printing-roller adjustable at various angles to the axis of rotation of the lathe, substantially as and for the purposes described.

2. The apparatus for printing on revolving articles of glass or china ware, consisting of a frame capable of adjustment on a pivot at any required angle, in combination with a spindle carrying a printing-roller, such spindle being held by yielding bearings, so that the printing-roll shall be capable of conforming to the irregularities of the surfaces of articles upon which it prints.

3. In machines for printing on glass and similar articles, the combination of a lathe for centering and holding the article at both ends and revolving it to be printed on, with a tapering printing-roller mounted on a revoluble shaft, so as to be in printing contact with the surface of the article held between the centers of the lathe, substantially as and for the purposes described.

4. In a machine for printing on glassware and similar objects, having a revoluble printing-roller and a lathe for holding the article to be printed on, the combination, with such roller and lathe, of radially-arranged holding and centering jaws caused to act toward a common center by the pressure of a common spring, substantially as and for the purposes described.

In testimony whereof I have hereunto set my hand this 26th day of March, A. D. 1883.

HERMANN SCHULZE-BERGE.

Witnesses:

W. B. CORWIN,

JAMES K. BAKEWELL.